

EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med



VOLUME: 17 • ISSUE: 1 • MARCH 2018

LETTER TO THE EDITOR

- 1 **Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration**
Umut Gulacti, Ugur Lok; Adiyaman, Turkey

ORIGINAL ARTICLES

- 3 **Emergency Department Experience of Foreign Body Ingestion: An Analysis of 69 Cases in an Academic Hospital in Saudi Arabia**
Jameel Talal Abualenain, Hani Akram Jawa, Yagoub Yahya Bintaleb, Mahdi Mohammed Abulkalam, Mohammed Abdullah Aldini, Abdulrahman Khaled Dafterdar, Nawaf Turki Ashgan; Washington DC, USA; Jeddah, Saudi Arabia
- 9 **Competency of Residents and Interns in Pneumothorax Diagnosis on Chest Radiography: an Observer Performance Study**
Ebru Ozan, Gokce Kaan Atac, Yucel Akkas, Togay Evrin, Bulent Kocer; Ankara, Turkey
- 14 **Interpretation of Pneumothorax on Emergency Department Chest Radiographs by Emergency Physicians and Residents**
Burcu Azapoglu Kaymak, Vehbi Ozaydin, Halil Tozum, Didem Ay; Istanbul, Turkey
- 18 **Implementation of Quebec Shoulder Dislocation Rule in Turkish Patient Population**
Aytun Temiz, Murat Das; Balikesir, Canakkale, Turkey

- 22 **The Comparison of the Effects of "Trometamol; Tris-Hydroxymethylaminomethane" and "Sodium Bicarbonate" Treatments on Mortality and Survival Time in Experimental Metabolic Acidosis Induced by Methanol Intoxication**
Mustafa Bolatkale, Gurkan Ersoy, Sedat Yanturali, Osman Yilmaz, Cagdas Can, Ahmet Cagdas Acara, Necati Gokmen; Izmir, Turkey

BRIEF REPORT

- 28 **An Unknown Cause of Agricultural Accidents: Hoeing Machine**
Kasim Turgut, Sukru Gurbuz, Hakan Oguzturk, Serkan Bican, Abdullah Keyfo Kama; Adiyaman, Malatya, Turkey

CASE REPORTS

- 33 **Erythrodermic Psoriasis with Superimposed Fungal Infection-a Presentation in the Emergency Room**
Muhammad Akbar Baig, Sadaf Sheikh; Karachi, Pakistan
- 36 **Aortoenteric Fistula Causing Syncope and Gastrointestinal Bleeding**
Aureliu Grasun, Hector Alonso Valle, María Andrés Gómez, Luis Prieto Lastra, Pablo Garmilla Ezquerro, Francisco Manuel Mateos Chaparro, Nuria Odriozola Romillo, Elena Grasun, Sergio Rubio Sánchez, Luis Iglesias Oliva, Patricio Alberto Seabrook Maggio, Ricardo Jauregui Solorzano; Santander, Spain
- 39 **Ketoacidosis due to Starvation**
Nalan Metin Aksu, Zehra Akcora, Bugra Ilhan, Ozgur Bayar, Meltem Akkas; Ankara, Turkey



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Owner and Responsible Manager

Başar Cander

Department of Emergency Medicine, Necmettin Erbakan University School of Medicine, Konya, Turkey
basarcander@yahoo.com

Editor in Chief

İsa Kılıçaslan

Department of Emergency Medicine, Gazi University School of Medicine, Ankara, Turkey
isakilicaslan@hotmail.com

Editors

E. Erol Ünlüer

Department of Emergency Medicine, Uşak University School of Medicine, Uşak, Turkey
erolerdennun@yahoo.com

Behçet Al

Department of Emergency Medicine, Gaziantep University School of Medicine, Gaziantep, Turkey
behcet.al@gmail.com

Emine Emektar

Department of Emergency Medicine, Keçiören Training and Research Hospital, Ankara, Turkey
emineakinci@yahoo.com

Hakan Oğuztürk

Department of Emergency Medicine, İnönü University School of Medicine, Malatya, Turkey
oguzturk@hotmail.com

Harun Güneş

Department of Emergency Medicine, Düzce University School of Medicine, Düzce, Turkey
haroonsun@hotmail.com

Jameel Talal Abualenain

Department of Emergency Medicine, King Abdulaziz University Hospital, Saudi Arabia
abualenain@kau.edu.sa

Luis Garcia-Castrillo Riesgo

Department of Emergency Medicine, Hospital Universitario Marques Valdecilla, Spain
urggrl@hum.es

Nalan Metin Aksu

Department of Emergency Medicine, Hacettepe University School of Medicine, Ankara, Turkey
nametaksu@yahoo.com.tr

Nazire Belgin Akıllı

Department of Emergency Medicine, Konya Training and Research Hospital, Konya, Turkey
drbelginakilli@hotmail.com

Mehmet Nuri Bozdemir

Department of Emergency Medicine, Antalya Training and Research Hospital, Antalya, Turkey
drnuribozdemir@yahoo.com.tr

T.S. Srinath Kumar

Department of Emergency Medicine, Narayana Health, Hosur Main Road, Hosur Main Road, Bommasandra, India
sriruturekha@yahoo.co.in

Wael Hakmeh

Department of Emergency Medicine, Bronson Methodist Hospital, Michigan, USA
whakmeh@yahoo.com

Zeynep Gökcan Çakır

Department of Emergency Medicine, Atatürk University School of Medicine, Erzurum, Turkey
zeynepgckakir@gmail.com

Acil Tıp Uzmanları Derneği adına sahibi ve Sorumlu Yazı İşleri Müdürü / Owner and Responsible Manager on behalf of the Emergency Medicine Physicians Association of Turkey: Başar Cander
• Yayın türü / Publication Type: Yerel süreli / Local periodical • Basım yeri / Printed at: Matsis Matbaa Hizmetleri San. ve Tic. Ltd. Şti., 2. Tevfikbey Mahallesi Dr. Ali Demir Cad. No:51 34290 Sefaköy, İstanbul, Turkey (+90 212 624 21 11) • Basım tarihi / Printing Date: Mart 2018 / March 2018 • Acil Tıp Uzmanları Derneği tarafından yayınlanmaktadır / Published by Emergency Medicine Physicians Association of Turkey, Yukarı Ayrancı Güleriyüz Sok. No: 26/19 06550 Çankaya, Ankara, Türkiye (+90 312 426 12 14)



Publisher
İbrahim KARA

Publication Director
Ali ŞAHİN

Deputy Publication Director
Gökhan ÇİMEN

Publication Coordinators
Betül ÇİMEN
Zeynep YAKIŞIRER

Gizem KAYAN
Özlem ÇAKMAK
Okan AYDOĞAN
Merve SAĞLAMER
İrem DELİÇAY

Project Assistants
Büşra PARMAKSIZ
Ecenur ASLİM

Graphics Department
Ünal ÖZER
Neslihan YAMAN
Deniz DURAN

Contact:
Address: Büyükdere Cad. 105/9 34394
Mecidiyeköy, Şişli, İstanbul, Turkey
Phone: +90 212 217 17 00
Fax: +90 212 217 22 92
E-mail: info@avesyayincilik.com



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Editorial Advisory Board

Abdelouahab Bellou

Department of Emergency Medicine, Harvard University School of Medicine, Cambridge, USA

Abdo Khoury

Department of Emergency Medicine & Critical Care, University of Franche-Comté, France

Abdülkadir Gündüz

Department of Emergency Medicine, Karadeniz Technical University School of Medicine, Trabzon, Turkey

Abu Hassan Asaari B. Abdullah

Department of Emergency Medicine, Ministry Health Kuala Lumpur Hospital, Kuala Lumpur, Malaysia

Ahmad Mahmoud Wazzan

Consultant Trauma, Emergency Medicine, King AbdulAziz Medical City. National Guard Health Affairs, United Arab Emirates

Anwar AL-Awadhi

Department of Emergency Medicine, Mubarak Al-Kabeer Hospital-Kuwait

Ajith Venugopalan

Department of Emergency Medicine, MOSC Medical College Hospital, Kolenchery, Ernakulam, Kerala, India

Constantine Au

Emergency Care Training-HK, Medical Director, Hong Kong

Eddy Lang

Department of Emergency Medicine, Calgary University Faculty of Medicine, Calgary, Canada

Eric Revue

Emergency Department and EMS, Louis Pasteur Hospital, France

Gireesh Kumar

Department of Emergency Medicine, Amrita Institute of Medical Sciences, Cochin, India

Gregory Luke Larkin

Department of Emergency Medicine, University of Auckland, New Zealand

Imron Subhan

Department of Emergency Medicine, Apollo Hospital, Society for Emergency Medicine, India

Jabeen Fayyaz

Department of Emergency Medicine, Aga Khan University Hospital, Karachi, Pakistan

Jill I. McEwen

Department of Emergency Medicine Undergraduate Education Program Director, Canada

Jonathan H. Valente

Department of Emergency Medicine, Rhode Island Hospital, New York, USA

Julie Mayglothling

Virginia Commonwealth University Surgery Medical Center, Richmond, VA, USA

Junaid A. Razzak

Department of Emergency Medicine, The Aga Khan University, Karachi, Sindh, Pakistan

Mahmood Al Jufaili

Senior consultant Emergency Medicine, Oman Medical Specialty Board, United Arab Emirates

Marc Sabbe

Department of Emergency Medicine, University Hospital Gasthuisberg, Leuven, Belgium

Mehmet Gül

Department of Emergency Medicine, Necmettin Erbakan University School of Medicine, Konya, Turkey

Mehmet Okumuş

Department of Emergency Medicine, Ankara Training and Research Hospital, Ankara, Turkey

Mehtap Bulut

Department of Emergency Medicine, İstanbul Medipol University School of Medicine, İstanbul, Turkey

Oktay Eray

Department of Emergency Medicine, Akdeniz University School of Medicine, Antalya, Turkey

EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Osama Kentab

Paediatrics and Emergency Medicine, King Saud Bin Abdulaziz University, Saudi Arabia

Rasha Buhumaid

Emergency Department and Assistant Program Director, Sheikh Khalifa Medical City, Abu Dhabi, UAE

S. Saravana Kumar

Department of Emergency Medicine, Mehta Hospital, Chennai, India

S.V Mahadevan

Department of Emergency Medicine, Stanford University Faculty of Medicine, Stanford, USA

Saleh Saif Fares

Department of Emergency Medicine, Deputy Head of Zayed Military Hospital's, Abu Dhabi, UAE

Samad Shams Vahdati

Department of Emergency Medicine, Tabriz University of Medical Science, Tabriz, Iran

Sedat Yanturalı

Department of Emergency Medicine, Dokuz Eylül University School of Medicine, İzmir, Turkey

Sharon E. Mace

Department of Emergency Medicine, Ohio State University School of Medicine, Cleveland, OH, USA

Sreekrishnan T P

Department of Emergency Medicine and Critical Care, Amrita Institute of Medical Sciences, Kochi, India

Şahin Aslan

Department of Emergency Medicine, Uludağ University School of Medicine, Bursa, Turkey

Yunsur Çevik

Department of Emergency Medicine, Keçiören Training and Research Hospital, Ankara, Turkey

List of the reviewers who reviewed papers for Eurasian Journal of Emergency Medicine between December 2017-March 2018.

Ali Karakuş

Asım Kalkan

Atıf Bayramoğlu

Ayhan Aköz

Ayhan Sarıtaş

Bedia Gülen

Eylem Kудay Kaykısız

Havva Şahin

Hüseyin Narcı

Kerem Şeref Çorbacıoğlu

Mehmet Gül

Muhammet Gökhan Turtay

Murat Yücel

Nurşah Başol

Önder Tomruk

Özlem Bilir

Pınar Hanife Kara

Samad Shams Vahdati

Seçgin Söyüncü

Togay Evrin

Tuba Cimilli Öztürk

Turgut Deniz

Ugur Lok

Wajid Hussain

EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Aims and Scope

Eurasian Journal of Emergency Medicine (Eurasian J Emerg Med) is the open access, scientific publication organ of the Emergency Medicine Physicians' Association of Turkey that is published in accordance with independent, unbiased, double blind peer review principles. The journal is published 4 times in a year in March, June, September and December.

The journal aims to publish scientifically high quality articles which can contribute to the literature and written in the emergency medicine field and other related fields. Review articles, case reports, editorial comments, letters to the editor, scientific letters, education articles, original images and articles on history and publication ethics which can contribute to readers and medical education are also published.

The journal's target audience includes Emergency Medicine experts, School members who conduct scientific studies and work in the Emergency Medicine field, researchers, experts, assistants, practicing physicians and other health sector professionals.

Editorial and publication processes of the journal are shaped in accordance with the guidelines of the international organizations such as the International Council of Medical Journal Editors (ICMJE), the World Association of Medical Editors (WAME), the Council of Science Editors (CSE), the Committee on Publication Ethics (COPE), the European Association of Science Editors (EASE). The journal is in conformity with Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice).

Eurasian Journal of Emergency Medicine is indexed in Web of Science-Emerging Sources Citation Index, TUBITAK ULAKBIM TR Index, EMCare, DOAJ, EBSCO, CINAHL, GALE and ProQuest.

Processing and publication are free of charge with Eurasian Journal of Emergency Medicine. No fees are requested from the authors at any point throughout the evaluation and publication process. All manuscripts must be submitted via the online submission system which is available through the journal's web page at www.eajem.com. Journal's guidelines, technical information and the required forms are available on the journal's web page.

All expenses of the journal are covered by the Emergency Medicine Physicians' Association of Turkey. Pharmaceutical advertisements may be published in the printed copies of the journal. Potential advertisers should get in contact with the Editorial Office. Advertisement images are only published upon Editor in Chief's approval.

Statements or opinions expressed in the manuscripts published in the journal reflect the views of the author(s) and not the opinions of the Eurasian Journal of Emergency Medicine, the editors, the editorial board and/or the publisher, AVES; the editors, the editorial board and the publisher disclaim any responsibility or liability for such materials.

All published content is available online free of charge at www.eajem.com.

Emergency Medicine Physicians' Association of Turkey holds the international copyright of all content published in the journal.

Eurasian Journal of Emergency Medicine is distributed internationally and free of charge to its target audience. Archive of the journal is available online at www.eajem.com, free of charge.

The journal is printed on an acid-free paper.



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Instructions to Authors

Eurasian Journal of Emergency Medicine (Eurasian J Emerg Med), as a double-blind peer reviewed journal published by the Emergency Medicine Physicians' Association of Turkey, publishes original articles on clinical, experimental and basic sciences in the Emergency Medicine field, review articles covering basic and up-to-date subjects, case reports, short editorial manuscripts and manuscripts covering medicine history and publication and research ethics.

Editorial and publication processes of the journal are shaped in accordance with the guidelines of the international organizations such as the International Council of Medical Journal Editors (ICMJE), the World Association of Medical Editors (WAME), the Council of Science Editors (CSE), the Committee on Publication Ethics (COPE), the European Association of Science Editors (EASE). The journal is in conformity with Principles of Transparency and Best Practice in Scholarly Publishing (doaj.org/bestpractice).

Originality, high scientific quality and citation potential are the most important criteria for a manuscript to be accepted for publication. Manuscripts submitted for evaluation should not be previously presented or published in an electronic or a printed medium. Editorial Board should be informed of manuscripts that have been submitted to another journal for evaluation and rejected for publication. Submission of previous reviewer reports will expedite the evaluation process. Manuscripts that have been presented in a meeting should be submitted with detailed information on the organization including the name, date and location of the organization.

Manuscripts submitted to Eurasian Journal of Emergency Medicine will go through a double blind peer review process. Each submission will be reviewed by at least two external, independent peer reviewers who are experts in the field in order to ensure an unbiased evaluation process. The editorial board will invite an external and independent editor to manage the evaluation processes of manuscripts submitted by editors or the editorial board members of the journal. The Editor in Chief is the final authority in the decision making process of all submissions.

An approval of research protocols by Ethics Committee in accordance with international agreements (World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", amended in October 2013, www.wma.net) is required for experimental, clinical and drug studies and some case reports. If required, ethics committee reports or an equivalent official document may be requested from the authors. For manuscripts concerning experimental research on humans, a statement should be included that shows informed consent of patients and volunteers was obtained following a detailed explanation of the procedures that

they may undergo. For studies carried out on animals, the measures taken to prevent pain and suffering of the animals should be stated clearly. Information on patient consent, name of the ethics committee and the ethics committee approval number should also be stated in the materials and methods section of the manuscript. It is the authors' responsibility to carefully protect the patients' anonymity. For photographs that may reveal the identity of the patients, releases signed by the patient or their legal representative should be enclosed.

All submissions are screened by a similarity detection software (iThenticate by CrossCheck).

In the event of an alleged or suspected research misconduct, including plagiarism, citation manipulation, and data falsification/fabrication, among others, the Editorial Board will follow and act in accordance with COPE guidelines.

Each individual listed as an author should fulfill the authorship criteria recommended by the International Committee of Medical Journal Editors (ICMJE - www.icmje.org). The ICMJE recommends that authorship be based on the following 4 criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he or she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their coauthors.

All those designated as authors should meet all four criteria for authorship, and all who meet the four criteria should be identified as authors. Those who do not meet all four criteria should be acknowledged in the title page of the manuscript.

Eurasian Journal of Emergency Medicine requires corresponding authors to submit a signed and scanned version of the authorship contribution form (available for download through www.eajem.com) during the initial submission process in order to act appropriately to authorship rights and prevent ghost or honorary authorship. If the editorial board suspects a case of "gift authorship", the submission will be rejected with-

out further review. As part of submission of the manuscript, the corresponding author should also send a short statement declaring that he/she accepts to undertake all the responsibility for authorship during the submission and review stages of the manuscript.

Eurasian Journal of Emergency Medicine requires and encourages the authors and the individuals involved in the evaluation process of submitted manuscripts to disclose any existing or potential conflicts of interests including financial, consultant, institutional and other relationships that might lead to bias or a conflict of interest.

Any financial grants or other support received for a submitted study from individuals or institutions should be disclosed to the Editorial Board and to disclose potential conflicts of interest ICMJE Potential Conflict of Interest Disclosure Form should be filled in and submitted by all contributing authors. Cases of potential conflicts of interest of editors, authors and reviewers are resolved by the journal's Editorial Board within the scope of COPE and ICMJE guidelines.

Editorial Board of the journal handles appeal and complaint cases within the scope of COPE guidelines. Authors should get in direct contact with the editorial office regarding their appeals and complaints. When needed, an ombudsperson can be assigned to resolve cases that cannot be resolved internally. The Editor in Chief is the final authority in the decision making process of appeals and complaints.

When submitting a manuscript to the Eurasian Journal of Emergency Medicine, authors accept to assign the copyright of their manuscript to Emergency Medicine Physicians' Association of Turkey. If rejected for publication, the copyright of the manuscript will be assigned back to the authors. Eurasian Journal of Emergency Medicine requires each submission to be accompanied by a Copyright Transfer Form (available for download at www.eajem.com). When using previously published content, including figures, tables, or any other material in both print and electronic formats, authors must obtain permission from the copyright holder.

Statements or opinions expressed in the manuscripts published in Eurasian Journal of Emergency Medicine reflect the views of the author(s) and not the opinions of the editors, the editorial board or the publisher; the editors, the editorial board and the publisher disclaim any responsibility or liability for such materials. The final responsibility in regard to the published content rests with the authors.

Manuscript Preparation

The manuscripts should be prepared in accordance with ICMJE-Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals (updated in December 2016 -



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

<http://www.icmje.org/icmje-recommendations.pdf>). Authors are required to prepare manuscripts in accordance with CONSORT guidelines for randomized research studies, STROBE guidelines for observational original research studies, STARD guidelines for studies on diagnostic accuracy, PRISMA guidelines for systematic reviews and meta-analysis, ARRIVE guidelines for experimental animal studies and TREND guidelines for non-randomized public behavior.

Manuscripts can only be submitted through the journal's online manuscript submission and evaluation system, available at www.eajem.com. Manuscripts submitted via any other medium will not be evaluated.

Manuscripts submitted to the journal will first go through a technical evaluation process where the editorial office staff will ensure that the manuscript is prepared and submitted in accordance with the journal's guidelines. Submissions that don't conform the journal's guidelines will be returned to the submitting author with technical correction requests.

Authors are required to submit the;

- Copyright Transfer Form,
- Author Contributions Form,
- and ICMJE Potential Conflict of Interest Disclosure Form (should be filled in by all contributing authors) during the initial submission. These forms are available for download at www.eajem.com

Title page: A separate title page should be submitted with all submissions and this page should include;

- The full title of the manuscript as well as a short title (running head) of no more than 50 characters,
- Name(s), affiliations and major degree(s) of the author(s)
- Grant information and detailed information on the other sources of support,
- The name, address, telephone (including the mobile phone number) and fax numbers and e-mail address of the corresponding author,
- Acknowledgement of the individuals who contributed to the preparation of the manuscript but do not fulfil the authorship criteria.

Abstract: An abstract should be submitted with all submissions except for letters to the editor. The abstract of Original Articles should be structured with subheadings (Aim, Materials and Methods, Results and Conclusion).

Keywords: Each submission must be accompanied by a minimum of three and a maximum of six keywords for subject indexing at the end of the abstract.

The keywords should be listed in full without abbreviations.

Manuscript Types

Original Articles: This is the most important type of article since it provides new information based on original research. The main text of original articles should be structured with Introduction, Materials and Methods (with subheadings), Results, Discussion, Study Limitations, Conclusion subheadings. Please check Table 1 for limitations for Original Articles.

Statistical analysis to support conclusions is usually necessary. Statistical analyses must be conducted in accordance with the international statistical reporting standards (Altman DG, Gore SM, Gardner MJ, Pocock SJ. Statistical guidelines for contributors to medical journals. *Br Med J* 1983; 7; 1489-93). Information on statistical analyses should be provided with a separate subheading under the Materials and Methods section and statistical software that was used during the process must certainly be specified. Data must be expressed as mean $\pm$ standard deviation when parametric tests are used to compare continuous variables. Data must be expressed as median (minimum-maximum) and percentiles (25th and 75th percentiles) when non-parametric tests are used. In advanced and complicated statistical analyses, relative risk (RR), odds ratio (OR) and hazard ratio (HR) must be supported by confidence intervals (CI) and p values.

Editorial Comments: Editorial comments aim at providing brief critical commentary by the reviewers having expertise or with high reputation on the topic of the research article published in the journal. Authors are selected and invited by the journal. Abstract, Keywords, Tables, Figures, Images and other media are not included.

Review Articles: Reviews which are prepared by authors who have extensive knowledge on a particular field and whose scientific background has been translated into high volume of publication and higher citation potential are taken under review. The authors may be invited by the journal. Reviews should be describing, discussing and evaluating the current level of knowledge or topic used in the clinical practice and should guide future studies. Please check Table 1 for limitations for Review Articles.

Case Reports: There is limited space for case reports in the journal and reports on rare cases or conditions that constitute challenges in the diagnosis and treatment, those offering new therapies or revealing knowledge not included in the books, and interesting and educative case reports are accepted for publication. The text should include Introduction, Case Presentation, Discussion, Conclusion subheadings. Please check Table 1 for limitations for Case Reports.

Letters to the Editor: This type of manuscripts can discuss important parts, overlooked aspects or lacking parts of a previously published article. Articles on the subjects within the scope of the journal that might attract the readers' attention, particularly educative cases can also be submitted in the form of "Letter to the Editor". Readers can also present their comments on the published manuscripts in the form of "Letter to the Editor". Abstract, Keywords, Tables, Figures, Images and other media are not included. The text should be unstructured. The manuscript that is being commented on must be properly cited within the manuscript.

Scientific letter: Manuscripts with prior notification characteristics, announcing new, clinically important scientific developments or information are accepted as Scientific Letters. Scientific Letters should not include sub-headings and should not exceed 900 words. Number of references should be limited to 10 and number of tables and figures should be limited to 2.

Clinical Imaging / Visual Diagnosis: Images must be typical for diagnosis, and should facilitate rapid diagnosis for emergency medicine and / or should be educational. Except for the header and references, it must consist of maximum 400 words. A maximum of three authors name, six images and five references should be included.

History: This type of manuscript explains events related to emergency and general medicine and presents information on the history of diagnosis and treatment of diseases. Historical findings should be a result of relevant research studies. Manuscript should not include sub-headings, should not exceed 900 words and total number of references should be limited to 10.

Publication ethics: This type of manuscript includes current information on research and publication ethics and presents cases of ethics infringement. Main text should not exceed 900 words and total number or references should be limited to 10.

Tables

Tables should be included in the main document, presented after the reference list and they should be numbered consecutively in the order they are referred to within the main text. A descriptive title must be placed above the tables. Abbreviations used in the tables should be defined below the tables by footnotes (even if they are defined within the main text). Tables should be created using the "insert table" command of the word processing software and they should be arranged clearly to provide an easy reading. Data presented in the tables should not be a repetition of the data presented within the main text but should be supporting the main text.

Table 1. Limitations for each manuscript type.

Type of manuscript	Word limit	Abstract word limit	Reference limit	Table limit	Figure limit
Original Article	5000 (Structured)	200	50	6	7 or total of 15 images
Review Article	5000	200	50	6	10 or total of 20 images
Case Report	1500	200	10	No tables	10 or total of 20 images
Letter to the Editor	500	N/A	5	No tables	No media
Scientific letter	900	N/A	10	No tables	2 or total of 4 images
Clinical Imaging/ Visual Diagnosis	400	N/A	5	No tables	3 or total of 6 images
History	900	N/A	10	No tables	3 or total of 6 images
Publication ethics	900	N/A	10	No tables	No media

Figures and Figure Legends

Figures, graphics and photographs should be submitted as separate files (in TIFF or JPEG format) through the submission system. The files should not be embedded in a Word document or the main document. When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system. Images should not be labelled (a, b, c, etc.) to indicate figure subunits. Thick and thin arrows, arrowheads, stars, asterisks and similar marks can be used on the images to support figure legends. Like the rest of the submission, the figures too should be blind. Any information within the images that may indicate an individual or institution should be blind. The minimum resolution of each submitted figure should be 300DPI. To prevent delays in the evaluation process all submitted figures should be clear in resolution and large in size (minimum dimensions 100x100 mm). Figure legends should be listed at the end of the main document.

All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and the main text. The abbreviation should be provided in parenthesis following the definition.

When a drug, product, hardware, or software mentioned within the main text product information,

including the name of the product, producer of the product, city of the company and the country of the company should be provided in parenthesis in the following format: "Discovery St PET/CT scanner (General Electric, Milwaukee, WI, USA)"

All references, tables and figures should be referred to within the main text and they should be numbered consecutively in the order they are referred to within the main text.

Limitations, drawbacks and shortcomings of original articles should be mentioned in the "Discussion" section before the conclusion paragraph.

References

While citing publications, preference should be given to the latest, most up to date publications. If an ahead of print publication is being cited the DOI number should be provided. Authors are responsible for the accuracy of references. Journal titles should be abbreviated in accordance with the journal abbreviations in Index Medicus/ Medline/PubMed (for journal abbreviations consult the List of Journals indexed for MEDLINE, published annually by NLM). When there are 6 or fewer authors, all authors should be listed. If there are 7 or more authors the first 6 authors should be listed followed by "et al". In the main text of the manuscript, references should be cited using Arabic numbers in parentheses. The reference styles for different types of publications are presented in the following examples:

Journal article: Lewin MR, Stein J, Wang R, Lee MM, Kernberg M, Boukhan M, et al. Humming is as effective as Valsalva's maneuver and Trendelenburg's position for ultrasonographic visualization of the jugular venous system and common femoral veins. *Ann Emerg Med.* 2007; 50: 73-7.

Book Section: Sherry S. Detection of thrombi. In: Strauss HE, Pitt B, James AE, editors. *Cardiovascular Medicine.* St Louis: Mosby; 1974.p.273-85.

Books with Single Author: Cohn PF. Silent myocardial ischemia and infarction. 3rd ed. New York: Marcel Dekker; 1993.

Editor(s) as author: Norman IJ, Redfern SJ, editors. *Mental health care for elderly people.* New York: Churchill Livingstone; 1996.

Conference Proceedings: Bengissson S. Sothemin BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, editors. *MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics;* 1992 Sept 6-10; Geneva, Switzerland. Amsterdam: North-Holland; 1992.p.1561-5.

Scientific or Technical Report: Smith P. Golladay K. Payment for durable medical equipment billed

during skilled nursing facility stays. Final report. Dallas (TX) Dept. of Health and Human Services (US). Office of Evaluation and Inspections: 1994 Oct. Report No: HHSIGOE 169200860.

Thesis: Kaplan SI. Post-hospital home health care: the elderly access and utilization (dissertation). St. Louis (MO): Washington Univ. 1995.

Manuscripts accepted for publication, not published yet: Leshner AI. Molecular mechanisms of cocaine addiction. *N Engl J Med* In press 1997.

Epub ahead of print Articles: Sarıtaş A, Güneş H, Kandıç H, Çıkman M, Çandar M, Korkut S, et al. A Retrospective Analysis of Patients Admitted to our Clinic with Aortic Dissection. *Eurasian J Emerg Med* 2011 Dec 10. doi: 10.5152/jaem.2011.035. [Epub ahead of print]

Manuscripts published in electronic format: Morse SS. Factors in the emergence of infectious diseases. *Emerg Infect Dis* (serial online) 1995 Jan-Mar (cited 1996 June 5): 1(1): (24 screens). Available from: URL: [http:// www.cdc.gov/ncidod/EID/cid.htm](http://www.cdc.gov/ncidod/EID/cid.htm).

REVISIONS

When submitting a revised version of a paper, the author must submit a detailed "Response to reviewers" that states point by point how each issue raised by the reviewers has been covered and where it can be found (each reviewer's comment followed by the author's reply and line numbers where the changes have been made) as well as an annotated copy of the main document. Revised manuscripts must be submitted within 30 days from the date of the decision letter. If the revised version of the manuscript is not submitted within the allocated time, the revision option may be cancelled. If the submitting author(s) believe that additional time is required, they should request this extension before the initial 30 day period is over.

PROOFS AND DOI NUMBER

Manuscripts accepted for publication are provided with a DOI number immediately after acceptance. Accepted manuscripts are copy-edited for grammar, punctuation, and format. Once the publication process of a manuscript is completed it is published online on the journal's webpage as an ahead of print publication before it is included in its scheduled issue. A PDF proof of the accepted manuscript is sent to the corresponding author and their publication approval is requested within 2 days of their receipt of the proof.

PERMISSIONS AND REPRINTS

Permission requests for reproduction of published content and reprint orders should be directed to the Editorial Office.

Please get in direct contact with the Editorial Office if you have any questions or comments regarding the journal.



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

Editorial

Dear Colleagues;

With this first issue of the year 2018, we present you our new Editorial Board together with my esteemed colleagues. First of all, we would like to thank Prof. Erol Erden Unluer and his editorial team, for their great contribution and endeavor to the Eurasian Journal of Emergency Medicine.

With intensive efforts of our previous Editorial Boards, our journal was accepted for inclusion in the Web of Science Emerging Sources Citation Index". We would also like to thank the previous editors who brought our journal to this stage; Prof. Cuma Yildirim, Prof. Mustafa Serinken, Prof. Behcet Al and Prof. Erol Erden Unluer and their editorial boards.

With this count, our first aim is to be able to have the Eurasian Journal of Emergency Medicine, a publication of Emergency Medicine Physicians Association of Turkey, indexed by PubMed Central and Web of Science Flagship databases.

In order to make our journal known in the international arena, we expect you to support us either in authorship or in refereeing.

Sincerely

On behalf of the Editorial Board

Editor in Chief

Dr. Isa Kilicaslan



EAJEM

Eurasian Journal of Emergency Medicine

Citation abbreviation: Eurasian J Emerg Med

CONTENTS

Letter to the Editor

- 1 Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration
Umut Gulacti, Ugur Lok; Adiyaman, Turkey

Original Articles

- 3 Emergency Department Experience of Foreign Body Ingestion: An Analysis of 69 Cases in an Academic Hospital in Saudi Arabia
Jameel Talal Abualenain, Hani Akram Jawa, Yagoub Yahya Bintaleb, Mahdi Mohammed Abulkalam, Mohammed Abdullah Aldini, Abdulrahman Khaled Dafterdar, Nawaf Turki Ashgan; Washington DC, USA; Jeddah, Saudi Arabia
- 9 Competency of Residents and Interns in Pneumothorax Diagnosis on Chest Radiography: an Observer Performance Study
Ebru Ozan, Gokce Kaan Atac, Yucel Akkas, Togay Evrin, Bulent Kocer; Ankara, Turkey
- 14 Interpretation of Pneumothorax on Emergency Department Chest Radiographs by Emergency Physicians and Residents
Burcu Azapoglu Kaymak, Vehbi Ozaydin, Halil Tozum, Didem Ay; Istanbul, Turkey
- 18 Implementation of Quebec Shoulder Dislocation Rule in Turkish Patient Population
Aytun Temiz, Murat Das; Balikesir, Canakkale, Turkey
- 22 The Comparison of the Effects of "Trometamol; Tris-Hydroxymethylaminomethane" and "Sodium Bicarbonate" Treatments on Mortality and Survival Time in Experimental Metabolic Acidosis Induced by Methanol Intoxication
Mustafa Bolatkale, Gurkan Ersoy, Sedat Yanturali, Osman Yilmaz, Cagdas Can, Ahmet Cagdas Acara, Necati Gokmen; Izmir, Turkey

Brief Report

- 28 An Unknown Cause of Agricultural Accidents: Hoeing Machine
Kasim Turgut, Sukru Gurbuz, Hakan Oguzturk, Serkan Bican, Abdullah Keyfo Kama; Adiyaman, Turkey

Case Reports

- 33 Erythrodermic Psoriasis with Superimposed Fungal Infection-a Presentation in the Emergency Room
Muhammad Akbar Baig, Sadaf Sheikh; Karachi, Pakistan
- 36 Aortoenteric Fistula Causing Syncope and Gastrointestinal Bleeding
Aureliu Grasun, Hector Alonso Valle, María Andrés Gómez, Luis Prieto Lastra, Pablo Garmilla Ezquerra, Francisco Manuel Mateos Chaparro, Nuria Odriozola Romillo, Elena Grasun, Sergio Rubio Sánchez, Luis Iglesias Oliva, Patricio Alberto Seabrook Maggio, Ricardo Jauregui Solorzano; Santander, Spain
- 39 Ketoacidosis due to Starvation
Nalan Metin Aksu, Zehra Akcora, Bugra Ilhan, Ozgur Bayar, Meltem Akkas; Ankara, Turkey

Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration

Umut Gulacti , Ugur Lok 

Department of Emergency Medicine, Adiyaman University School of Medicine, Adiyaman, Turkey

Cite this article as: Gulacti U, Lok U. Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration. Eurasian J Emerg Med. 2018; 17: 1-2.

Dear Editor,

We intriguingly read the article by Ece et al. (1) titled "Evaluation of Characteristics and Clinical Outcomes of Patients with Cardiac Arrest" in the June 2017 edition of Eurasian Journal of Emergency Medicine and we believe that is an important subject for emergency physicians. In this paper, the authors aimed to investigate the efficiency of updated cardiopulmonary resuscitation (CPR) methods and emergency cardiac care guidelines on CPR outcomes. We congratulate the authors for this valuable study, and we have a few comments on the same.

A study by Dane et al. (2) found that Advanced Cardiovascular Life Support (ACLS) courses increase the knowledge level in healthcare providers and the survival-to-discharge rate. Therefore, emergency physicians and nurses should be trained regarding updated CPR methods and emergency cardiac care guidelines including basic life support and ACLS. Although the authors aimed to investigate the efficiency of updated CPR methods and emergency cardiac care guidelines on CPR outcomes, they failed to demonstrate this in their findings as the authors did not specify the guidelines used and whether they were used.

Return of spontaneous circulation (ROSC) and survival-to-discharge ratios are higher in patients with pulseless ventricular tachycardia

(pVT) and ventricular fibrillation (VF), and the ROSC ratio is higher during respiratory arrest (3,4). Cardiac arrest associated with trauma is one of the special circumstances of CPR. The ROSC ratio in trauma patients is different from that in non traumatic patients (5). Authors stated that a study investigating trauma patients requiring CPR over a 5-year period found the survival rate to be 9.5%. Of all patients, 14.2% were successfully resuscitated and survived and they mentioned that "the reason for the greater survival rate in our study might be associated with the possibility of unpredictable injuries that multiple-trauma patients might have." In their study, the number of patients with VF at the time of arrival was presented; however, the numbers of patients with pVT at the time of arrival, those with respiratory arrest, and those with trauma and the ROSC ratio of trauma patients were not presented. To evaluate the clinical outcomes of patients with cardiac arrest, presenting these data would be beneficial.

Blood glucose concentration is a factor that influences CPR outcomes including functional neurological recovery. Therefore, it is important to specify the upper normal values of blood glucose and to indicate the values of blood glucose levels in patients who died and those discharged from hospital, separately (6). However, authors did not state these parameters in their study. For identifying the association between higher glucose levels and higher mortality, upper normal values of blood glucose and values (median or mean) of blood glucose levels should be determined.

ORCID IDs of the authors: U.G. 0000-0003-2151-7212; U.L. 0000-0002-6091-9401.



Correspondence to: Umut Gulacti e-mail: drumutgulacti@gmail.com

Received: 20.06.2017 • **Accepted:** 20.07.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com

DOI: 10.5152/eajem.2018.30301

References

1. Ece Y, Unluer EE, Erenler AK, Sener A. Evaluation of Characteristics and Clinical Outcomes of Patients with Cardiac Arrest. *Eurasian J Emerg Med.* 2017; 16: 79-82. [\[CrossRef\]](#)
2. Dane FC, Russell-Lindgren KS, Parish DC, Durham MD, Brown TD. In-hospital resuscitation: association between ACLS training and survival to discharge. *Resuscitation.* 2000; 47: 83-7. [\[CrossRef\]](#)
3. Gulacti U, Celik M, Akcay S, Erdogan MO, Ustun C. Initial results of code blue emergency call system: first experience in Turkey. *Anadolu Kardiyol Derg.* 2014; 14: 486-7. [\[CrossRef\]](#)
4. Gulacti U, Lok U, Aydin I, Gurger M, Hatipoglu S, Polat, H, et al. Outcomes of In-Hospital Cardiopulmonary Resuscitation after Introduction of Medical Emergency Team. *Kuwait Med J.* 2016; 48: 127-31.
5. Lavonas EJ, Drennan IR, Gabrielli A, Heffner AC, Hoyte CO, Orkin AM, et al. Part 10: Special Circumstances of Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation.* 2015; 132(18 Suppl 2): S501-18.
6. Müllner M, Sterz F, Binder M, Schreiber W, Deimel A, Laggner AN. Blood glucose concentration after cardiopulmonary resuscitation influences functional neurological recovery in human cardiac arrest survivors. *J Cereb Blood Flow Metab.* 1997; 17: 430-6. [\[CrossRef\]](#)

Author's Reply

Re: Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration

Dear Editor,

We are grateful and thankful to all authors that spare their precious time on analyzing the results of our study.

It is understood that some concerns have raised about the findings of our study and we hope this letter helps eliminate confusions.

Firstly, our study was conducted with patients presented between 2010 and 2011. So, some of the patients involved were resuscitated according to previous guideline and some of them were resuscitated according to 2010 guideline (1, 2). However, our study did not aim to compare guidelines but focused on outcomes of cardiopulmonary resuscitation (CPR) whether of traumatic or non-traumatic source. With the statement 'updated CPR methods', we tried to underline the fact that every patient was treated by the 'valid guideline' on time of admission. Since this data was not relevant to our aim and outcomes, we did not feel the need to mention it.

Certainly, some of our patients had pulseless VT (pVT) on admission. In the study, we mentioned that defibrillation was performed in 49 patients and 31 patients had ventricular fibrillation (VF) on admission. It is obvious that 18 patients presented with 'the other shockable rhythm'; pVT. However, this data was not presented in the study since only the most common three rhythms were mentioned within the text. Additionally, number of unrecognized rhythms on admission was presented as a limitation of our study.

Glucose level in patients with arrest definitely has some effects on outcomes of CPR (3). However, we believe that comparison of all parameters or determination of all issues about CPR must not be expected from a single study. For instance, we also did not investigate the effects of hypothermia on CPR procedure (4). Our aim was to share our clinical experience and reveal the performance of our clinic.

We are looking forward to further studies on CPR investigating different aspects of the procedure.

Best regards.

References

1. Kaminska H, Wiecek W, Matusik P, Czyzewski L, Ladny JR, Smereka J, et al. Factors influencing high quality chest compressions during cardiopulmonary resuscitation scenario according to 2015 American Heart Association Guidelines. *Kardiol Pol.* 2018; DOI: 10.5603/KPa.2018.0003. [\[CrossRef\]](#)
2. Mallikethi-Reddy S, Akintoye E, Rubenfire M, Briassoulis A, Grines CL, Afonso L. Nationwide survival after in-hospital cardiac arrest before and after 2010 cardiopulmonary resuscitation guidelines: 2007-2014. *Int J Cardiol.* 2017; 249: 231-3. [\[CrossRef\]](#)
3. Wang CH, Huang CH, Chang WT, Tsai MS, Yu PH, Wu YW, et al. Associations between blood glucose level and outcomes of adult in-hospital cardiac arrest: a retrospective cohort study. *Cardiovasc Diabetol.* 2016; 15: 118. [\[CrossRef\]](#)
4. Hakim SM, Ammar MA, Reyad MS. Effect of therapeutic hypothermia on survival and neurological outcome in adults suffering cardiac arrest: a systematic review and meta-analysis. *Minerva Anesthesiol.* 2018; DOI: 10.23736/S0375-9393.18.12164-X.

Yasemin Ece¹, Erden Erol Unluer², Ali Kemal Erenler³, Asli Sener⁴

¹Department of Emergency Medicine, Private Medifema Hospital, Izmir, Turkey

²Department of Emergency Medicine, Usak University Hospital, Usak, Turkey

³Department of Emergency Medicine, Hitit University Corum Education and Research Hospital, Corum, Turkey

⁴Clinic of Emergency Medicine, Cigli Region Education Hospital, Izmir, Turkey

Cite this article as: Ece Y, Unluer EE, Erenler AK, Sener A. Re: Outcomes of Patients with Cardiac Arrest and Effect of Blood Glucose Concentration. *Eurasian J Emerg Med.* 2018; 17: 2.

ORCID IDs of the authors: Y.E. 0000-0002-9371-6475; A.S. 0000-0002-2107-9438; E.E.U. 0000-0003-0334-7440

Correspondence to: Yasemin Ece **e-mail:** yasemin_dr@yahoo.com

DOI: 10.5152/eajem.2018.280218



Emergency Department Experience of Foreign Body Ingestion: An Analysis of 69 Cases in an Academic Hospital in Saudi Arabia

Jameel Talal Abualenain^{1,2,3} , Hani Akram Jawa⁴ , Yagoub Yahya Bintaleb⁵ , Mahdi Mohammed Abulkalam¹ ,
Mohammed Abdullah Aldini¹ , Abdulrahman Khaled Dafterdar¹ , Nawaf Turki Ashgan¹ 

¹Department of Emergency Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

²King Abdulaziz University Hospital, Jeddah, Saudi Arabia

³Department of Emergency Medicine, George Washington University, Washington DC, USA

⁴Department of Internal Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

⁵Department of Pediatric, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

Cite this article as: Abualenain JT, Jawa HA, Bintaleb YY, Abulkalam MM, Aldini MA, Dafterdar AK, et al. Emergency Department Experience of Foreign Body Ingestion: An Analysis of 69 Cases in an Academic Hospital in Saudi Arabia. *Eurasian J Emerg Med.* 2018; 17: 3-8.

Abstract

Aim: Foreign body (FB) ingestions represent a challenging clinical problem in the emergency departments (EDs), and 20% of cases undergo an endoscopy. We aimed to report our experience with FB ingestion based on age, sex, type of FB material, comorbidities, and intervention in ED of King Abdulaziz University hospital where an emergency endoscopic service is available.

Materials and Methods: This was a retrospective descriptive study of patients who presented to ED with FB ingestion over a 4-year period (January 2013 to December 2017) and who were managed by either an upper endoscopy or laparotomy.

Results: A total of 130 patients presented with FB to ED; we included 69 patients (53%) who were treated using either endoscopy or laparotomy. The majority of patients had ingested a single FB (97%), with children representing 83% of the patients. The most common age group of FB ingestion was 0–4 years, with a male predominance (57%). The most common type of FB material was metallic in the pediatric patients and food in the adult patients; 45% of the patients were symptomatic. Comorbidities were present only in 13% of the patients. X-ray was performed in 87% of the patients, whereas computed tomography was performed only in 7%. The esophagus (75%) and stomach (13%) were the most common anatomical locations for FB. Upper endoscopy was the most common procedure performed (93%), and it was almost successful in all patients at the first attempt (96%).

Conclusion: FB ingestion is common in children, and approximately half of the patients underwent an emergency endoscopy. The availability of such a service is invaluable in the management of FB ingestion given its high success rate and low complications.

Keywords: Foreign body, ingestion, emergency, endoscopy

ORCID IDs of the authors: J.T.A. 0000-0003-4623-7292; H.A.J. 0000-0003-4323-1661; Y.Y.B. 0000-0002-7148-1943; M.M.A. 0000-0002-0786-048X; M.A.A. 0000-0002-0581-3585; A.K.D. 0000-0001-8595-7183; N.T.A. 0000-0002-9184-035X.



Correspondence to: Jameel Talal Abualenain e-mail: jameel.abualenain@gmail.com

Received: 27.12.2017 • **Accepted:** 29.01.2018

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.70188

Introduction

Foreign body (FB) ingestions, including food bolus impactions, represent a challenging clinical problem in emergency departments (EDs). FB ingestions can be defined as objects that are accidentally or intentionally swallowed and are considered a problem commonly seen in emergency endoscopy (1). These emergencies may carry a significant risk of morbidity and sometimes mortality if not appropriately evaluated and managed in a timely manner when indicated. They also sometimes pose diagnostic and therapeutic challenges (2-5).

Among children, there is an increased tendency to explore and swallow different types of objects, such as coins, buttons, batteries, magnets, or toys. FB ingestion is a problem encountered in pediatric pathology (6), and FBs are mostly radiopaque (7). In adults, FB ingestion occurs more frequently by accident or because of other contributing pathological factors, such as psychiatric disorders, mental retardation, and food impactions or impairment, which occur more commonly in patients with a previous pathology (2, 4). While the majority (80%) of ingested FBs may spontaneously pass without intervention, it is crucial that clinicians recognize those FBs that might require urgent endoscopic or surgical retrieval when dealing with such scenarios (4, 8). Recent studies have showed that in intentional ingestion, the rate of endoscopic procedures is 63%-76% and the need for surgical procedures is 12%-16% (2, 9). The management of FB depends on several factors, such as anatomic location and size and shape of FB (2).

To the best of our knowledge, descriptive studies analyzing FB ingestions in hospitals in Saudi Arabia are limited. In this study, we aimed to retrospectively analyze the epidemiology, clinical presentations, findings, and outcomes of a cohort of patients who presented to King Abdulaziz University hospital (KAUH), which has emergency endoscopic settings, with FB ingestions and food bolus impactions.

Table 1. Age and sex distribution of foreign bodies in children and adults

	Sex		
	Male n (%)	Female n (%)	Total
Children			
1 month to 4 years	17 (46%)	20 (54%)	37
5-8 years	9 (75%)	3 (25%)	12
9-13 years	6 (75%)	2 (25%)	8
Total	32 (56%)	25 (44%)	57
Adults			
14-30 years	4 (50%)	4 (50%)	8
>30 years	3 (75%)	1 (25%)	4
Total	7 (58%)	5 (42%)	12

Materials and Methods

This study was approved by the research ethics committee of KAUH in June 2017. The need for informed consent was waived off by the ethical committee because all data were deidentified and no identifiable patients' information was collected or utilized during the study. We performed a retrospective descriptive study of a 4-year period (January 2013-June 2017) in which we reviewed the records of patients who had visited ED of KAUH for FB ingestion. KAUH is an 845-bed academic tertiary care hospital located in Jeddah, Saudi Arabia. Our ED is a 75 bed academic department offering full services (adult, pediatrics, and obstetrics). ED is staffed by board-certified emergency medicine consultants and specialists, including gastroenterologists and surgeons (for adult and pediatric patients), who provide 24 hours emergency consultations. There are approximately 64,000 ED visits per year.

We included all adult (≥ 14 years) and pediatric patients who presented with FB ingestion and who were managed with either upper endoscopy or laparotomy. Patients were identified using the electronic medical records (Phoenix; Al Anaiah) of KAUH. We also used the electronic reporting system (Provation) of the endoscopy unit to ensure that all cases were analyzed. We excluded those who were treated medically since there was no intervention performed to confirm the presence of the FB, which similar to what other studies did.

We developed a data collection sheet prior to data collection using variables, including patient demographics, presenting symptoms, comorbidities, radiological investigations, anatomical location, type of FB material, and therapeutic procedures, which were significant for our study and applicable in ED.

We categorized FB into three types: metallic, food, and others. The data were collected from procedure reports, progress notes by physicians, medical discharge reports, and radiological reports. Four researchers collected and reviewed the records simultaneously in two groups. The first group collected the records and the second group reviewed those records; thereafter, the groups switched roles.

Statistical analysis

All statistical analyses were performed using Statistical Package for the Social Sciences 20 (IBM SPSS Statistics; Armonk, NY, USA) to determine the descriptive values. Frequency tests were used, and categorical values were analyzed using the Fisher's exact test. A p value of <0.05 was considered significant.

Results

A total of 130 patients were initially identified. However, only 69 patients were included in this study. The 61 excluded patients were those who were treated medically without intervention (17 patients), who had no FB (31 patients), who had insufficient data on record (9 patients), or who had ingested a chemical (4 patients). FBs were identified using upper endoscopy or laparotomy in all 69 patients. Regarding age and sex distribution, we found that the

Table 2. Type of foreign body (FB) by age group, sex, nationality, clinical presentations, number of FBs, anatomical location, procedure type, and number of attempts for removal by endoscopy

Foreign Body Type	Total n (%)	Food n (%)	Metallic n (%)	Others* n (%)	p
Age group					
Adult patients	12 (17)	10 (83)	1 (8)	1 (8)	0.001
Pediatric patients	57 (83)	2 (3)	50 (88)	5 (9)	
Sex					
Male	39 (56)	8 (21)	29 (74)	2 (5)	0.40
Female	30 (44)	4 (13)	22 (73)	4 (13)	
Nationality					
Saudi Arabian	48 (70)	6 (12)	38 (80)	4 (8)	0.30
Not Saudi Arabian	21 (30)	6 (29)	13 (62)	10 (9)	
Symptoms					
Asymptomatic	22 (32)	1 (4)	21 (96)	0 (0)	
Symptomatic	31 (45)	7 (23)	19 (61)	5 (16)	0.06
Undeclared	16 (23)	4 (25)	11 (69)	1 (6)	
Number of FBs					
Single	67 (97)	11 (16)	50 (75)	6 (9)	0.45
Multiple		1 (50)	1 (50)	0 (0)	
Anatomical location					
Esophagus	52 (75.4)	9 (17)	39 (75)	4 (8)	
Stomach	9 (13)	0 (0)	8 (89)	1 (11)	
Duodenum	3 (4.2)	0 (0)	3 (100)	0 (0)	
Hypopharynx	1 (1.4)	1 (100)	0 (0)	0 (0)	0.005
Cricopharynx	2 (3)	2 (100)	0 (0)	0 (0)	
Broncos	1 (1.4)	0 (0)	0 (0)	0 (0)	
Cecum	1 (1.4)	0 (0)	1 (100)	1 (100)	
Procedure type					
Endoscopy	64 (93)	12 (19)	46 (72)	6 (9)	0.39
Laparotomy	5 (7)	0 (0)	5 (100)	0 (0)	
Attempts					
Single	66 (99)	11 (17)	49 (74)	6 (9)	0.69
Multiple	3 (4)	1 (33)	2 (67)	0 (0)	

*implies plastics, organic subjects such as human fingernails.

majority of FB ingestions were in children aged 0-4 years and occurred more among females (54%), who had a slightly higher FB ingestion rate than males in this age group. However, among the overall pediatric patients, males (56%) had a slightly higher rate. Adult patients were similar to pediatric patients: males (58%) had a slightly higher FB ingestion rate than females (Table 1). The age range distribution was from 1 month to 91 years with a mean age of 9.4 (± 15.9) years. The majority of the patients were pediatric patients with 57 cases (83%); the mean age was 3.8 (± 3.2) years, the median age was 3 years, and the age range was from 1 month to 13 years. There were only 12 adult patients (17%), with a mean age of 36.3 (± 23.7) years, median age of 26 years, and age range of 15-91 years.

Males represented 57% of the patients. In terms of nationality, 48 patients were Saudi Arabians (80%). Moreover, there were different types of FBs found in the gastrointestinal tract. The most common was the metallic type (74%), followed by various food particles (17%), plastics (6%), and organic objects (1%; e.g., human fingernails). Upon further subanalysis, we found that metallic FBs were the most common among pediatric patients (88%) compared with adult patients for whom food FBs were the most common (83%; Table 2).

Moreover, 45% of the patients were symptomatic, mostly with salivation, vomiting, dysphagia, pain in the neck or abdomen, and choking. Furthermore, 32% were asymptomatic, and in the remaining 23%, there was no documentation of the symptoms.

Table 3. Radiological investigations for foreign bodies

	Sex		
	Male n (%)	Female n (%)	Total
X-ray	52 (87)	8 (13)	60
CT	5 (1005)	0 (0)	5
	FB Type		
	Food n (%)	Metallic n (%)	Others n (%)
X-ray	9 (15)	48 (80)	3 (5)
CT	1 (20)	4 (80)	0 (0)
			p
			0.004
			0.772

CT: computed tomography; FB: foreign bodies

There was no significant difference in the symptoms for different types of FB ($p=0.06$). Regarding comorbidities, majority of the patients (87%) did not have any comorbidity, whereas 13% had esophageal narrowing, peptic ulcer, autism, Down syndrome, bronchial asthma, esophageal narrowing, or upper respiratory tract infection (Table 2).

Regarding anatomical location, FBs were mainly located in the esophagus (75%), followed by stomach (13%); other locations included duodenum, hypopharynx, cricopharynx, bronchus, and cecum (Table 2). The most common procedure performed to remove FBs was upper endoscopy, it was performed in 63 out of the 69 included patients (93%) (49% of all 130 FBs patients). Laparotomy (7%) as a secondary option was used either because of failed endoscopy or because FB was unreachable. Regarding the number of attempts, nearly all procedures were successful at the first attempt (96%; Table 2).

The most common radiological investigation was X-ray (87%), followed by computed tomography (CT; 7%). Eight patients (12%) did not undergo any imaging; however, all of them finally underwent interventional management. Among the five patients who underwent CTs, two underwent X-ray that showed FBs (Table 3).

Discussion

FB ingestion is considered a major health concern because it is a common occurrence in both pediatric and elderly patients. As demonstrated in this study, 83% of the patients were pediatric patients, and nearly 40% of the adult patients were aged >50 years. These results are similar to those of other studies in the literature (3, 4, 10, 11). Almost half of the patients who presented to ED with FBs were treated with endoscopic intervention, which is different from that reported in the literature. Louie and Bradin (12) concluded that the majority of FBs were spontaneously resolved; only 10%-20% required non-surgical intervention, such as upper endoscopy and <1% required surgical interventions, such as laparotomy. The high rate of endoscopic intervention in our study could be related to the presence of qualified emergency endoscopic staff that was comfortable in dealing with the patients and opted to intervene earlier to avoid potential FB complications.

Regarding the age distribution of children, we found that majority of the children were aged ≤ 6 years. These findings are similar to those reported by Diaconescu et al. (10), Adhikari et al. (13), and Gilyoma et al. (14), who stated that approximately half or more of their patients were aged <6 years. Regarding adult patients, we found the mean age to be 10 years younger compared with that reported by Geraci et al. (1) and 30 years younger compared with that reported by Zhang et al. (15).

In general, we found a male predominance in FB ingestion irrespective of the age group, which is consistent with that reported by Adhikari et al. (13) and Susy Safe Working Group (16), and in opposition to Smaranda et al. (10) who stated that sex involvement is not significant.

Anatomically, the location of FB impaction is commonly in the narrowest parts, such as the esophagus and pyloric sphincter, as in our study and similar to that reported in some other studies (15, 17, 18). Patients with FB ingestions present either as asymptomatic or with a variety of symptoms. In our study, 32% of the patients presented as asymptomatic, which was consistent with the findings of other authors who found asymptomatic presentation ranging between 25% and 55% (1, 19-21). Moreover, approximately 45% of patients presented with a variety of symptoms, most commonly vomiting and dysphagia. This also supports the findings of several studies in the literature (17, 22, 23), in which vomiting and dysphagia were the most common symptoms. The most common FBs ingested in our study were coins, followed by batteries and food bolus; similar results were found in other studies (10, 24).

One of the initial steps to approach FB ingestion is a radiological examination and identification of FB (25). In our study, plain neck, chest, and abdominal X-rays were the initial radiological choices for identifying FB. Approximately 87% of the patients underwent X-rays, which is similar to that reported in other studies in which the rates were 64%-96% (10, 16, 26, 27). Additional radiological studies, such as CTs, were used in a few patients in whom diagnoses could not be confirmed by X-rays or in patients in whom it was decided to directly perform CT. The management plan in 20% of the patients (14 patients: six did not undergo imaging and eight did not have FB on X-ray) who had a typical presentation of FB ingestion was an interventional procedure, which was similar to that reported by other studies (23, 28-30).

In the literature, the use of a variety of procedures, including balloon extraction, bougie, and upper endoscopy, has been reported. The choice of the optimal procedure for the patient mainly depends on the condition of the patient, characteristics of FB, anatomical location of FB, availability of the procedure, and availability of an expert to perform the procedure at the center (31, 32). In our study, the most commonly used procedure for the removal of FB was upper endoscopy in 93% of the included patients (49% of all 130 patients with FB ingestion), which was higher than 23% and 31% reported by Diaconescu et al. (10) and Yang et al. (33), respectively, and much lower than 98% reported by Pokharel et al. (34). However, the upper endoscopy success rate at the first attempt was 96%, which was higher than 63%-76% reported by Ikenberry et al. (8). FBs that could not be removed by upper endoscopy and could not be treated medically (7%)

were removed by laparotomy because of either inaccessibility of the anatomical location or failed endoscopic attempts. The most common FB was battery, which could develop further long-term complications if not treated surgically. Other studies reported 1%–2.6% of surgical intervention cases (5, 13, 17).

The limitations of this review are that it has a retrospective-descriptive design where data misinterpretation and insufficient documentation from physicians and nurses might occasionally be present. The data was from a single academic tertiary care hospital, so generalization is also an issue. In our study, there were very few adult patients, which makes it difficult to make any solid conclusions for this group.

Conclusion

FB ingestion remains a common occurrence in the pediatric population presenting to the ED. It represents both diagnostic and therapeutic challenges in patients regardless of being symptomatic or not. A 24-h emergency endoscopic service is of a great value to ensure prompt successful intervention when needed with a very low failure rate and complications.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of King Abdulaziz University.

Informed Consent: Written informed consent was waived by the ethical committee because all data were deidentified and no identifiable patients' information was collected or utilized during the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – J.T.A., M.M.A., M.A.A., A.K.D., N.T.A.; Design – J.T.A., M.M.A., M.A.A., A.K.D., N.T.A.; Supervision – J.T.A., H.A.J., Y.Y.B.; Resources – J.T.A.; Materials – J.T.A.; Data Collection and/or Processing – J.T.A., M.M.A., M.A.A., A.K.D., N.T.A.; Analysis and/or Interpretation – J.T.A., H.A.J., Y.Y.B., M.M.A., M.A.A., A.K.D., N.T.A.; Literature Search – M.M.A., M.A.A., A.K.D., N.T.A.; Writing Manuscript – J.T.A., M.M.A., M.A.A., A.K.D., N.T.A.; Critical Review – J.T.A., H.A.J., Y.Y.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Geraci G, Sciume C, Di Carlo G, Picciurro A, Modica G. Retrospective analysis of management of ingested foreign bodies and food impactions in emergency endoscopic setting in adults. *BMC Emerg Med*. 2016; 16: 42. [\[CrossRef\]](#)
- Palta R, Sahota A, Bemarki A, Salama P, Simpson N, Laine L. Foreign-body ingestion: characteristics and outcomes in a lower socioeconomic population with predominantly intentional ingestion. *Gastrointest Endosc*. 2009; 69: 426-33. [\[CrossRef\]](#)
- Cuneo S, Canepa V, Vignolo S, Laforge S, Saggese M. Ingestione di corpo estraneo nel paziente adulto: gestione in PS. *Em Care J*. 2009; 4: 11-7. [\[CrossRef\]](#)
- Mosca S, Manes G, Martino R, Amitrano L, Bottino V, Bove A, et al. Endoscopic management of foreign bodies in the upper gastrointestinal tract: report on a series of 414 adult patients. *Endoscopy*. 2001; 33: 692-6. [\[CrossRef\]](#)
- Hong KH, Kim YJ, Kim JH, Chun SW, Kim HM, Cho JH. Risk factors for complications associated with upper gastrointestinal foreign bodies. *World J Gastroenterol*. 2015; 21: 8125-31. [\[CrossRef\]](#)
- Litovitz TL, Klein-Schwartz W, White S, Cobaugh DJ, Youniss J, Omslaer JC, et al. 2000 Annual report of the American Association of Poison Control Centers Toxic Exposure Surveillance System. *Am J Emerg Med*. 2001; 19: 337-95. [\[CrossRef\]](#)
- Arana A, Hauser B, Hachimi-Idrissi S, Vandenplas Y. Management of ingested foreign bodies in childhood and review of the literature. *Eur J Pediatr*. 2001; 160: 468-72. [\[CrossRef\]](#)
- Committee ASOP, Ikenberry SO, Jue TL, Anderson MA, Appalaneni V, Banerjee S, et al. Management of ingested foreign bodies and food impactions. *Gastrointest Endosc*. 2011; 73: 1085-91. [\[CrossRef\]](#)
- Weiland ST, Schurr MJ. Conservative management of ingested foreign bodies. *J Gastrointest Surg*. 2002; 6: 496-500. [\[CrossRef\]](#)
- Diaconescu S, Gimiga N, Sarbu I, Stefanescu G, Olaru C, Ioniuc I, et al. Foreign Bodies Ingestion in Children: Experience of 61 Cases in a Pediatric Gastroenterology Unit from Romania. *Gastroenterol Res Pract*. 2016; 1982567. [\[CrossRef\]](#)
- Klein CA. Intentional ingestion and insertion of foreign objects: a forensic perspective. *J Am Acad Psychiatry Law*. 2012; 40: 119-26.
- Louie MC, Bradin S. Foreign body ingestion and aspiration. *Pediatr Rev*. 2009; 30: 295-301. [\[CrossRef\]](#)
- Adhikari P, Shrestha B, Baskota D, Sinha B. Foreign Body Ingestion: Analysis of 163 Cases. *Int Arch Otorhinolaryngol*. 2007; 11: 267-70.
- Gilyoma JM, Chalya PL. Endoscopic procedures for removal of foreign bodies of the aerodigestive tract: The Bugando Medical Centre experience. *BMC Ear Nose Throat Disord*. 2011; 11: 2. [\[CrossRef\]](#)
- Zhang X, Jiang Y, Fu T, Zhang X, Li N, Tu C. Esophageal foreign bodies in adults with different durations of time from ingestion to effective treatment. *J Int Med Res*. 2017; 45: 1386-93. [\[CrossRef\]](#)
- Susy Safe Working Group. The Susy Safe project overview after the first four years of activity. *Int J Pediatr Otorhinolaryngol*. 2012; 76(Supplement 1): S3-11. [\[CrossRef\]](#)
- Little DC, Shah SR, St Peter SD, Calkins CM, Morrow SE, Murphy JP, et al. Esophageal foreign bodies in the pediatric population: our first 500 cases. *J Pediatr Surg*. 2006; 41: 914-8. [\[CrossRef\]](#)
- Umihanić Š, Brkić F, Umihanić Š, Hodžić S. Foreign body impaction in esophagus: experiences at Ear-Nose-Throat Clinic in Tuzla, 2003-2013. *Kulak Burun Bogaz Ihtis Derg*. 2015; 25: 214-8. [\[CrossRef\]](#)
- Arms JL, Mackenberg-Mohn MD, Bowen MV, Chamberlain MC, Skrypek TM, Madhok M, et al. Safety and efficacy of a protocol using bougienage or endoscopy for the management of coins acutely lodged in the esophagus: a large case series. *Ann Emerg Med*. 2008; 51: 367-72. [\[CrossRef\]](#)
- Abbas MI, Oliva-Hemker M, Choi J, Lustik M, Gilger MA, Noel RA, et al. Magnet ingestions in children presenting to US emergency departments, 2002-2011. *J Pediatr Gastroenterol Nutr*. 2013; 57: 18-22. [\[CrossRef\]](#)
- Connors GP. Finding Aluminum Foreign Bodies. *Pediatr Rev*. 2000; 21: 172. [\[CrossRef\]](#)
- Saki N, Nikakhlagh S, Safai F, Peyvasteh M. Esophageal foreign bodies in children. *Pakistan J Medical Scie*. 2007; 23: 854-6.
- Lai AT, Chow TL, Lee DT, Kwok SP. Risk factors predicting the development of complications after foreign body ingestion. *Br J Surg*. 2003; 90: 1531-5. [\[CrossRef\]](#)
- Rybojad B, Niedzielska G, Niedzielski A, Rudnicka-Drozak E, Rybojad P. Esophageal Foreign Bodies in Pediatric Patients: A Thirteen-Year Retrospective Study. *ScientificWorldJournal*. 2012; 102642. [\[CrossRef\]](#)
- Smith MT, Wong RK. Esophageal foreign bodies: types and techniques for removal. *Curr Treat Options Gastroenterol*. 2006; 9: 75-84. [\[CrossRef\]](#)
- Litovitz T, Whitaker N, Clark L. Preventing battery ingestions: an analysis of 8648 cases. *Pediatrics*. 2010; 125: 1178-83. [\[CrossRef\]](#)

27. Shastri N, Leys C, Fowler M, Conners GP. Pediatric button battery and small magnet coingestion: two cases with different outcomes. *Pediatr Emerg Care*. 2011; 27: 642-4. [\[CrossRef\]](#)
28. Webb WA. Management of foreign bodies of the upper gastrointestinal tract: update. *Gastrointest Endosc*. 1995; 41: 39-51. [\[CrossRef\]](#)
29. Ginsberg GG. Management of ingested foreign objects and food bolus impactions. *Gastrointest Endosc*. 1995; 41: 33-8. [\[CrossRef\]](#)
30. Chiu YH, Hou SK, Chen SC, How CK, Lam C, Kao WF, et al. Diagnosis and endoscopic management of upper gastrointestinal foreign bodies. *Am J Med Sci*. 2012; 343: 192-5. [\[CrossRef\]](#)
31. Emmanuel M, Jean-Pierre O. Toxic and traumatic injury of the esophagus. *Pediatric Gastrointestinal Disease*. 2008: 1277-80.
32. Orji FT, Akpeh JO, Okolugbo NE. Management of esophageal foreign bodies: experience in a developing country. *World J Surg*. 2012; 36: 1083-8. [\[CrossRef\]](#)
33. Yang CY. The management of ingested foreign bodies in the upper digestive tract: a retrospective study of 49 cases. *Singapore Med J*. 1991; 32: 312-5.
34. Pokharel R, Adhikari P, Bhusal CL, Guragain RP. Oesophageal foreign bodies in children. *JNMA J Nepal Med Assoc*. 2008; 47: 186-8.

Competency of Residents and Interns in Pneumothorax Diagnosis on Chest Radiography: an Observer Performance Study

Ebru Ozan¹ , Gokce Kaan Atac¹ , Yucel Akkas² , Togay Evrin³ , Bulent Kocer² 

¹Department of Radiology, Ufuk University School of Medicine, Ankara, Turkey

²Division of Thoracic Surgery, Ankara Numune Training and Research Hospital, Ankara, Turkey

³Department of Emergency Medicine, Ufuk University School of Medicine, Ankara, Turkey

Cite this article as: Ozan E, Atac GK, Akkas Y, Evrin T, Kocer B. Competency of Residents and Interns in Pneumothorax Diagnosis on Chest Radiography: an Observer Performance Study. Eurasian J Emerg Med. 2018; 17: 9-13

Abstract

Aim: This study aimed to investigate the competency of residents and interns in diagnosing pneumothorax on chest radiography (CXR) as well as to identify potential areas requiring training on this subject.

Materials and Methods: A case set including a total of 40 chest radiographies that were in the digital imaging and communications in medicine (DICOM) format were loaded to the DICOM-compatible software tool-Viewer for Digital Evaluation of X-ray images (ViewDEX). Fifty-three observers, including 25 residents and 28 interns, interpreted the images by answering all the questions determined for each case.

Results: The overall accuracy rate to diagnose pneumothorax on CXR was 79% in the study cohort, with 79.5% and 78.6% for residents and interns, respectively. No significant difference was observed between residents and interns when compared in terms of accuracy rates (regardless of the residents' specialties; $p=0.600$). When the residents' specialties were considered, the diagnostic accuracy rate was found to be significantly different between the groups ($p<0.05$).

Conclusion: The results of our study in terms of the overall accuracy rates of residents and interns in pneumothorax diagnosis on CXR are comparable to the previous studies in literature. However, comparison to another national study was not feasible due to the lack of published studies on this topic in Turkey. We believe that our study may serve as a starting point by raising the awareness on the subject and promote further studies in our country.

Keywords: Pneumothorax, chest radiography, diagnosis, competency, residents, interns

Introduction

Pneumothorax refers to a collection of air within the pleural space. It is mostly seen after any blunt or penetrating trauma; however, spontaneous or iatrogenic cases of pneumothorax may commonly be encountered in clinical practice (1). Although its clinical manifes-

tations are widely variable from asymptomatic to progressive cases causing death, pneumothorax is an urgent situation that should be treated immediately upon diagnosis. The first-line imaging modality to identify pneumothorax is chest radiography (CXR) (2). Expeditious diagnosis following accurate interpretation of CXR is expected from emergency physicians and/or clinicians of several departments in this clinical setting. Physicians may not always have the opportunity

ORCID IDs of the authors: E.O. 0000-0001-7130-0121; G.K.A. 0000-0002-4145-8275; Y.A. 0000-0002-4432-2832; T.E. 0000-0002-8306-4303; B.K. 0000-0002-7344-9859.



Correspondence to: Ebru Ozan e-mail: ebru.sanhal@ufuk.edu.tr

Received: 20.07.2017 • **Accepted:** 10.08.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.14632

to consult a radiologist; therefore, decisions are made based on their initial interpretations relying upon personal experience and basic skills. The aim of the present study was to investigate the competence of residents and interns in diagnosing pneumothorax on CXR as well as to identify potential areas requiring training on this topic.

Materials and Methods

This retrospective study was conducted at the Radiology, Emergency Medicine, and Thoracic Surgery Departments of our institutions. The study was approved by the institutional ethics committee of Ufuk University School of Medicine (approval number: 30112015-9). Informed consent was obtained from all participants included in the study.

Selection of CXRs

The selection procedure was managed by a national board-certified radiologist who had 5 years of experience in CXR interpretation. Forty adult patients (aged ≥ 18 years) who underwent a posteroanterior (PA) CXR examination with a suspected diagnosis of primary spontaneous pneumothorax were included. Digital PA CXRs of 35 patients with spontaneous pneumothorax and five patients with normal findings were randomly recruited from the Picture Archiving and Communication System (Centricity PACS, GE Healthcare, General Electric, Milwaukee, USA). All pneumothoraces were apparent on PA CXRs. All CXRs were taken in the upright position with full digital flat panel equipment (General Electric Medical solutions, GE Milwaukee, USA). The diagnoses were confirmed with clinical findings or computed tomography of the chest for all pneumothorax cases and with clinical findings and PA CXR in all cases without pneumothorax. Medical records of the patients were reviewed and patient demographics, symptoms, clinical findings, and final diagnoses were noted.

Interpretation of CXRs

A case set including a total of 40 CXRs (35 with spontaneous pneumothorax and five with normal findings) that were in the digital imaging and communications in medicine (DICOM) format was

loaded to the DICOM-compatible software tool-Viewer for Digital Evaluation of X-ray images (ViewDEX), which is suitable for observer performance studies (Figure 1) (3). This tool allowed each observer to evaluate the image and proceed by answering all of the questions determined for each case. A measuring tool and image handling functions, including zoom, window settings, and pan, were also available in the tool. Each observer was briefly informed and trained about the tool before starting the interpretation process. The cases were presented at random. There was no time limitation for interpretation. It was explained that not all the radiographs were necessarily abnormal. No clinical information was provided other than the age and sex of each patient. After completion of interpretation, a log file containing the answers and the time spent on each case was created for each observer.

Each case was interpreted preliminarily by a consensus panel of two experts in CXR interpretation: one national board-certified radiologist and one thoracic surgeon. They were not included in the initial CXR selection procedure and were blinded to the demographic and clinical information of the patients. A question folder, comprising the following six questions, was created on ViewDEX for each case: (1) Is pneumothorax present on this PA CXR? (2) What is the maximum dimension/depth of the pneumothorax? (3) Is an accompanying finding present? (4) Are you confident in your diagnosis? (5) What is the most helpful finding to make the diagnosis? (6) Is this PA CXR diagnostic? Subsequently, the choices for the questions and the correct answers for each case were defined by the same consensus panel (Table 1).

After completion of interpretation, each observer was requested to complete a survey composed of two questions: (1) Did you enjoy the interpretation session? (2) Did you find the ViewDEX tool easy to use? The choice was either "Yes" or "No."

Selection of observers

Fifty-three observers from the same university hospital, including 25 residents and 28 interns (final-year medical students), participated in the study. The age, sex, specialty of the participants, and level of training in the specialty were recorded. Of 25 residents, 8, 7, 3, 2, and 5 were specialists in emergency medicine, anesthesiology, radiology, pulmonary medicine, and surgery residents, respectively. All interns were close to completion of all of their rotations, including internal medicine, surgery, emergency medicine, pediatrics, and obstetrics and gynecology. Emergency medicine, anesthesiology, internal medicine, and surgery residents were chosen because they interpret CXRs in their daily practice, prior to surgery or in the intensive care unit. In addition, these residents are most likely to encounter pneumothorax cases and have the responsibility to make an accurate diagnosis following interpretation of CXRs. Radiology residents for the most part had practiced general radiology.

Statistical analysis

The analysis of the results was performed using the IBM Statistical Package for Social Sciences statistics (IBM SPSS Statistics; Armonk, New York, USA) version 21.0 software for Windows. Descriptive statistics were reported and Chi-square test was used for group comparisons. The statistical significance level was set at a p value of <0.05 .

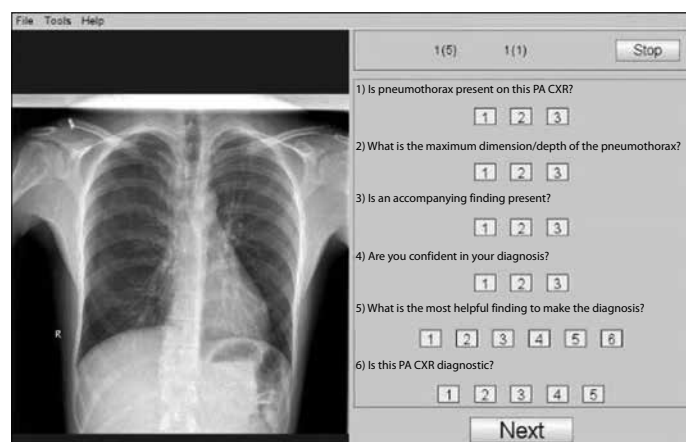


Figure 1. Screenshot of the DICOM-compatible software tool-ViewDEX. A PA CXR (left) and the answer folder (right) are presented. The observer evaluates the image and makes a decision for each question in the answer folder. By clicking on "next," the observer proceeds to the next image

Results

The participants included 28 interns and 25 residents; 24 (46%) participants were women. Of the 25 residents, 8, 7, 3, 2, and 5 were specialists in emergency medicine, anesthesiology, radiology, pulmonary medicine, and surgery residents, respectively.

The overall accuracy rate in diagnosing pneumothorax on CXR was 79% in the study cohort, whereas it was 79.5% and 78.6% for the residents and interns, respectively. No significant difference was found between residents and interns when compared in terms of accuracy rates (regardless of the residents' specialties; $p=0.600$). When the residents' specialties were considered, the diagnostic accuracy rate was found to be significantly different between the groups ($p<0.05$; Table 2).

Table 1. Choices for questions

Questions	Choices
1) Is pneumothorax present on this PA CXR?	a) No
	b) On right side
	c) On left side
2) What is the maximum dimension/depth of the pneumothorax?	a) No pneumothorax
	b) <2 cm
	c) >2 cm
3) Is an accompanying finding present?	a) No
	b) Haemothorax (same side)
	c) Rib fracture (same side)
4) Are you confident in your diagnosis?	a) Not sure
	b) Undecided
	c) Sure
5) What is the most helpful finding to make the diagnosis?	a) No pneumothorax
	b) Displacement of the pleural line
	c) Absence of distal lung markings
	d) Collapse of the lung
	e) Mediastinal shift
	f) Subcutaneous emphysema
6) Is this PA CXR diagnostic?	a) Surely not diagnostic
	b) Not diagnostic
	c) Undecided
	d) Diagnostic
	e) Surely diagnostic

PA CXR: posteroanterior chest radiography

The rate of correct diagnosis (rate of correct answers obtained for question 1) ranged between 25% and 100%, whereas the error rate ranged between 0% and 75% for each CXR.

The rate of correct answers for question 2 (the size of pneumothorax) was 71.3% and 69.9% for residents and interns, respectively. No significant difference was found between the resident and intern groups ($p=0.681$). When the residents' specialties were considered, the rates of correct answers for question 2 were 73.3%, 59.5%, 80%, 71.2%, and 90% for emergency medicine, anesthesiology, radiology, pulmonary medicine, and surgery residents, respectively, and 70.5% for interns. The difference was found to be significantly different between the groups ($p<0.05$).

The rates of correct answers for question 3 (the accompanying findings) were 65.6%, 62%, 65%, 58.5%, 56%, and 63% for emergency medicine, anesthesiology, radiology, pulmonary medicine, surgery residents, and interns, respectively. No significant difference was found between the groups ($p=0.785$).

The answers for question 4 were analyzed to evaluate the confidence level. In terms of confidence level, no significant difference was found between residents and interns ($p=0.133$). The confidence level was found to be significantly different between the correctly diagnosed and missed cases for both the residents and interns ($p<0.001$).

For answers to question 5, choices b and c were considered together. The displacement of the pleural line and absence of distal lung markings were considered the most helpful findings in diagnosing pneumothorax by 70.8% and 70% of the residents and interns, respectively. For answers to question 6, both choices d and e were considered "diagnostic." Accordingly, 75.2% and 74.1% of the residents and the interns defined the CXRs as diagnostic, respectively.

With respect to the responses to the survey that was conducted to evaluate the participants' opinions about the CXR interpretation session using the ViewDEX tool, it was found that all of the observers enjoyed their sessions and defined the tool as easy to use.

Discussion

CXR is the first choice imaging modality for identifying pneumothorax because it represents a simply accessible, rapid, inexpensive, and noninvasive imaging technique (4). In patients with suspected pneumothorax, CXR provides valuable information beyond confirmation by determining the extent of pneumothorax and potential causes. Additionally, it may assist in treatment options. Regarding the importance of accurate and fast diagnosis needed for proper management, the competency of physicians in pneumothorax diagnosis on CXR is crucial. To the best of our knowledge, the present study is the first to investigate the competency of residents and interns in pneumothorax diagnosis on CXR, which was conducted in Turkey.

Table 2. Accuracy rates of interns and residents regarding specialties

	Interns	Emergency medicine residents	Anesthesiology residents	Radiology residents	Pulmonary medicine residents	Surgery residents	p
Accuracy rate	78.6%	82%	72%	79.2%	95%	92%	0.001

Among all radiographic examinations, CXR is the most widely and represents one of the most complex imaging modalities to interpret. Unsatisfactory CXR interpretation skills of medical students, residents in training, and practicing physicians have been demonstrated in prior studies (5-9).

The current study investigated the competence of residents and interns in diagnosing pneumothorax on CXR. The overall accuracy rate was 79% in the study cohort, with 79.5% and 78.6% for the residents and interns, respectively. Regarding accuracy rates, no significant difference was found between the interns and residents, regardless of the residents' specialties. In contrast, when the residents' specialties were considered, the difference was found to be significant. Accordingly, the pulmonary medicine and surgery residents had the highest accuracy rates. Radiology and emergency medicine residents had lower rates, whereas anesthesiology residents and interns had the lowest rates.

One study investigated the ability of final-year medical students to interpret conventional CXRs with several abnormal findings, including multiple pulmonary metastases, left ventricular failure, total lung collapse, pneumothorax, rib notching (aortic coarctation), bullous emphysema, right middle lobe consolidation, pneumoperitoneum, and apical tuberculosis (10). Pneumothorax was missed by 40.4% of the participating students. The authors indicated that an error rate of 20%-30% would probably be acceptable, although the ideal correct diagnosis rate was 100%. In our study, interns had an error rate of 21.4%, and it may be considered acceptable. In another study, pneumothorax was misdiagnosed by 91% of the 145 participants, including interns, residents, and pulmonary/critical care and cardiology personnel (11). A more recent study by Christiansen et al. (12) found an overall accuracy of 51% in chest X-ray interpretation by junior doctors. The number of correct diagnoses regarding two chest X-rays with pneumothorax included in their study were reported as 73% and 59%, respectively. Thus, the overall accuracy rates depicted in our study are comparable to previous studies. Nevertheless, it may be assumed that the residents' overall performance in diagnosing pneumothorax on CXR was low, although expected to be obviously superior when compared to interns. Furthermore, because pneumothorax is an emergency that requires rapid and accurate diagnosis, higher performance of residents in terms of diagnosis may be anticipated.

We have to emphasize that our institution represents a relatively small-scale faculty of medicine; thus, residents' relatively low experience with patients with pneumothorax might have influenced their diagnostic performance. However, comparison to another national study was not feasible due to the lack of published studies on this topic in Turkey. Thus, the results of our study provide an opportunity to raise awareness and define the potential fields of our curriculum to be strengthened, if any. We believe that targeted education can decrease resident error rates and that improved patient care can be achieved. The implementation of quality control measures in postgraduate residency programs should also be valuable for providing an insight and ascertaining the fields requiring improvement in training activities, including basic radiology skills, particularly, interpretation of CXR. Additionally, another point of consideration is that basic radiology skills of residents originate from undergraduate training

that widely varies among institutions. Further studies investigating the CXR interpretation skills of medical students and residents in other national institutions should be conducted and improvement of standardization in national medical education and residency training programs should be targeted.

Recent surveys and publications emphasized the importance of undergraduate radiology teaching (13, 14). CXR interpretation is considered an essential clinical skill for medical school graduates. Additionally, independent and rapid assessment of CXR by residents prior to formal radiology reading is often required. However, one study clearly demonstrated that both undergraduate and postgraduate trainees do not agree that the existing radiology teaching matches their learning needs (15). In the current study, the DICOM-compatible software tool-ViewDEX was used for the image evaluation process. Both residents and interns agreed that they enjoyed their interpretation session and defined the tool as easy to use. One potential future direction of the current study could be the development of a CXR competency exam using this tool. In this way, we could easily and confidently assess the deficiencies of training in our institution to meet the learning needs in the field of basic radiology. Examinations may provide more insight to the interns and residents on basic radiology skills, raise their awareness, and motivate them. Moreover, this tool may provide new teaching opportunities. For instance, data sets consisting of examples of "can't miss" diagnoses on several topics may be created to serve as new components to teach radiology during the preclinical and clinical phases of the curriculum.

The rate of correct diagnosis (rate of correct answers obtained for question 1) ranged between 25% and 100%, whereas the rate of misdiagnosis ranged between 0% and 75% for each CXR. Four of the 40 cases involved in the study were accurately diagnosed by 100% of the observers (all of them were examples of large pneumothorax). Higher missing rates were obtained mostly in cases of small pneumothorax: one of them being the most misdiagnosed case with a rate of 75%. Although accuracy of CXR in the estimation of pneumothorax size is beyond the scope of the current study, the higher missing rates in small pneumothorax cases in our study imply that the pneumothorax size may influence the detection of pneumothorax on CXR, particularly by inexperienced observers.

In a study that investigated the ability of final-year medical students to interpret conventional CXRs with several abnormal findings, the overall level of certainty about diagnoses was found to be low: 25% of pneumothorax diagnoses (10). In our study, although the difference was not significant, the overall level of confidence was high: 76.6% and 71.8% for residents and interns, respectively. The level of confidence for correctly diagnosed cases was higher than that of missed cases for both residents and interns.

The diagnosis of pneumothorax on CXR is usually straightforward with the radiographic hallmarks, including displacement of the pleural line and absence of distal lung markings between the edge of the pleura and the chest (16). In our study, these two characteristic findings were considered the most helpful findings for diagnosing pneumothorax by 70% and 70.8% of the interns and residents, respectively.

Future research in this area should focus on whether training of observers helps to improve competency in diagnosing pneumothorax on CXR. This could be investigated by determining their diagnostic accuracy rates at the start of the study (baseline data), subsequently training one group in the diagnosis of pneumothorax on CXR and keeping a control group without training. After a period of time, the observers could be re-evaluated to determine whether training enhanced their diagnostic accuracy rates.

Study limitations

The main limitation of the present study was the observation bias. The difference between real clinical scenario and the prepared scenario might have influenced the estimation of the observers' ability. Other potential limitations were small number of observers, particularly residents representing different training programs and that the year of training among residents was not considered.

Conclusion

The results of our study in terms of the overall accuracy rates of residents and interns in pneumothorax diagnosis on CXR are comparable to the previous studies in literature. However, comparison to another national study was not feasible due to the lack of published studies on this topic in Turkey. We believe that our study may serve as a starting point by raising the awareness on the subject and promote further studies in Turkey. By this way, the potential fields to be supplied should be defined and more useful conclusions should be drawn.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ufuk University School of Medicine (30112015-9).

Informed Consent: Informed consent was obtained from all individual participants included in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – E.O., G.K.A.; Design – E.O., G.K.A.; Supervision – E.O., G.K.A., B.K.; Resources – E.O., G.K.A., Y.A., T.E., B.K.; Materials – E.O., G.K.A., T.E., B.K.; Data Collection and/or Processing – E.O., G.K.A., Y.A.; Analysis and/or Interpretation – E.O., G.K.A., Y.A., T.E., B.K.; Literature Search – E.O., G.K.A., Y.A.; Writing Manuscript – E.O., G.K.A., Y.A.; Critical Review – E.O., G.K.A., Y.A., T.E., B.K.; Other – E.O., G.K.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Zarogoulidis P, Kioumis I, Pitsiou G, Porpodis K, Lampaki S, Papaiwannou A, et al. Pneumothorax: from definition to diagnosis and treatment. *J Thorac Dis.* 2014; 6: 372-6.
2. Spillane RM, Shepard JO, Deluca SA. Radiographic aspects of pneumothorax. *Am Fam Physician.* 1995; 51: 459-64.
3. Håkansson M, Svensson S, Zachrisson S, Svallkvist A, Båth M, Månsson LG. VIEWDEX: an efficient and easy-to-use software for observer performance studies. *Radiat Prot Dosimetry.* 2010; 139: 42-51. [\[CrossRef\]](#)
4. Mirvis SE, Shanmuganathan K. Trauma radiology: part II. Diagnostic imaging of thoracic trauma: review and update. *J Intensive Care Med.* 1994; 9: 179-90. [\[CrossRef\]](#)
5. Dawes TJ, Vowler SL, Allen CM, Dixon AK. Training improves medical student performance in image interpretation. *Br J Radiol.* 2004; 77: 775-6. [\[CrossRef\]](#)
6. Gatt ME, Spectre G, Paltiel O, Hiller N, Stalnikowicz R. Chest radiographs in the emergency department: is the radiologist really necessary? *Postgrad Med J.* 2003; 79: 214-7. [\[CrossRef\]](#)
7. Kaufman B, Dhar P, O'Neill DK, Leitman B, Fermon CM, Wahlander SB, et al. Chest radiograph interpretation skills of anesthesiologists. *J Cardiothorac Vasc Anesth.* 2001; 15: 680-3. [\[CrossRef\]](#)
8. Mehrotra P, Bosemani V, Cox J. Do radiologists still need to report chest x rays? *Postgrad Med J.* 2009; 85: 339-41. [\[CrossRef\]](#)
9. Troy PJ, Salerno EL, Venkatesh P. An evaluation of a short chest radiograph learning intervention to evaluate internal medicine residents' ability to identify basic pathologic abnormalities and normal anatomy. *Conn Med.* 2006; 70: 421-5.
10. Jeffrey DR, Goddard PR, Callaway MP, Greenwood R. Chest Radiograph Interpretation by Medical Students. *Clin Radiol.* 2003; 58: 478-81. [\[CrossRef\]](#)
11. Eisen LA, Berger JS, Hegde A, Schneider RF. Competency in chest radiography. A comparison of medical students, residents, and fellows. *J Gen Intern Med.* 2006; 21: 460-5. [\[CrossRef\]](#)
12. Christiansen JM, Gerke O, Karstoft J, Andersen PE. Poor interpretation of chest X-rays by junior doctors. *Dan Med J.* 2014; 6: A4875.
13. European Society of Radiology (ESR). Undergraduate education in radiology. A white paper by the European Society of Radiology. *Insights Imaging.* 2011; 2: 363-74. [\[CrossRef\]](#)
14. Oris E, Verstraete K, Valcke M; ESR Working Group on Undergraduate Education. Results of a survey by the European Society of Radiology (ESR): undergraduate radiology education in Europe-influences of a modern teaching approach. *Insights Imaging.* 2012; 3: 121-30. [\[CrossRef\]](#)
15. Nyhsen CM, Steinberg LJ, O'Connell JE. Undergraduate radiology teaching from the student's perspective. *Insights Imaging.* 2013; 4: 103-9. [\[CrossRef\]](#)
16. O'Connor AR, Morgan WE. Radiological review of pneumothorax. *BMJ.* 2005; 330: 1493-7. [\[CrossRef\]](#)

Interpretation of Pneumothorax on Emergency Department Chest Radiographs by Emergency Physicians and Residents

Burcu Azapoglu Kaymak¹ , Vehbi Ozaydin² , Halil Tozum³ , Didem Ay² 

¹Department of Emergency, University of Health Sciences Fatih Sultan Mehmet Training and Research Hospital, Istanbul, Turkey

²Department of Emergency Medicine, Medeniyet University Goztepe Training and Research Hospital, Istanbul, Turkey

³Department of Thoracic Surgery, Medeniyet University Goztepe Training and Research Hospital, Istanbul, Turkey

Cite this article as: Azapoglu Kayman B, Ozaydin V, Tozum H, Ay D. Interpretation of Pneumothorax on Emergency Department Chest Radiographs by Emergency Physicians and Residents. Eurasian J Emerg Med. 2018; 17: 14-7.

Abstract

Aim: Pneumothorax is defined as the entry of air into the pleural space, which may cause mortal complications when delayed in diagnosis and treatment. The diagnosis is made on an erect posteroanterior chest X-ray that shows an edge caused by visceral pleura and absence of lung markings beyond this edge. These chest radiographs are initially interpreted by an emergency physician and decisions are made on the basis of this initial interpretation.

Materials and Methods: The chest radiographs of 100 patients were collected from the PACS archive. Fifty of these radiographs were reported as normal and 50 of them were pneumothorax. Emergency clinicians participating in the study included four emergency medicine physicians, three final year-residents (senior), four intermediate year residents (middle-senior), and four first-year residents (junior). Each physician interpreted 100 radiographs. The effects of interobserver variability and degree of pneumothorax on diagnosing pneumothorax on chest X-ray were investigated. The chest radiographs were re-interpreted 2 weeks later to identify intraobserver variability.

Results: The accuracy of the emergency department physicians and residents on diagnosing complete pneumothorax was 100%, intermediate pneumothorax was 95.1%, and small pneumothorax was 49.7%. The rate of correct diagnosis among final-year, intermediate-year, and first-year residents was 83.3%, 75.5%, and 62.5% of the radiographs, respectively.

Conclusion: The increase in the volume of pneumothorax rendered easy diagnosis chest radiograph. The residency year is associated with correct diagnose of pneumothorax especially in small pneumothorax cases.

Keywords: Pneumothorax, chest radiograph, emergency physicians, emergency residents, interpreting radiograph

Introduction

The presence of air between the visceral and parietal pleura leaves is clinically defined as pneumothorax and can lead to complications that can result in mortality if the diagnostic-therapy process is not managed appropriately (1).

Chest radiographs are the first choice among imaging methods to diagnose pneumothorax correctly and rapidly. Diagnosis is made by identifying the visceral pleural line and the absence of lung parenchyma distal to this line on the graph. The chest radiographs imaged with pneumothorax pre-diagnosis are initially evaluated by emergency clinicians. Due to the complexity of the emergency de-

ORCID IDs of the authors: B.A.K. 0000-0001-7517-8637; V.O. 0000-0003-1180-3274; H.T. 0000-0001-7981-299X; D.A. 0000-0002-0406-6440.



Correspondence to: Burcu Azapoglu Kaymak e-mail: burcuazap@hotmail.com

Received: 28.07.2017 • **Accepted:** 26.08.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.52523

partment and the clinicians' need for rapid decision-making, cases are often diagnosed without radiological consultation, and clinical management is based on these decisions.

This study aims to quantify the emergency clinicians' (residents' and physicians') accuracy to diagnose pneumothorax on chest radiograph. We aim to raise awareness to pneumothorax, which may be a life-threatening situation requiring emergent treatment, and improve the accurate interpretation by listing the factors that will affect the skills and time of recognition.

Materials and Methods

The study was carried out in the Medeniyet University Goztepe Training and Research Hospital Emergency Medicine Department using 100 chest radiographs collected from the Radiology Department's archive after obtaining approval from the Medeniyet University Goztepe Training and Research Hospital Ethics Committee (10.02.2015 /2015/0007). All radiographs were examined by radiology specialists; one-half of the radiographs were selected from the pneumothorax graphs and the remaining one-half from normal lung graphs. For the detection of pneumothorax in chest radiography, to eliminate the false negative condition stated in the study titled "NEXUS Chest Validation of a Decision Instrument for Selective Chest Imaging in Blunt Trauma," cases with computed tomography of the thorax were preferred (2). Thus, all pneumothorax cases that are expected to be evaluated and recognized in the radiographs have been confirmed using the "gold standard" technique.

Eleven emergency residents and 4 emergency physicians participated in the study. Emergency medicine residents who have been working in the clinic for 2 years are considered junior, while those in their third year were considered middle senior, and those in the fourth year were considered senior residents after successful completion of exams. Among the 11 emergency residents who participated in the study, 3 were seniors, 4 were middle-seniors, and 4 were juniors. The emergency physicians who participated in our study had been working in our clinic for 3-4 years.

The quantification of pneumothorax was determined using the Light formula in radiographs (Figure 1). This formula helps classify pneumothorax cases into three groups: as complete (total collapse, loss of contact between lungs and diaphragm), moderate (50% collapse in the lung), and small (thin air surrounding the lung). Digital copies of chest radiographs that were compiled in a random order and numbered from 1 to 100, by de-identifying patients' details. A folder was created, which contained the radiographs' reference numbers given by our clinic, patients' identification details, and the clinical diagnosis. Each participant evaluated 100 chest X-rays in turn, and stated in the evaluation form regarding the presence and absence of pneumotho-

rax. Participants were requested to re-evaluate the same X-rays in a different sequence after 2 weeks. We aimed to evaluate the significance of statistical data by showing intraobserver variability using this method. All participants were informed that the radiographs were taken with a pneumothorax pre-diagnosis prior to evaluations. Also, the length of employment for each emergency resident and physicians was recorded before each evaluation.

After the evaluation forms were collected, the accuracy of the answers were assessed. The number of radiographs that were diagnosed correctly as normal, small pneumothorax suspicion, moderate pneumothorax, and complete pneumothorax were recorded. In addition, the number of radiographs considered by the participants as "pneumothorax" situation, "normal," and "not sure" were recorded for each clinician. Hence, the factors that might affect the recognition of pneumothorax by emergency clinicians, the effect of their clinical experience, and the amount of pneumothorax were aimed to be measured.

Statistical analysis

The data were analyzed using Mann-Whitney U, Wilcoxon and Chi-square tests by the Statistical Package for Social Sciences (SPSS Inc.; Chicago, IL, USA) software, version 16.0.

Results

A total of 15 emergency clinicians participated in the study with 11 residents and four physicians. According to the Light formula, 26 were small pneumothorax, 15 were moderate pneumothorax, and 9 were complete pneumothorax of the 50 pneumothorax radiographs among the 100 chest radiographs evaluated.

The rate of pneumothorax defined correctly at the initial evaluation was 72.4% and misidentified pneumothorax was 20.1%; the rate of pneumothorax correctly identified after 2 weeks was 72.8%, and the rate of misidentified pneumothorax was 18.8%. There was no significant difference between the two trials in terms of the correct diagnosis of pneumothorax ($X^2=0.762$; $p>0.05$). The rate of normal radiographs correctly diagnosed at initial evaluation was 82.5%, the rate of normal radiographs thought to be pneumothorax was 4.8%, and the rate of unsure normal radiography was 12.7%. The rate of normal radiographs correctly diagnosed after 2 weeks was 82.0%, the rate of normal radiographs thought to be pneumothorax was 5.1%, and the rate of unsure normal radiographs was 12.9%. There was no significant difference between the two trials in terms of recognizing healthy people ($X^2=0.088$; $p>0.05$).

As a result of the evaluation of the radiographs, pneumothorax size was found to be significantly effective in defining pneumothorax correctly ($X^2=209.86$; $p<0.05$; Table 1).

Among the emergency residents, the rate of correct diagnosis of pneumothorax was 72.9%, wrong diagnosis was 18.4%, and unsure radiographs was 8.4%; among the emergency physicians, the rate of correct diagnosis of pneumothorax was 71.0%, wrong diagnosis of pneumothorax was 24.0%, and unsure radiographs was 5%. It was found that being a resident or a physician in terms of defining pneumothorax was not significantly effective ($X^2=4.322$; $p>0.05$).

$$\% \text{ of Pneumothorax } (\%) = \frac{(\text{Diameter of hemithorax})^3 - (\text{Diameter of collapsed lung})^3}{(\text{Diameter of hemithorax})^3}$$

Figure 1. Calculation of percentage of pneumothorax using the light formula

Table 1. Chi-squared test analysis of the comparison of pneumothorax diagnosis depends on the pneumothorax size

Size	n	Correct (%)	Incorrect (%)	Unsure (%)	X ²	p
Small	390	49.7	36.9	13.3	15	0.000
Moderate	225	95.1	3.1	1.8	1.9	
Complete	135	100.0	0.0	0.0	7*	

*Linear by Linear Association

Table 2. Chi-squared test analysis of the comparison between residents and physicians diagnosing normal graphs

Title	n	Correct	Incorrect (%)	Unsure (%)	X ²	p
Resident	550	79.3	5.5	15.3	15.5	0.000
Physician	200	91.5	3.0	5.5	56	0

Table 3. Chi-squared test analysis of size-based comparison of diagnosing pneumothorax between residents and physicians

Size	Title	n	Correct	Incorrect	Unsure	X ²	p
Small	Senior	78	69.2	23.1	7.7	24.442	0.000
	Middle	104	54.8	33.7	11.5		
	Senior						
	Junior	104	34.6	41.3	24.0		
Moderate	Senior	45	97.8	2.2	0.0	5.640	0.228
	Middle	60	96.7	1.7	1.7		
	Senior						
	Junior	60	88.3	8.3	3.3		
Complete	Senior	27	100.0	0.0	0.0	-	-
	Middle	36	100.0	0.0	0.0		
	Senior						
	Junior	36	100.0	0.0	0.0		

It was determined that being a resident or a physician is significant in terms of defining normal graphs correctly ($X^2=15.556$, $p<0.05$; Table 2).

The rate of correct diagnosis of pneumothorax was 83.3%, 75.5%, and 62.5% among senior, middle, and junior residents, respectively. In the first trial, the experience of the residents was found to have a significant effect on the correct diagnosis of the pneumothorax ($X^2=20.702$, $p<0.05$). As the experience of residents decreased, the rate of correct recognition of pneumothorax also decreased, and similarly, the rate of misdiagnosis of pneumothorax increased. The rates of correct diagnosis of small pneumothorax and misdiagnosis was 69.2% and 23.1%; 54.8% and 33.7%, and 34.6% and 41.3% among senior, middle senior, and junior residents, respectively. The experience of the residents was found to have a significant effect on the correct diagnosis of the small pneumothorax ($X^2=24.442$; $p<0.05$; Table 3).

Discussion

Despite all the improvements in radiological imaging, chest radiographs are still the first imaging method used in many pathologies because of their rapid results (3). The radiographs taken are often initially evaluated by the clinician, especially in emergency depart-

ments, where clinicians' own experience and skills play a major role. Emergency clinicians plan the treatment on their assessment without having the opportunity to interact with the radiology specialists in life-threatening and urgent situations. Due to this common situation, several studies have been carried out to compare the emergency medical team's success on evaluating radiographs with radiologists (4-13). In these studies, it is often said that clinicians in different specialties evaluate radiographs not as adequately as radiologists.

In a study conducted by Brunswick et al. (6) in 1996, the diagnostic inconsistency between radiologists and emergency physicians was found to range from 0.3% to 3%, and the treatment modality resulting from this incompatibility was ranged from 0.06% to 0.3%. Al Aseri (12) reported that 66% of the emergency reports of chest radiographs were in agreement with those of radiologists. Petinaux et al. (13) reviewed the radiology discrepancies of emergency department radiograph interpretations and performed the largest study with 151693 radiographs during a 9-year study period. They reported that 85 of 5308 discrepancies required emergent change in medical management and 24 of the cases were pneumothoraxes.

In our study, the abilities of emergency medical residents and physicians were evaluated using radiographs reported by radiologists. The

cases of complete pneumothorax requiring immediate intervention were identified by all of the participants, and there was no disruption in the treatment plan.

Significant pathologic findings can be detected by all clinicians regardless of clinical experience and skill, and the assessments made with these pathologic findings may not reveal differences between observers. In this study, the large pneumothorax cases observed in the radiographs were detected by all the observers. Pathologies that are more challenging to detect could reveal the skill diversity among the participants from the same class (4). In this study, most of the pathologic radiographs were "small pneumothorax" cases. The difference between the senior resident, middle resident, and junior resident was statistically significant, although there was no significant difference in finding small pneumothorax cases when all the residents and physicians were compared. The increase of the ability of evaluating chest radiographs among emergency physicians supports the view that radiography evaluation skills are gained during emergency residency training.

Our study showed that there may be differences in achieving accurate diagnosis within the emergency room clinicians, but that there is no missing case in life-threatening situations, such as complete pneumothorax. However, since statistically significant differences were found in the diagnosis of small pneumothorax radiographs, all radiographs in the emergency departments should be evaluated not only by residents but also by physicians with sufficient clinical experience.

Study limitations

Participants in the study were selected from a single center. The higher the number of participants in the subgroups adjusted for each class indicates a higher level of significance of the data. The only pathology in the radiographs was pneumothorax. Participants evaluated the graphs in an environment isolated from emergency services. The data of the evaluation done beside the patient and in emergency room conditions could be more meaningful.

Conclusion

In future studies more radiographs with different pathologies can be shown to the emergency physicians and residents to quantify the ability of radiographic evaluation in other mortal situations.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Medeniyet University Göztepe Training and Research Hospital (10.02.2015 /2015/0007).

Informed Consent: Written informed consent was not obtained from patients because patients were not participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – B.A.K., V.O.; Design – D.A.; Supervision – H.T., B.A.K.; Resources – V.O., D.A.; Materials – H.T.; Data Collection and/or Processing – B.A.K., D.A.; Analysis and/or Interpretation – V.O.; Literature Search – D.A., B.A.K.; Writing Manuscript – B.A.K.; Critical Review – V.O.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Henry M, Arnold T, Harvey J. BTS guidelines for the management of spontaneous pneumothorax. *Thorax*. 2003; 58(Suppl 2): 39-52.
2. Rodriguez RM., Anglin D, Langdorf MI, Baumann BM, Hendey GW, Bradley RN, et al. NEXUS chest: validation of a decision instrument for selective chest imaging in blunt trauma. *JAMA Surg*. 2013; 148: 940-6. [\[CrossRef\]](#)
3. Gurney JW. Why chest radiography became routine. *Radiology*. 1995; 195: 245-6. [\[CrossRef\]](#)
4. Eng J, Mysko WK, Weller GE, Renard R, Gitlin JN, Bluemke DA, et al. Interpretation of emergency department radiographs: a comparison of emergency medicine physicians with radiologists, residents with faculty, and film with digital display. *AJR Am J Roentgenol*. 2000; 175: 1233-8. [\[CrossRef\]](#)
5. Gatt ME, Spectre G, Paltiel O, Hiller N, Stalnikowicz R. Chest radiographs in the emergency department: is the radiologist really necessary? *Postgrad Med J*. 2003; 79: 214-7.
6. Brunswick JE., Ilkhanipour K, Seaberg DC, McGill L. Radiographic interpretation in the emergency department. *Am J Emerg Med*. 1996; 14: 346-8. [\[CrossRef\]](#)
7. Mayhue FE, Rust DD, Aldag JC, Jenkins AM, Ruthman JC. Accuracy of interpretations of emergency department radiographs: effect of confidence levels. *Ann Emerg Med*. 1989; 18: 826-30. [\[CrossRef\]](#)
8. Eisen LA, Berger JS, Hedge A, Schneider RF. Competency in chest radiography: a comparison of medical students, residents and fellows. *J Gen Intern Med*. 2006; 21: 460-5. [\[CrossRef\]](#)
9. Pfeifer, M. Nonradiologists reading radiographs: Good medicine or stretching the scope of practice. *J Cardiothorac Vasc Anesth*. 2001; 15: 675-6. [\[CrossRef\]](#)
10. Taves J, Skitch S, Valani R. Determining the clinical significance of errors in pediatric radiograph interpretation between emergency physicians and radiologists. *Can J Emerg Med*. 2017: 1-5.
11. Bent C, Chicklore S, Newton A, Habig K, Harris T. Do emergency physicians and radiologists reliably interpret pelvic radiographs obtained as part of a trauma series? *Emerg Med J*. 2013; 30: 106-11.
12. Al Aseri Z. Accuracy of chest radiograph interpretation by emergency physicians. *Emerg Radiol*. 2009; 16: 111-4. [\[CrossRef\]](#)
13. Petinaux B, Bhat R, Boniface K, Aristizabal J. Accuracy of radiographic readings in the emergency department. *Am J Emerg Med*. 2011; 29: 18-25. [\[CrossRef\]](#)

Implementation of Quebec Shoulder Dislocation Rule in Turkish Patient Population

Aytun Temiz¹ , Murat Das² 

¹Department of Orthopaedics and Traumatology, Edremit State Hospital, Balıkesir, Turkey

²Department of Emergency Medicine, Canakkale Onsekiz Mart University School of Medicine, Canakkale, Turkey

Cite this article as: Temiz A, Das M. Implementation of Quebec Shoulder Dislocation Rule in Turkish Patient Population. *Eurasian J Emerg Med.* 2018; 17: 18-21.

Abstract

Aim: The aim of this study was to investigate whether the Quebec Shoulder Dislocation Rule (QSDR) is valid in Turkish patient population.

Materials and Methods: Adult patients with an anterior shoulder dislocation were enrolled in this study. Patients with a severe head injury, multiple trauma, and drug or alcohol intoxication were excluded. All patients were classified according to the associated fracture status. Patients with fracture dislocation were classified as “case” group (group 1) and patients with isolated dislocation were included to the “control” group (group 2). Group 1 and 2 patients were statistically compared in terms of risk factors defined by QSDR. Diagnostic performance of this decision tool in predicting a clinically significant fracture was studied. Sensitivity, specificity, positive predictive value, and negative predictive value were calculated.

Results: A total of 248 patients were included in the study. Fracture dislocation was detected in 63 (25.40%) patients (group 1), and no complicated dislocation was detected in 185 (74.59%) patients (group 2). Statistically significant difference was found between groups 1 and 2 in terms of risk factors defined by the QSDR. Sensitivity, specificity, and positive and negative predictive values of the Quebec rule were detected as 100%, 33.51%, 33.87%, and 98.41%, respectively.

Conclusion: Our study suggests that QSDR is a useful decision tool to estimate which patient has fracture dislocation of the shoulder in Turkish population. We think that if a shoulder dislocation patient is “Quebec–,” pre-reduction X-ray could be safely omitted.

Keywords: Quebec Shoulder Dislocation Rule, Turkish population, X-ray

Introduction

Shoulder is the most frequently dislocated joint seen in the emergency department (ED) (1). Approximately 2% of the general population and 7% of the young athletes suffer from this type of injury (2). The most common direction of dislocation is anterior, and it might be complicated by the fracture of the greater tuberosity (up to 25%) or fractures at other sites of the shoulder girdle (1, 3, 4). If a displaced fracture is associated with shoulder dislocation, surgical fixation may be required in addition to the joint reduction (5).

It was reported that emergency physicians were 98% to 100% accurate in their clinical diagnosis of a shoulder dislocation (6). Clinical assessment may be sufficient for the diagnosis of shoulder dislocation in the absence of concern for concomitant fracture. For this reason, multiple studies have questioned the utility of pre-reduction radiographs in shoulder dislocation patients (5-7). Omission of pre-reduction films would decrease the cost and length of hospital stay and prevent muscle spasm that may inhibit the reduction process (8). Although most shoulder dislocations can be safely reduced in the ED, a coexisting fracture may prevent the

ORCID IDs of the authors: A.T. 0000-0002-3335-4177; M.D. 0000-0003-0893-6084.



Correspondence to: Murat Das e-mail: muratdas58@gmail.com

Received: 28.10.2017 • **Accepted:** 15.11.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.62634

emergency physician from reducing the dislocation and require orthopedic consultation (9).

The Quebec Shoulder Dislocation Rule (QSDR) is a clinical decision rule to allow selective use of pre-reduction radiography in shoulder dislocation (5). According to QSDR, factors likely to predict a clinically significant associated fracture include patient's age older than 40 y, first-time dislocation, and high-energy injury mechanism (fall from more than one flight of stair, motor vehicle accident, fight/assault) (5). If a patient has these clinical risk factors, pre-reduction X-ray should be ordered because of the high probability of clinically significant associated fracture (5, 9). However, successful validation studies are required for wider adoption of this decision rule (10). For this reason, the primary aim of this study was to investigate the validity of clinical risk factors defined by QSDR in the Turkish patient population. Our hypothesis was that QSDR is a useful and reliable decision tool to predict which patient has shoulder fracture dislocation in EDs of our country.

Materials and Methods

This is a retrospective, observational, case-control study approved by ethics committee of Balikesir University, School of Medicine. Adult patients (older than 18 y) who presented to the ED of Balikesir-Edremir State Hospital between January 2013 and September 2015 with an anterior shoulder dislocation were identified from ED databases. Patients with a severe head injury (initial Glasgow Coma Scale Score ≤ 13), multiple trauma, and drug or alcohol intoxication were excluded. Patients were also excluded if the mechanism of injury could not be ascertained. None of the patients were professional athletes. If a patient had more than one episode of dislocation during the study period, only the first episode was included. All patients had both of the pre- and post-reduction X-rays.

First, all anterior-posterior pre-reduction films were evaluated by authors and all patients were classified according to the associat-

ed fracture status. During the assessment of pre-reduction X-rays, researchers did not know whether the patient had a clinical risk factor defined by QSDR. Fracture dislocation was defined as a fracture associated with an anterior glenohumeral dislocation in which special care was needed during reduction to prevent distraction of minimally displaced segments or in which surgical fixation was needed. Noncomplicated dislocation was defined as the absence of fracture or the presence of a benign Hill-Sachs lesion. Patients with fracture dislocation were classified as "case" group (group 1), and patients with isolated dislocation were included to the "control" group (group 2).

Primary variables of our study were patient's age, whether the dislocation is first episode, and injury mechanism (risk factors defined by QSDR). The injury mechanism was divided into eight categories: (1) Fall from a distance less than or equal to the patient's own height, (2) Fall from more than the patient's own height and less than one flight of stairs, (3) Fall from more than one flight of stairs, (4) Sport activities involving physical contact (e.g., soccer), (5) Sport activities involving speed (e.g., skiing), (6) Fight/assault, (7) Motor vehicle crash, and (8) Atraumatic mechanism. Fall from more than one flight of stairs, motor vehicle crash, and fight/assault were considered as high-energy injury mechanisms according to the QSDR. Group 1 and 2 patients were statistically compared in terms of these variables. Pearson chi-square test was used for statistical analysis, and logistic regression model was created for all risk factors.

Finally, patients with at least one of these risk factors considered as "Quebec+" and patients with no risk factor were grouped as "Quebec-." Diagnostic performance of QSDR in predicting a clinically significant fracture was studied. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.

Results

Of the 248 patients were included in this study, 164 (66.12%) were men and 84 (33.87%) were women. The mean age was 45.54 y (range, 17-100 y). Of the 248, 123 (49.59%) patients were younger than 40 y and 125 (50.40%) patients were 40 y or older. First-time dislocation was established in 166 (66.93%) patients and recurrent dislocation in 82 (33.06%) patients. Injury mechanism was a fall from patient's own height or less (mechanism 1) in 116 (46.77%) patients, a fall from more than own height but less than 1 flight of stairs (mechanism 2) in 20 (8.06%) patients, a fall from 1 flight of stairs or more (mechanism 3) in 36 (14.51%) patients, a sport activity involving physical contact (soccer) (mechanism 4) in 10 (4.03%) patients, a sport activity involving speed (mechanism 5) in 1 (0.40%) patient, a fight/assault injury (mechanism 6) in 3 (1.20%) patients, a motor vehicle collision (mechanism 7) in 13 (5.24%) patients, and an atraumatic mechanism (mechanism 8) in 50 (20.16%) patients.

Fracture dislocation was detected in 63 (25.40%) patients (group 1), and noncomplicated dislocation was detected in 185 (74.59%) patients (group 2). We found an overall incidence of fractures in patients with dislocations of 25.40%. All of the group 1 patients had first-time dislocation. Statistically significant difference was found between groups 1 and 2 in terms of risk factors defined by QSDR (Table 1, 2).

Table 1. Comparison of groups in terms of risk factors of QSDR

Risk factor	Group 1, n (%)	Group 2, n (%)	p
Age ≥ 40	43 (68.25)	82 (44.32)	0.003
First time dislocation	63 (100)	103 (55.68)	<0.001
High Energy Mechanism (fall >1 flight of stair, MVC, fight/assault)	40 (63.49)	12 (6.48)	<0.001

QSDR: Quebec Shoulder Dislocation Rule; MVC: Motor Vehicle Collision

Table 2. Logistic regression model of risk factors

Risk factor	Group 1, n (%)	Group 2, n (%)	p
Age ≥ 40	0.003	1.032	1.011-1.055
First time dislocation	<0.001	31.982	7.051-139.675
High energy mechanism (fall >1 flight of stair, MVC, fight/assault)	<0.001	39.123	12.871-118.923

CI: confident Interval; MVC: Motor Vehicle Collision

Table 3. Ability of the Quebec Shoulder Dislocation Rule to predict the presence of clinically important fractures on X-ray

	Fracture + n (%)	Fracture - n (%)	Total	
Quebec +	63 (100)	123 (66.48)	186	Positive predictive value: 33.87%
Quebec -	0	62 (33.51)	62	Negative predictive value: 98.41%
Total	63	185	248	
	Sensitivity: 100%	Specificity: 33.51%		

Table 3 presents the diagnostic performance of the QSDR using any of the three risk factors for the detection of clinically important associated fracture. It was detected that if the QSDR was used in our ED, the pre-reduction X-ray reduction rate would be 25% without missing of any associated fracture.

Discussion

We detected statistically significant differences between group 1 (fracture dislocation) and group 2 (isolated dislocation) patients in terms of clinical risk factors defined by QSDR. Diagnostic performance of the QSDR in our patient population was similar to the previously reported studies in the literature.

One of the clinical risk factors described in QSDR is patient's age, and Emond et al. (5), in their original article, reported a five-fold increase in the probability of clinically important fracture associated with shoulder dislocation in patients aged 40 y or older. Recently, Orloski et al. (11) found that patients in the second to third decades of life are unlikely to have fracture dislocation, and they suggested that pre-reduction X-ray may be safely omitted in these patients. In our study, we found that if the patient was 40 y or older, the risk of associated fracture increased 1.032-fold.

First episode of dislocation represents an important risk factor for an associated fracture (9). Hendey (6) reported low risk of fracture dislocation in patients with previous shoulder dislocations experiencing a new episode. We also detected that first-time dislocation is a 31.982-time risk factor for associated fracture. All of the patients with fracture dislocation had first-time dislocation in the current study.

The mechanism of injury remains an important predictor of fracture associated with a shoulder dislocation (5, 9). The study by Emond et al. (5) suggest that associated fracture risk is high in patients with high-energy traumatic dislocation (fall more than one flight of stairs, fight/assault, and motor vehicle accident). We determined that all patients with atraumatic mechanism had noncomplicated dislocation.

First, in 2004, sensitivity, specificity, PPV, and NPV of the QSDR were reported as 97.7%, 22.9%, 30.2%, and 96.6% respectively by Emond et al. (5). In 2009, Emond et al. (10) reported the diagnostic performance of the QSDR with a sensitivity of 100%, a specificity of 34.2%, a PPV of 25.2%, and NPV of 99.2%. In our study, sensitivity, specificity, PPV, and NPV of the QSDR were detected as 100%, 33.51%, 33.87%, and 98.41%, respectively.

Study limitations

Our study is a retrospective analysis of single-center patients, and it has all the inherent limitations of a retrospective study. However, cer-

tain types of bias are unique to the case-control studies. The retrospective nature did not permit us to clearly identify any predictive factor regarding physical examination. Also, we only addressed the issue of whether a clinically important fracture was present, not whether physicians could clinically identify a glenohumeral dislocation.

Conclusion

Despite these limitations, our study suggests that QSDR is a practical and functional decision tool to predict an associated clinically important fracture in our shoulder dislocation patient population. Using QSDR, Emergency Physician (EPs) will be more efficient in detecting shoulder fracture dislocation, and this can lead to a more rational use of pre-reduction X-ray in the ED without affecting patient safety.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Balikesir University (Decision no:2016/34 - Date: 10.02.2016).

Informed Consent: The informed consent form was not taken from the patients, as this study is retrospective.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.T.; Design – A.T., M.D.; Supervision – A.T., M.D.; Resources – A.T., M.D.; Materials – A.T.; Data Collection and/or Processing – A.T., M.D.; Analysis and/or Interpretation – A.T., M.D.; Literature Search – A.T., M.D.; Writing Manuscript – A.T.; Critical Review – A.T., M.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Berkovitch Y, Shapire J, Haddad M, Keren Y, Rosenberg N. Current clinical trends in first time traumatic anterior shoulder dislocation. *Merit Res J Med Sci.* 2013; 1: 7-13.
- Davy AR, Steve JD. Management of shoulder dislocation-are we doing enough to reduce the risk of recurrence? *Injury.* 2002; 33: 775-9. [\[CrossRef\]](#)
- Ceroni D, Sadri H, A Leuenberger. Radiographic evaluation of anterior dislocation of the shoulder. *Acta Radiologica.* 2000; 41: 658-61. [\[CrossRef\]](#)
- Cunningham NJ. Techniques for reduction of anteroinferior shoulder dislocation. *Emerg Med Australia.* 2005; 17: 463-71. [\[CrossRef\]](#)
- Emond M, Le Sage N, Lavoie A, Rochette L. Clinical factors predicting fractures associated with an anterior shoulder dislocation. *Acad Emerg. Med* 2004; 11: 853-8. [\[CrossRef\]](#)

6. Hendey GW. Necessity of radiographs in the emergency department management of shoulder dislocation. *Ann Emerg Med.* 2000; 36: 108-13. [\[CrossRef\]](#)
7. Shuster M, Abu-Laban R, Boyd J. Prereduction radiographs in clinically evident anterior shoulder dislocation. *Am J Emer Med.* 1999; 17: 653-8. [\[CrossRef\]](#)
8. Bonz J, Tinloy B. Emergency department evaluation and treatment of the shoulder and humerus. *Emerg Med Clin N Am.* 2015; 33: 297-310. [\[CrossRef\]](#)
9. Shuster M, Abu-Laban R, Boyd J, Gauthier C, Shepherd L, Turner C. Prospective evaluation of a guideline for the selective elimination of pre-reduction radiographs in clinically obvious anterior shoulder dislocation. *Can J Emerg Med.* 2002; 4: 257-62. [\[CrossRef\]](#)
10. Emond M, Le Sage N, Lavoie A, Moore L. Refinement of the Quebec decision rule for radiography in shoulder dislocation. *CJEM.* 2009; 11: 36-43. [\[CrossRef\]](#)
11. Orloski J, Eskin B, Allegra P, Allegra JR. Do all patients with shoulder dislocation need prereduction x-rays? *Am J Emerg Med.* 2011; 29: 609-12. [\[CrossRef\]](#)

The Comparison of the Effects of “Trometamol; Tris-Hydroxymethylaminomethane” and “Sodium Bicarbonate” Treatments on Mortality and Survival Time in Experimental Metabolic Acidosis Induced by Methanol Intoxication

Mustafa Bolatkale¹ , Gurkan Ersoy¹ , Sedat Yanturali¹ , Osman Yilmaz² , Cagdas Can³ , Ahmet Cagdas Acara⁴ , Necati Gokmen⁵ 

¹Department of Emergency Medicine, Dokuz Eylul University School of Medicine, Izmir, Turkey

²Department of Laboratory Animal Science, Dokuz Eylul University, Institute of Health Sciences, Izmir, Turkey

³Department of Emergency Medicine, Merkezefendi State Hospital, Manisa, Turkey

⁴Department of Emergency Medicine, Gaziemir State Hospital, Izmir, Turkey

⁵Department of Anesthesia and Reanimation, Dokuz Eylul University, Institute of Health Sciences, Izmir, Turkey

Cite this article as: Bolatkale M, Ersoy G, Yanturali S, Yilmaz O, Can Ç, Acara A, et al. The Comparison of the Effects of “Trometamol; Tris-Hydroxymethylaminomethane” and “Sodium Bicarbonate” Treatments on Mortality and Survival Time in Experimental Metabolic Acidosis Induced by Methanol Intoxication. Eurasian J Emerg Med. 2018; 17: 22-7.

Abstract

Aim: Metabolic acidosis is the most serious complication of methanol intoxication, which needs urgent treatment. The aim of this study was to investigate effects of “Trometamol; Tris-hydroxymethylaminomethane” (THAM) and “Sodium Bicarbonate” (NaHCO₃) treatments on mortality and survival time in rats with metabolic acidosis induced by intragastric-administered methanol.

Materials and Methods: In 21 rats, a cannula was inserted in the right common carotid artery; the esophagus of each rat was penetrated with a branul. Baseline arterial blood gas samples were taken, and a 6 g/kg dose of methanol was injected into the cannula in the esophagus. The rats with confirmed acidosis were separated into three groups as “THAM,” “NaHCO₃,” and “control” for the treatments. The control group received no medication, and the THAM and NaHCO₃ groups were administered corresponding treatments intravenously.

Results: A statistically significant difference was determined between the survival times of the THAM and NaHCO₃ groups ($p=0.036$) and the THAM and control groups ($p=0.002$).

Conclusion: The results of this study support the use of THAM, which is a biological, low-toxicity, inert amino alcohol, instead of NaHCO₃ in the treatment of metabolic acidosis induced by intragastric methanol intoxication.

Keywords: Metabolic acidosis, methanol, Tris-hydroxymethylaminomethane, sodium bicarbonate, rat

Introduction

Methanol is a clear colorless alcohol obtained by the distillation of wood and has a smell and taste similar to ethanol. It is highly toxic by absorption through the skin, inhalation, or ingestion. Normally, it

is used only in industry. However, when ingested accidentally or for suicide, it may cause methanol intoxication with high mortality rates (1, 2). Following the uptake, methanol is rapidly metabolized to formaldehyde in the liver, and the formaldehyde is converted to the toxic metabolite, formic acid, which causes serious complications (3). The

ORCID IDs of the authors: M.B. 0000-0001-6708-7946; G.E. 0000-0002-4769-3700; S.Y. 0000-0002-6011-3424; O.Y. 0000-0001-7817-757; C.C. 0000-0003-4920-3637; A.C.A. 0000-0001-6708-7946; N.G. 0000-0002-3225-7666.



Correspondence to: Cagdas Can e-mail: drcagdascan@yahoo.com

Received: 18.07.2017 • **Accepted:** 31.07.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com

DOI: 10.5152/eajem.2018.69772

most serious complication of methanol intoxication is metabolic acidosis; moreover, cardiovascular instability, ocular toxicity resulting in blindness, and death may also occur (2). The prognosis of methanol intoxication correlates with the degree of metabolic acidosis, with more severe acidosis conferring a poorer prognosis (4, 5).

In metabolic acidosis caused by methanol intake, particularly when pH drops below 7.2, myocardial contractions are suppressed and serious arrhythmias may be observed (6, 7). Yanturali et al. (8) reported a case of metabolic acidosis after hydrochloric acid intake in which the patient developed acute myocardial infarction; Sodium Bicarbonate (NaHCO_3) was used to treat metabolic acidosis, but the patient died. The authors claimed that if acidosis could be treated effectively, there would be a better prognosis. The treatment of metabolic acidosis is based on the control of the underlying pathophysiological process and the reversal of organ dysfunction. Despite a lack of data on the effect of NaHCO_3 therapy, many emergency physicians attempt to alkalinize blood with intravenous (IV) NaHCO_3 administration as part of metabolic acidosis treatment. However, benefits of NaHCO_3 administration in metabolic acidosis of sepsis are controversial in clinical practice. In addition, alkali therapy with NaHCO_3 has specific side effects, such as hypernatremia, hyperosmolality, and volume overload (4, 9, 10). Therefore, effective drugs to correct acidosis are required.

Tris-hydroxymethylaminomethane (THAM) is a biologically inert amino alcohol of low toxicity, which has the ability to buffer carbon dioxide and acids in vitro and in vivo. At 37°C, a weak base with a pK of 7.8 has been proposed as an alternative alkalinizing agent. THAM is a proton acceptor (11) that can bind both carbon dioxide and metabolic acid, and due to its favorable buffer properties, THAM has been propagated as an effective alkalinizing agent in either respiratory or metabolic acidosis (3, 5, 12).

In vivo, THAM completes the buffering capacity of blood bicarbonate system, accepts proton, generates bicarbonate, and reduces the partial pressure of carbon dioxide in arterial blood. Unlike bicarbonate, it does not need open circulatory systems to reveal the effects of carbon dioxide elimination during buffering. THAM may show the buffering effect both in half-open and closed circulatory systems. Buffering power continues during states of hyperthermia. THAM can improve organ functions by rapidly correcting blood pH and maintaining acid-base balance in a state of acidemia, which has the potential to create organ dysfunction due to metabolic acid accumulation or carbon dioxide retention (13). It is used to correct hypercapnia in the treatment of respiratory failure. In addition, renal and diabetic acidosis, salicylate and barbiturate intoxication, and cerebral trauma associated with increased intracranial pressure are other indication areas where it can be used (11).

However, to the best of our knowledge, there are no studies in the literature comparing effects of NaHCO_3 and THAM in metabolic acidosis induced by methanol intoxication. Because of the lack of data on the use of THAM in life-threatening metabolic acidosis, this study aimed to evaluate the in vivo effect of NaHCO_3 and THAM treatments on rats with metabolic acidosis.

In this study, short-term effects of IV THAM and NaHCO_3 treatments on mortality and survival time were investigated in an experimental

rat model of metabolic acidosis induced by intragastric-administered methanol.

Materials and Methods

The research was conducted at the Dokuz Eylul University Faculty of Medicine Multidisciplinary Experimental Animal Laboratory. The study was approved by the Dokuz Eylul University Faculty of Medicine Experimental Animal Research Ethics Committee (Ethics Committee approval: protocol no., 71/2013; dated August 14, 2013).

Study design

In previous studies on methanol intoxication, effects of methanol and its toxic metabolite formic acid on Wistar albino rats were observed. Toxic methanol levels were detected in the blood of the rats 30 min after methanol administration. It reached its peak level after 60 min and began decreasing after the 120 min (14). With reference to this, in our study, arterial blood gas samples were taken from the rats 30 min after methanol administration to check for the development of metabolic acidosis. Acidosis developed in all the rats in each group. Medication was given to each rat according to its group. Sixty min after methanol administration, arterial blood gas samples were taken again to observe the response to the metabolic acidosis treatment. The response to the treatment was evaluated. Rats were observed for a two-hour period after methanol administration, and the number of minutes each rat in each group survived and the number of rats that survived the intoxication were recorded.

A total of 21 male Wistar Albino rats, each weighing 200-210 g, were obtained from the Dokuz Eylul University Faculty of Medicine Multidisciplinary Experimental Animal Laboratory, Izmir, Turkey. Throughout the study, the animals were housed in standard laboratory conditions (12-h light and dark cycle, 20°C-22°C room temperatures, and 50%-60% humidity). Daily nutrition standards were provided for all the animals in the same way, with free access to unlimited water and standard rat food.

At the beginning of this study, equal numbers of rats were randomly assigned to each group. A cannula was inserted in the right common carotid artery, and the esophagus was penetrated with a branul in all rats. Baseline arterial blood gas samples were taken, and methanol was injected into the cannula in the esophagus.

During these surgical procedures, one rat from the THAM group and one rat from the control group died. After 30 min, arterial blood gas samples were taken again. The rats with acidosis confirmed by the arterial blood gas sample results were separated into three groups namely THAM, NaHCO_3 , and control. No medication was applied to the control group, and the THAM and NaHCO_3 groups were treated with the corresponding medications administered intravenously. At 30 min after the treatment, arterial blood gas samples were taken again. The rats were then observed for 60 min, the survival time of each rat was recorded, and the experiment was completed (14).

Anesthesia and surgical procedures

The rats were anesthetized with 50 mg/kg ketamine (Ketalar®, Pfizer, Istanbul, Turkey) and 7.5 mg/kg xylazine (Xylazine Bio®, Pana-life Bio-Chemical, China). After 60 min, 20 mg/kg ketamine and 5 mg/kg

xylazine were intraperitoneally administered for the maintenance of anesthesia.

After anesthesia, the tails of the rats were cleaned with 10% povidone-iodine (Poviodeks®, Kimpur Drug Lab, Istanbul, Turkey), and the dorsal tail veins were cannulated with a 24-G branul (B-CAT IV cannula; Bıçakçılar Company, Istanbul, Turkey). The neck regions were also wiped with 10% povidone-iodine and shaved. Blunt and fine dissection was applied through skin and subcutaneous incisions. The right common carotid artery was identified, suspended with 3/0 silk, and cannulated. The mean arterial pressure (MAP) and heart rate (HR) of the rats were monitored. Following the dissection, the esophagus was identified, penetrated with a 24-G branul, and the tip of the branul was advanced toward the stomach. The branul was fixed inside the esophagus with 3/0 silk at 0.1 cm distal of the insertion hole. A 0.3 mL blood sample was taken for measuring the baseline arterial blood gas values. During these surgical procedures, one rat from the THAM group and one rat from the NaHCO₃ group died.

Intragastric methanol administration

Methanol (99.9% purity) (Galenik Pharmaceuticals and Chemicals Storage, Izmir) was diluted to 50% concentration with saline solution (NaCl 0.9%, Eczacıbaşı-Baxter Hospital Supply Company, Istanbul), and a 6 g/kg dose was intragastrically administered through the cannula placed in the esophagus (15). After 30 min of methanol administration, arterial blood gas samples were taken again to evaluate acidosis. In literature, different cutoff levels of pH have been stated for the diagnosis of acidosis. In this study, a pH value of <7.29 was accepted as acidosis (16-18). Acidosis was observed in each rat. The rats with confirmed acidosis were randomly separated into three equal treatment groups namely THAM, NaHCO₃, and control.

Treatment groups

THAM Group (n=6): Metabolic acidosis developed, and IV infusion of THAM (Tribonat™ flk, Fresinus Kabi, Norway) was administered for the treatment. The THAM dose was individually calculated for each rat using the following formula: mmol buffer=0.3(x)body weight(x) base deficit.

NaHCO₃ Group (n=7): Metabolic acidosis developed, and IV infusion of NaHCO₃ (Sodium bicarbonate flk, Osel Lab, Istanbul) was administered for the treatment. The NaHCO₃ dose was individually calculated for each rat using the following formula: mmol buffer=0.3(x)body weight(x)base deficit.

Control Group (n=6): Metabolic acidosis developed, and no treatment was applied.

Evaluated parameters

Mean arterial pressure and HR were recorded using a monitor before methanol administration as a baseline and after 30 and 60 min of administration. A volume of 0.3 mL of arterial blood gas samples were taken from the right common carotid artery before methanol administration as a baseline and after 30 and 60 min after administration. Blood gas analysis was employed using the Irma Trupoint Blood Analysis System (ITC Med, USA) device. For each blood gas sample, the measured pH, PaCO₂, PaO₂, Na⁺, K⁺, and base excess (BE) values were recorded in data sheets.

All rats were observed for 90 min after initiating the treatment. The time of death was recorded in the data sheets for all dead rats. The study was terminated at the 90th min after the start of treatment. Rats that were still alive were euthanized under high-dose halothane anesthesia.

Statistical analysis

Data obtained was entered into SPSS for Windows version 15.0 statistics program (SPSS Inc., Chicago, Illinois, USA). The Kolmogorov-Smirnov test was used to analyze compliance with normal distribution. Data were stated as mean±standard deviation (mean±SD). The Kruskal-Wallis Test was used for the comparison of variables determined by between-group measurements, and the Mann-Whitney U test was applied to compare two groups. The Fisher's Exact Test was used to compare categorical values between groups. The time elapsed until death was recorded for survival analysis. The Mann-Whitney U test was applied for the comparison of two groups. The Kaplan-Meier Survival analysis was performed, and survival curve was generated. A value of p<0.05 was considered statistically significant.

Results

MAP and NR

When the baseline and 30th-min MAP and HR values were compared, no statistically significant difference was observed between the study groups (Kruskal-Wallis test, p>0.05). When the 60th-min MAP and HR values were compared, no statistically significant difference was observed between the THAM and NaHCO₃ groups (Mann-Whitney U test, p>0.05).

Arterial blood gas values

When the baseline and 30th-min values of arterial blood PaO₂, PaCO₂, Na⁺, K⁺, and BE were compared, no statistically significant difference was observed between the study groups (Kruskal-Wallis test, p>0.05). When the 60th-min values of arterial blood PaO₂, PaCO₂, Na⁺, K⁺, and BE were compared between the THAM and NaHCO₃ groups, no statistically significant difference was observed (Mann-Whitney U test, p>0.05).

When the baseline and 30th-min values of arterial blood pH were compared, no statistically significant difference was observed between the study groups (Kruskal-Wallis test, p>0.05). When the 60th-min values of arterial blood pH were compared between the THAM (pH: 7.31±0.02) and NaHCO₃ (pH: 7.26±0.01) groups, the pH values were significantly higher in the THAM group (Mann-Whitney U test, p=0.02) than those in the NaHCO₃ group.

Survival times

A statistically significant difference was observed between the survival times of the THAM and NaHCO₃ groups (Mann-Whitney U test, p=0.036). A statistically significant difference was observed between the survival times of the THAM and control groups (Mann-Whitney U test, p=0.002). No statistically significant difference was observed between the survival times of the NaHCO₃ and control groups (Mann-Whitney U test, p=0.828) (Table 1 and Figure 1). At the end of the study, six rats from the THAM group and three rats from the NaHCO₃ group survived, whereas all six rats in the control group died (Table 2).

Table 1. Mean survival times of THAM, NaHCO₃, and Control groups

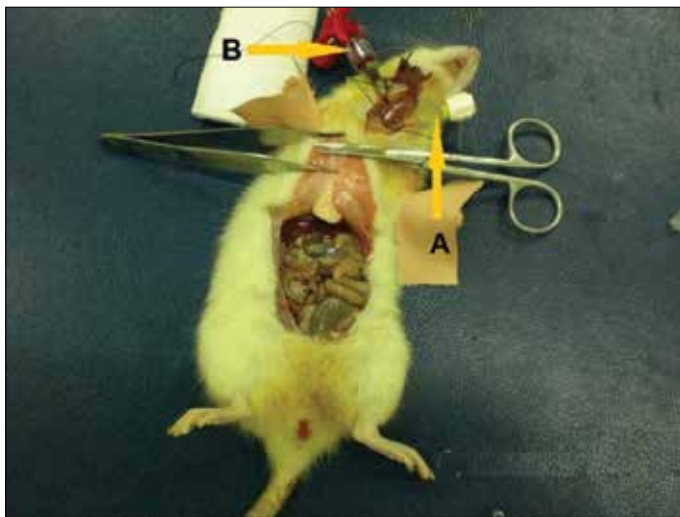
	THAM group (n=6)	NaHCO ₃ group (n=7)	p
Survival time (min)	90±0	64.5±23.8	0.036
	NaHCO ₃ group (n=7)	Control group (n=6)	
Survival time (min)	64.5±23.8	50.17±5.3	0.828
	THAM group (n=6)	Control group (n=6)	
Survival time (min)	90±0	50.17±5.3	0.002

Min: minute; THAM: trometamol; Tris: hydroxymethylaminomethane; NaHCO₃: sodium bicarbonate

Table 2. Distribution of dead rats in groups

	Alive (n) (%)	Dead (n) (%)
THAM group (n=6)	6 (100%)	0
NaHCO ₃ group (n=7)	3 (42.86%)	4 (57.14%)
Control group (n=6)	0	6 (100%)

THAM: trometamol; Tris: hydroxymethylaminomethane; NaHCO₃: sodium bicarbonate; N: number

**Figure 1.** The rat with cannulated right common carotid artery (A) and the esophagus (B)

Discussion

In the treatment of metabolic acidosis, IV NaHCO₃ is widely used worldwide. However, the effectiveness of NaHCO₃ use in acidosis is controversial in the literature. The correction of acidosis with NaHCO₃ administration aims to normalize extracellular and intracellular pH and improve outcome. However, many studies have suggested that this approach is overly simplistic, and the impact of NaHCO₃ administration on restoring hemodynamic and improving clinical outcomes is unknown. Despite a lack of data on the effect of NaHCO₃ treatment, many emergency physicians attempt to alkalinize blood with IV NaHCO₃ administration as a part of metabolic acidosis treatment. However,

the benefit of NaHCO₃ administration in metabolic acidosis caused by sepsis is controversial in clinical practice. Alkali therapy with NaHCO₃ also has specific side effects for metabolic acidosis, including hypernatremia, hyperosmolality, and volume overload (4, 9, 10).

In some studies, NaHCO₃ has not been found to be effective for treating of lactic acidosis and ketoacidosis and has even been shown to increase mortality (10, 19). Main reasons for the increase in mortality are increased intracellular acidosis, decreased ionized Ca⁺² level, and hyperosmolality. When the mechanism of action was examined, THAM was reported to increase HCO₃⁻ production and decreases CO₂ levels in the arterial blood. Therefore, THAM can be effectively used for treating metabolic acidosis (12).

Trometamol; Tris-Hydroxymethylaminomethane, which has a weak base with a pK of 7.8, has been proposed as an alternative alkalinizing agent. THAM can bind both carbon dioxide and metabolic acid, and due to its favorable buffer properties, THAM has been propagated as an effective alkalinizing agent in either respiratory or metabolic acidosis (3, 5, 12).

In the current study, short-term effects of IV THAM and NaHCO₃ treatments on mortality and survival expectancy were investigated and compared in an experimental rat model of metabolic acidosis induced by intragastric methanol. The IV THAM treatment was determined to significantly reduce mortality, improve arterial blood pH, and extend the survival time of rats in the first 90 min compared with NaHCO₃ treatment in experimental metabolic acidosis induced by intragastric methanol intoxication.

In principle, THAM shows a long-term buffering effect on metabolic acidosis by correcting intracellular acidosis (19, 20). THAM prevents the formation of intracellular acidosis, and this may be one of the main reasons for the decrease in the mortality rate among the rats.

Yanturali et al. (8) reported a case of metabolic acidosis after hydrochloric acid intake. The patient developed cardiac arrhythmias, hypotension, and acute myocardial infarction. NaHCO₃ was used for treating metabolic acidosis, but the patient died. The authors claimed that if acidosis could have been treated effectively, the patient would not have died because of myocardial infarction. It is thought that NaHCO₃ treatment does not correct acidosis. In the findings of the current study, there was no difference in mortality between NaHCO₃ and control groups, which also supports this opinion.

Velissaris et al. (4) stated that routine NaHCO₃ administration for the treatment of lactic acidosis in sepsis remains debatable. Published evidence suggests that NaHCO₃ treatment is not beneficial in cases of metabolic acidosis in sepsis and may even cause harm. In a study of pigs, Scheiderman et al. (16) claimed that THAM treatment is effective for normalizing pH in respiratory acidosis. Moreover, Sirieix et al. (17) in an isolated rabbit heart model that THAM is a good buffer in correcting pH in acidosis, and when NaHCO₃ and THAM are used in combination, better results are obtained for correcting pH.

Rice et al. (10) compared NaHCO₃ with THAM for correcting hyperchloremic acidosis in their research and showed that both agents increased pH levels. However, in the current study, in the post-treatment 60th-min blood gas analysis, a statistically significant improve-

ment in pH levels was only determined in the THAM group. Nahas et al. (11) claimed that for the treatment of lactic acidosis, THAM is a better buffering agent than NaHCO_3 on the basis of a decrease in CO_2 and an increase in HCO_3^- .

In some studies, where THAM has been used for acidosis treatment, it has been claimed that CO_2 exchange is deteriorated. Bar-Joseph et al. showed that THAM decreases blood CO_2 levels significantly in their study, where Carbicarp, THAM, and NaHCO_3 were used to correct metabolic acidosis, which occurred during cardiopulmonary resuscitation in dogs (5). In the present study, after the THAM treatment, a moderate increase in blood CO_2 level was observed. This moderate increase may be mostly attributed to respiratory factors as the time elapsed from the administration of the drug until the collection of the last blood gas sample. The rats were not intubated during the study for them to be compatible models with daily emergency department setting, where patients are not routinely intubated. The rats were allowed to breathe spontaneously. In future studies, this variable, which affects acidosis, can be ruled out by intubating the rats.

Methanol is converted to formaldehyde by alcohol dehydrogenase, and formaldehyde is converted to formic acid by aldehyde dehydrogenase in the liver. Formic acid is the metabolite responsible for toxicity and metabolic acidosis in methanol intoxication. In methanol metabolism, the first step is performed by alcohol dehydrogenase, and this enzyme can be competitively inhibited by ethanol or fomepizole (Antizol®). Therefore, if these are used as an antidote in treatment, the formation of formic acid, which is the toxic metabolite of methanol, is prevented (2). In the current study, THAM was used to correct metabolic acidosis. THAM is a biological low-toxicity inert amino alcohol. Because THAM is an alcohol and has a structure similar to like ethanol, it could have reduced the blood methanol and formic acid levels of rats in this study (11). Thus, while correcting acidosis; THAM may also have effects on methanol metabolism. The blood methanol and formic acid concentrations of the rats were not evaluated because these were not a part of the study objectives. Therefore, whether THAM had this effect in this study remains unclear. Whether THAM could also be used as an antidote in methanol intoxication should be investigated in the future studies.

Study limitations

Mortality caused by methanol ingestion can be related with systemic, local, or both systemic and local effects. In this study, only systemic aspects of mortality were investigated. The local effects of ingested methanol on mortality can be examined in a future study.

Formic acid is the metabolite of methanol formed during methanol metabolism in the body and is responsible for toxicity and metabolic acidosis. It is thought that the severity of the resulting acidosis is correlated with blood levels of formic acid, and in the early phase of methanol intoxication, the acidosis substantially develops due to formic acid (2). Therefore, methanol and formic acid levels should be evaluated.

In this study, rats were allowed to breathe spontaneously. In future studies, the rats could be intubated so that the role of respiration is minimized in acidosis development.

Conclusion

There are studies in the literature analyzing effects of IV NaHCO_3 and THAM treatments on correcting acidosis and mortality in various metabolic acidosis models (hypoxic lactic acidosis, hypovolemic shock, tricyclic antidepressant poisoning, desipramine intoxication, etc.) (10, 18, 19). To the best of our knowledge, there are no studies of rats with metabolic acidosis induced by oral methanol intake comparing the effects of NaHCO_3 and THAM treatments. Therefore, this study can be considered original research.

In this experimental rat model of metabolic acidosis induced by intragastric methanol, THAM treatment significantly reduced mortality, improved blood pH, and extended the survival time of rats compared with the NaHCO_3 and control treatments in the first 90 min after the metabolic acidosis developed. Consequently, THAM, which is a biological low-toxicity inert amino alcohol, can be considered for use instead of NaHCO_3 treatment in methanol intoxication-induced metabolic acidosis. These results with additional support from further studies can become a novel clinical treatment approach.

Trometamol; Tris-Hydroxymethylaminomethane is a drug that is not available in the pharmaceutical market in Turkey. New animal and human studies using THAM treatment on the basis of this study, which has demonstrated that THAM is effective in metabolic acidosis treatment, could be officially introduced into the market in Turkey and could be used in the treatment of patients with metabolic acidosis.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dokuz Eylul University Faculty of Medicine Experimental Animal Research Ethics Committee (protocol no, 71/2013; dated August 14, 2013).

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.B.; Design – G.E., S.Y.; Supervision – O.Y., C.C., A.C.A.; Resource – G.E., S.Y., N.G.; Materials – O.Y., C.C.; Data Collection and/or Processing – M.B., C.C., A.C.A.; Analysis and/or Interpretation – M.B., G.E., O.Y., C.C.; Literature Search – O.Y., C.C., A.C.A.; Writing Manuscript – M.B., G.E., S.Y., N.G., C.C., A.C.A., O.Y.; Critical Review – S.Y., N.G.; Other – C.C.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Davis LE, Hudson D, Benson BE, Jones Easom LA, Coleman JK. Methanol poisoning exposures in the United States: 1993-1998. *J Toxicol Clin Toxicol.* 2002; 40: 499-505. [CrossRef]
2. Tintinalli JE, Kelen GD, Stapczynski JS. Alcohols; Nicolaou DD, Kelen GD. *Emergency Medicine A Comprehensive Study Guide Textbook*, seventh edition. USA: McGraw-Hill, 2011.p.1222-30.
3. Jacobsen D, McMartin KE. Methanol and ethylene glycol poisonings. Mechanism of toxicity, clinical course, diagnosis and treatment. *Med Toxicol.* 1986; 1: 309-34. [CrossRef]
4. Velissaris D, Karamouzou V, Ktenopoulos N, Pierrakos C, Karanikolas M. The Use of Sodium Bicarbonate in the Treatment of Acidosis in Sepsis:

- A Literature Update on a Long Term Debate. *Crit Care Res Pract.* 2015; 2015: 1-7. [\[CrossRef\]](#)
5. Hoste EA, Colpaert K, Vanholder RC, Lameire NH, De Waele JJ, Blot SI. Sodium bicarbonate versus THAM in ICU patients with mild metabolic acidosis. *J Nephrol.* 2005; 18: 303-7.
 6. Sabatini S, Kurtzman NA. Bicarbonate therapy in severe metabolic acidosis. *J Am Soc Nephrol.* 2009; 20: 692-5. [\[CrossRef\]](#)
 7. Kraut JA, Kurtz I. Use of base in the treatment of severe acidemic states. *Am J Kidney Dis.* 2001; 38: 703-7. [\[CrossRef\]](#)
 8. Yanturali S, Aksay E, Atilla R. Acute myocardial infarction after hydrochloric acid ingestion. *Mt Sinai J Med.* 2005; 72: 409-2.
 9. Tintinalli JE, Kelen GD, Stapczynski JS. *Acid-Base Disorders*; Nicolaou DD, Kelen GD. *Emergency Medicine A Comprehensive Study Guide Textbook*, seventh edition. USA: McGraw-Hill, 2011.p.102-12.
 10. Rice M, Ismail B, Pillow MT. Approach to Metabolic Acidosis in the Emergency Department. *Emerg Med Clin North Am.* 2014; 32: 403-20. [\[CrossRef\]](#)
 11. Nahas GG, Sutin KM, Fermon C, Streat S, Wiklund L, Wahlander S, et al. Guidelines for the Treatment of Acidemia with THAM. *Drugs.* 1998; 55: 191-224. [\[CrossRef\]](#)
 12. Holmdahl MH, Wiklund L, Wetterberg T, Streat S, Wahlander S, Sutin K, et al. The place of THAM in the management of acidemia in clinical practice. *Acta Anaesthesiol Scand.* 2000; 44: 524-7. [\[CrossRef\]](#)
 13. Marfo K, Garala M, Kvetan V, Streat S, Wahlander S, Sutin K, et al. Use of Tris-hydroxymethyl Aminomethane in severe lactic acidosis due to highly active antiretroviral therapy: a case report. *J Clin Pharm Ther.* 2009; 34: 119-23. [\[CrossRef\]](#)
 14. Prinz S, Tiefenbach B, Kobow M, Hennighausen G. Formation of Methanol and Formate in Wistar Rats after Oral Administration of Methylated Rapeseed Oil: A Fuel for Lamps. *Clin Toxicol (Phila).* 2006; 44: 115-6. [\[CrossRef\]](#)
 15. Chrostek L, Szczepura D, Szmitkowski M, Jelski W, Wierzbowski J. Alcohol and aldehyde dehydrogenase activity in the stomach and small intestine of rats poisoned with methanol. *Hum Exp Toxicol.* 2001; 20: 255-8. [\[CrossRef\]](#)
 16. Scheiderman R, Rosenkrantz TS, Knox I, Cramer R, Smoloski R, Raye JR. Effects of a continuous infusion of Tris-hydroxymethyl Aminomethane on acidosis, oxygen affinity, and serum osmolality. *Biol Neonate.* 1993; 64: 287-94. [\[CrossRef\]](#)
 17. Sirieix D, Delayance S, Paris M. Tris-hydroxymethyl Aminomethane and sodium bicarbonate to buffer metabolic acidosis in an isolated heart model. *Am J Respir Crit Care Med.* 1997; 155: 957-63. [\[CrossRef\]](#)
 18. Nishino T, Liyori N, Isono S, Shinozuka N, Taguchi N, Ishikawa T. THAM improves an experimentally induced severe dyspnea. *J Pain Symptom Manage.* 2009; 37: 212-9. [\[CrossRef\]](#)
 19. Kraut JA, Madias NE. Treatment of acute metabolic acidosis: a pathophysiologic approach. *Nat Rev Nephrol.* 2012; 8: 589-601. [\[CrossRef\]](#)
 20. Vahdati SS, Ghafouri RR, Dalil S, Baghizadeh S, Ostadi A, Derakhti B, et al. Alcohol Poisoning in Toxicology Center of East Azarbaijan Province of Iran. *Eurasian J Emerg Med.* 2015; 14: 131-3. [\[CrossRef\]](#)

An Unknown Cause of Agricultural Accidents: Hoeing Machine

Kasim Turgut¹ , Sukru Gurbuz² , Hakan Oguzturk² , Serkan Bican² , Abdullah Keyfo Kama² 

¹Department of Emergency Medicine, Adiyaman University, Training and Research Hospital, Adiyaman, Turkey

²Department of Emergency Medicine, Inonu University School of Medicine, Malatya, Turkey

Cite this article as: Turgut K, Gurbuz S, Oguzturk H, Bican S, Kama AK. An Unknown Cause of Agricultural Accidents: Hoeing Machine. Eurasian J Emerg Med. 2018; 17: 28-32.

Abstract

Aim: The aim of this study was to evaluate the tragic hoeing machine accidents that result in many limb amputations and disability.

Materials and Methods: Ten patients, who were admitted to the emergency department (ED) of Inonu University between March 2012 and September 2016 because of hoeing machine accidents, were examined retrospectively.

Results: During the 4-year period, 10 patients were admitted to the ED because of a hoeing machine accident. All of them were male. The mean age of patients was 41.3 years, and one patient was a child (12 years). The accidents occurred in the spring and summer season, mostly in the afternoon (90%). The mean of the time spent in the ED was 91.9 min, and the mean of the hospitalization period was 32.6 days. The patients had many subtotal amputations or open fractures. All the patients were operated on by orthopedic surgeons. Limb amputation was performed in 4 patients. None of the patients died, but many of them were permanently disabled.

Conclusion: Hoeing machine accidents can cause serious lower-extremity injuries. The accidents occur mainly because of the misuse of machines by farmers. To prevent these accidents, farmers must use the machine according to the manufacturer's instructions, and the patients should be admitted to well-equipped trauma centers.

Keywords: Hoeing machine, emergency medicine, agricultural accidents, amputation

Introduction

The agricultural sector is the second greatest source of employment worldwide, and more than a third of the world's labor force is employed in it (1). In developed countries, farming activities are mostly performed by machines, but in developing countries, they are still performed manually (2). According to the International Labour Organization (ILO) statistics, 1.3 billion people are employed in the agricultural sector. A considerable number of laborers are exposed to work

accidents and develop occupational diseases with approximately 170.000 deaths annually. The European Union Statistics Office (Eurostat) have determined the agricultural sector as the second most dangerous sector, following the construction sector (3). Across Europe, the number of fatal accidents in the agricultural sector is higher than those in any other industry, except in the construction industry, where it is comparably high, although it continuously declines (4). The machines and equipments used in this sector are the main cause of the agricultural accidents. Tractors, tillage machines and their

ORCID IDs of the authors: K.T. 0000-0003-2955-1714; Ş.G. 0000-0003-3867-5479; H.O. 0000-0003-0117-8831; S.B. 0000-0003-4275-5973; A.K.K. 0000-0003-4026-5401.



Correspondence to: Kasim Turgut e-mail: kasimturgut@yahoo.com

Received: 29.09.2017 • **Accepted:** 30.10.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.22931

equipments, planting machines, fertilizer mixer machines, hoeing machines, and harvesting machines are mainly encountered machines (5). According to some studies conducted in America, tractors cause 75% of the agricultural accidents and one-third of the fatal accidents in this sector (6). Similar results were seen in other studies (7, 8).

Hoeing machine structurally looks like an all-terrain vehicle (ATV) and is commonly used for farming activities in Malatya, a city in the east of Turkey. This vehicle has 2 separate structures; the main part is an engine and the other part is a trailer or another agricultural equipment that changes with the purpose. For example, it can be used for transportation of people or loads, the expulsion of fields, planting, spraying activities, and removal of water from the soil after adding different equipments to the machine (9). Some farmers add the disks to the machines and form hoeing machines for digging land (Figure 1). These machines are used widely in Malatya region where the study was carried out. Therefore, the accidents caused by these machines are frequent.

In the present study, we aimed to evaluate demographic parameters, clinical characteristics, treatments, and outcomes of hoeing machine accidents.



Figure 1. Hoeing machine

Materials and Methods

We retrospectively examined the patients admitted to Inonu University medical school Emergency Department (ED) between March 2012 and September 2016, with a history of injury caused by a hoeing machine. The study was initiated upon approval of Inonu University Clinical Research ethics committee (approval no: 2016/84). All data were recorded on standard forms and studied in detail with regard to the patient's age, gender, accident time, emergency department (ED) admission time, the manner in which patients arrived at the arrival, vital signs, types of injuries, treatment variations, waiting period in emergency service, hospitalization duration, and hospitalization department.

Statistical analysis

Data analysis was performed with the statistical software (Statistical Package for the Social Sciences for Windows, Version 16.0, SPSS Inc.; Chicago, IL, USA). Descriptive statistics were reported including means $\pm$ standard deviations (SD), and percentages. Percentages were rounded.

Results

During the period of 4 years, 10 patients were admitted to the ED because of hoeing machine accidents. All patients were male. The mean age of the patients was 41.3 ± 21.5 years (range 12 to 67). All of the accidents occurred in spring and summer except one, which occurred in the autumn. Of these, 3 accidents occurred in the morning and others in the afternoon. Seven patients were transported to the hospital from the accident location, and the rest of them were referred from the state hospital. The 3 cases (Number 3, 7, and 10) that were referred from the state hospital lost more time after the accident compared with those that directly arrived to our hospital. The mean of the time spent in the emergency service was 91.9 ± 28.7 min (range 41 to 135). The mean of the hospitalization duration was 32.6 ± 26.9 days (range: 5-85). All the patients were conscious, but tachycardic and hypotensive mostly because of the bleeding caused by vascular injuries (Table 1).

Table 1. Characteristics of 10 patients admitted to emergency service

	Age	Gender	Arrival Duration (min)	Emergency Service Duration (min)	Hospitalization Duration (days)	Month	Manner of Arrival
1	28	M	160	135	69	May	Direct
2	67	M	120	71	85	April	Direct
3	24	M	186	107	14	July	Referred
4	62	M	63	41	31	March	Direct
5	63	M	60	52	30	October	Direct
6	66	M	60	94	42	March	Direct
7	18	M	240	105	8	July	Referred
8	31	M	70	100	35	May	Direct
9	12	M	110	110	5	April	Direct
10	42	M	345	104	7	June	Referred

Min: minutes; M: male; Direct: directly from accident place; Referred: from the State hospital

Table 2. Clinical characteristics and operations of patients

Lesion		Operation
1 Left femur subtotal amputation and right femur open fracture	ICU	Left leg amputation
	Orthopedics	Right leg open reduction internal fixation
2 Right femur total amputation and left femur open fracture	ICU	Right leg amputation
	Orthopedics	Left open reduction internal fixation
3 Right tibia- fibula open fracture	Orthopedics	Open reduction internal fixation
4 Right femur subtotal amputation and left foot crush injury	ICU	Right leg amputation
	Orthopedics	
5 Bilateral tibia-fibula open fracture	ICU	Open reduction internal fixation
	Orthopedics	
6 Right tibia-fibula open fracture	Orthopedics	Open reduction internal fixation
7 Left tibia-fibula open fracture	Orthopedics	Left leg amputation
8 Right tibia-fibula open fracture	Orthopedics	Open reduction internal fixation
9 Right tibia-fibula open fracture and left femur fracture	Orthopedics	Open reduction internal fixation
10 Rightfoot open fracture	Orthopedics	Open reduction internal fixation

ICU: intensive care unit

The patients mostly arrived to the emergency service with the part of the machine embedded in the limbs. We did not remove any of the machine parts, and this maneuver was performed in the operating room. In the emergency service, we monitored the patients for hemodynamics, opened 2 large bore vascular lines, and started saline infusion according to Advanced Trauma Life Support (ATLS). The blood samples (for performing tests such as complete blood count, biochemistry, and blood group type) were taken and erythrocyte suspensions were prepared. Tetanus prophylaxis was done and the first dose of antibiotics (cefazolin, ornidazole, gentamicin) was administered. At the same time, the removal of soil and dirt was done and irrigation was lightly performed.

The patients generally had developed injuries in both lower extremities. One patient (Number 2) had total femoral amputation, and 2 patients (Number 1 and 4) had subtotal femoral amputation. The others mostly suffered from open fractures and crush injuries. All the patients were referred to the orthopedics department and hospitalized for surgery. In the operating room, first, the machine parts were removed. The open reduction internal fixation procedure was done for fractures. Amputations were performed in 4 patients (Number 1, 2, 4, and 7). The vascular surgeon managed the arterial and venous damages with orthopedics. The cutaneous and subcutaneous tissues were repaired regularly. After the surgery, the patients were hospitalized in the intensive care unit. They were referred to the orthopedic service following extubation and after becoming stable hemodynamically. In the orthopedic service, they were followed up, wounds were routinely dressed, and received suitable medications. Some of the patients needed another operation and the surgery performed afterwards. None of the patients died, and all of them were discharged from the hospital, but unfortunately most of them remained disabled (Table 2).

Discussion

We determined that the hoeing machine accidents are a definite reason of morbidity because of the high number of lower-extremity amputations and a long convalescent period. In this study, 4 patients were subjected to leg amputations, and the rest of them had long recovery periods and also expectedly long absence from work. None of the patients lost their lives. In similar studies about the agricultural accidents, extremity injuries and substantial amount of amputations were also seen (4, 10, 11). In the present study, we found that the farmers misused the manual gas pedal of their hoeing machines while they were digging the land. Normally, the machine moves and digs the land after the gas pedal is compressed by the farmer. If the farmer wants to stop, they apply the pedal, and the machine immediately stops at that point. But in Malatya region, farmers tie the pedal by a rope to work nonstop for a long time, and with less fatigue of hands. If the farmer falls accidentally, the disks of machine catch and pull in the farmer's feet. After that, the disks start to grind the legs, and this goes on until somebody comes and stops the machine by cutting the rope or in some other way. Therefore, we see numerous tragic lower-extremity injuries caused by these accidents.

In the present study, nearly all the cases (90%) had lower-extremity open fractures. According to literature, these fractures can be accurately assessed in the operating room. Wide-spectrum antibiotics administration, tetanus prophylaxis, and irrigation should be performed in the emergency room promptly, because of a high risk of infection (12, 13). We irrigated the wounds, started the antibiotic therapy in the emergency service, and then sent the patients to

the operating room without delay. The surgeons reevaluated the fractures, irrigated the wound suitably, and removed the foreign materials. The fractures were then reduced and fixated properly. The surgery was performed after the closure of subcutaneous and cutaneous tissue.

We determined the latest follow-up time in the ED as 135 min, the earliest as 41 min, and the average for all cases as 91.9 min. Additionally, the longest hospitalization time was 85 days, the shortest time was 5 days, and the average of all cases was 32.6 days. In a similar study (9), the follow-up time in ED was 366 min, and the hospitalization period was 13.2 days. In another study (14), the hospitalization period was 17.1 days. We had a shorter follow-up time in the ED than that in similar studies, because our hospital is a trauma center which has a respectable and experienced team. The average hospitalization period of our patients was longer because of the numerous open fractures and the necessity of repeated surgery.

The average age of the patients in our study was 41.3 years. An England-based study about the agricultural accidents showed that the age groups of 25-35 and 35-45 years were the most exposed to accidents (15). In an Austrian study, it was seen that 67% of patients were older than 40 years (4). Akdur et al. (10) found the average age to be 35.8 years. In our study, half of the patients were over 40 years. Additionally, a patient (Number 9) was a 12-year-old child. According to ILO statistics, the highest rate of child labor (59%) is seen in the agricultural sector (16). The farming activities are done with contribution from all family members. Therefore, child labor in the agricultural sector will continue to be an important global problem.

The accidents predominantly occurred in spring and summer and 70% of the accidents occurred in the afternoon. The results of the other studies regarding the agricultural accidents agree with ours (4, 9, 14). There is no specific working time for farming activities, and farmers work from sunrise to sunset.

They get exhausted by afternoon, so most of the accidents occur during that time. All the casualties arrived to our hospital by emergency medical service. The patients who were referred to other hospitals and then to our hospital, lost a lot of time. All the cases were hospitalized in the orthopedics service and operated properly.

Study limitations

The main limitation of the study was an insufficient number of patients. If the study is repeated with a higher number of patients and prospectively, more comprehensive conclusions can be drawn.

Conclusion

Hoeing machine accidents do not result in death. But they frequently cause disability because of injuries in the extremities and a substantial number of amputations. The main cause of these accidents is an inappropriate use of machines, so the farmers should

be educated about the machine usage according to manufacturer's instructions. Additionally, the victims of these accidents must be transferred to well-equipped hospitals to avoid losing time. Thus, the number of these tragic accidents and their effects can be minimized.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İnönü University School of Medicine (approval no: 2016/84).

Informed Consent: The informed consent form was signed by all of the patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – K.T.; Design – S.G., K.T.; Supervision – H.O.; Resources – S.B., A.K.K.; Materials – S.B.; Data Collection and/or Processing – K.T.; Analysis and/or Interpretation – K.T., S.G.; Literature Search – K.T., H.O.; Writing Manuscript – K.T., S.G.; Critical Review – H.O., S.G.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Code of practice on safety and health in agriculture. International Labour Organization. Meetings-MESHA-Final Code;2010/10. Available from: http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_159457.pdf
2. Menemencioğlu K. Workplace Labor Conditions and Problems in Agriculture and Forestry. Turkish Journal of Scientific Reviews. 2012; 5: 72-6.
3. Camurcu S, Seyhan TG. Occupational Health and Safety in Agriculture. Journal of Engineering Sciences and Design. 2015; 3: 549-52.
4. Kogler R, Quendler E, Boxberger J. Occupational accidents with mowing machines in Austrian agriculture. Ann Agric Environ Med. 2015; 22: 137-41. [CrossRef]
5. Yıldırım C, Altıntaş E. Evaluation the Work Accidents Depending on the Work Safety Happened by Using Tractor and Agricultural Machinery in Tokat Province. Journal of Agricultural Faculty of Gaziosmanpaşa University. 2015; 32: 77-90.
6. Hard DL, Myers JR, Gerberich SG. Traumatic injuries in agriculture. J Agric Saf Health. 2002; 8: 51-65. [CrossRef]
7. Franklin RC, Davies JN. Farm-related injury presenting to an Australian base hospital. Aust J Rural Health. 2003; 11: 292-302. [CrossRef]
8. Nag PK, Nag A. Drudgery, Accidents and Injuries in Indian Agriculture. Industrial Health. 2004; 42: 149-62. [CrossRef]
9. Karapolat S, Sarıtaş A, Kandis H, Cıkman M, Gezer S, Özaydin I, et al. The evaluation of Pat-Pat related injuries in the western black sea region of Turkey. Scand J Trauma Resusc Emerg Med. 2011; 19: 40. [CrossRef]
10. Akdur O, Özkan S, Durukan P, Avsarogulları L, Koyuncu M, İkizceli İ. Machine-related Farm Injuries in Turkey. Ann Agric Environ Med. 2010; 17: 59-63.
11. Ünal HG, Yaman K, Gök A. Analysis of agricultural accidents in Turkey. J Agric Sci. 2008; 14: 38-45.
12. Buteera AM, Byimana J. Principles of Management of Open Fractures. East and Central African J Surg. 2009; 14: 2.

13. Zalavras CG, Patzakis MJ. Open fractures: evaluation and management. *J Am Acad Orthop Surg*. 2003; 11: 212-9. [\[CrossRef\]](#)
14. Say F, Coşkun HS, Erdoğan M, Bülbül A, Gürler D. Causes of open fractures: orthopaedic injuries related to home-made agricultural vehicles in the eastern Black Sea region of Turkey. *Turk J Med Sci*. 2016; 46: 972-6. [\[CrossRef\]](#)
15. Comprehensive Statistics in Support of the Revitalising Health and Safety Programmes, Agriculture, National Statistics. Anonymous. 2004. Health and Safety Commission. England, p.32.
16. Marketing progress against child labour- Global estimates and trends 2000-2012. Available from http://www.ilo.org/wcmsp5/groups/public/-ed_norm/---ipec/documents/publication/wcms_221513.pdf

Erythrodermic Psoriasis with Superimposed Fungal Infection-a Presentation in the Emergency Room

Muhammad Akbar Baig , Sadaf Sheikh 

Department of Emergency Medicine, Aga Khan University Hospital, Karachi, Pakistan

Cite this article as: Baig MA, Sheikh S. Erythrodermic Psoriasis with Superimposed Fungal Infection-a Presentation in the Emergency Room. Eurasian J Emerg Med. 2018; 17: 33-5.

Abstract

Erythrodermic psoriasis or erythroderma is a life-threatening, generalized exfoliative dermatitis involving majority of the body surface. A detailed evaluation is required for the identification of its underlying cause to successfully treat and prevent its relapse. We present a case of erythroderma in our local setting and review this disease in terms of the importance of immediate diagnosis and therapy for improved patient survival.

Keywords: Erythrodermic psoriasis, erythroderma, emergency department, Pakistan

Introduction

Erythrodermic psoriasis/erythroderma is a severe variant of psoriasis, which poses a life-threatening risk to the patient and a treatment challenge to the physician. It tends to involve approximately 90% of the body surface, giving rise to erythema and scaling. Uncontrolled flares of the disease can lead to superimposed infections involving the skin areas already afflicted with the condition. There is a paucity of relevant information regarding this condition for an emergency physician; therefore, we present a case of erythroderma with superimposed fungal skin infection encountered by us in the emergency department.

Case Presentation

A 62-year-old man presented to the emergency department with the complaint of acute eruption of fiery red skin lesions with intense pain and itching. He was a known case of asthma, hypothyroidism, and

psoriasis (disease in remission). Approximately 2 weeks prior to this presentation, he had been using a homeopathic medication for his overall general health, after which he noticed an increased erythematous plaque formation occupying his arms, torso, and legs. On initial assessment, the patient exhibited stable vital signs. Skin examination revealed erythematous geographical plaques with well-defined margins and superficial skin exfoliation that was distributed along the flexor and extensor aspects of bilateral forearms, the anterior aspect of the abdomen, bilateral medial thighs, and the posterior aspect of his lower legs. The lesions were warm and exquisitely tender to touch (Figures 1, 2); furthermore, clear fluid extravasation was seen. A provisional diagnosis of erythrodermic psoriasis was made. The patient was managed in the emergency department with intravenous fluids, analgesics, and a topical antihistamine lotion. His complete blood count and serum electrolyte levels were unremarkable as shown by laboratory test results. The patient was admitted to the medical ward and reviewed by a skin specialist the next day. Potassium hydroxide staining of the superficial skin scrapings demonstrated pseudo hy-

ORCID IDs of the authors: M.A.B. 0000-0002-2830-9099; S.S. 0000-0001-7457-0012.



Correspondence to: Muhammad Akbar Baig e-mail: dr_akbar2007@hotmail.com

Received: 05.07.2017 • **Accepted:** 19.07.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.57431



Figure 1. A 62-year-old male with erythrodermic psoriasis

phae formation, indicating a fungal infection. Therefore, oral anti-fungal fluconazole was started; topical and oral steroids were used as well, and the patient demonstrated a significant improvement during the course of his stay. The patient is currently admitted and is on oral antifungals as well as oral and topical steroids; he is due for discharge with advice for follow up in dermatology clinic.

Discussion

Erythrodermic psoriasis is an autoimmune condition affecting 3% of the world population, and it can be life threatening (1). In general, the condition is known to predominantly affect male population with a male to female ratio of 4:1; the mean age of the affected patients ranges from 40 to 60 years (2). However, no study has correctly estimated the current status of the disease in Third World nations such as Pakistan.

Erythrodermic psoriasis can be a challenging condition to diagnose, especially for the emergency physicians who have a limited experience in the management of this disease. Majority of such patients are misdiagnosed with drug reaction, cutaneous T-cell lymphoma, or atopic dermatitis (as in our presented case) (3). Dermatitis (established in a patient), like psoriasis, is the most common cause of erythrodermic psoriasis (4). It may also occur in relation to withdrawal of steroids, use of systemic or herbal medications, burns, and systemic illnesses (5). The most common precipitating cause of erythrodermic psoriasis is withdrawal of systemic corticosteroids. Thus, the use of systemic corticosteroids in patients with psoriasis is avoided as much as possible (6).

The underlying mechanism of erythrodermic psoriasis involves T cells playing a central role in the pathogenesis, which includes Lang-



Figure 2. Erythrodermic psoriasis demonstrated along the anteromedial aspect of the left thigh

erhans cell activation and maturation by skin antigens, T cell activation by the mature Langerhans cells, expansion and differentiation of the T cells within the lymph nodes, transport of the activated T cells from lymph node to the skin, and the subsequent release of cytokines. These cytokines are responsible for epidermal and vascular changes with pro-inflammatory effects (7).

Erythrodermic psoriasis causes development of erythematous patches, which coalesce to form an extensive erythema and involve most of the skin. The skin induration progresses to attain a dull gray discoloration and gives a sensation of skin tightness to the patient. A concomitant presence of lymphadenopathy and/or hepatosplenomegaly should raise the suspicion of drug reaction or malignancy and should be accordingly investigated (5).

The initial management of erythrodermic psoriasis includes replacement of nutritional, fluid, and electrolyte depletion. Local skin care should be performed using application of emollients and mildly potent corticosteroids along with sterile dressings. Any identified precipitant should be avoided, and the underlying cause should be treated to achieve a complete cure. Secondary fungal or bacterial infections are treated using recommended antifungals or antibiotics, respectively, tailored specifically as per local hospital guidelines. Any hemodynamic instability should be immediately addressed. Disease outcome is unpredictable and may include multiple exacerbations necessitating the use of systemic corticosteroids. Other medications such as methotrexate, acitretin (Soriatane), or cyclosporine may also be considered (8, 9). Skin inflammation is a predominant feature of erythroderma, and rapid release of tumor necrosis factor- α (TNF- α) causes the flare. Therefore, TNF- α blocking biologics such as etanercept, adalimumab, and infliximab that target this specific pathway can be considered for treatment; however, they should be used after a careful consideration of the associated side effects (10).

There is conflicting evidence regarding prognosis of erythroderma in developing nations. Common causes of death in affected patients are pneumonia, sepsis, and congestive heart failure. The elderly population is at a higher risk due to these complications; however, the incidence of death has substantially reduced due to early diagnosis and therapy (11).

Conclusion

Erythrodermic psoriasis is a rare and fatal exfoliative dermatitis, which should be immediately recognized and promptly treated. The mainstay of treatment is founded on aggressive supportive care and use of anti-inflammatory immunosuppressive therapy including the newer biologic agents.

We presented the case of a patient in whom erythroderma was likely triggered by the use of homeopathic medicines and was successfully treated with steroids and antifungals. Our patient's global assessment and compliance with treatment was good; therefore, he had a favorable recovery from the condition.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.A.B., S.S.; Supervision – M.A.B., S.S.; Resources – M.A.B., S.S.; Materials – M.A.B., S.S.; Literature Search – M.A.B., S.S.; Writing Manuscript – M.A.B., S.S.; Critical Review – M.A.B., S.S.; Other – M.A.B., S.S.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Schön MP. Advances in psoriasis treatment. *Lancet*. 2005; 366: 1333-5. [\[CrossRef\]](#)
- Sehgal VN, Srivastava G. Exfoliative dermatitis: A prospective study of 80 patients. *Dermatologica*. 1986; 173: 278-84. [\[CrossRef\]](#)
- Balasubramaniam P, Berth-Jones J. Erythroderma: 90% skin failure. *Hosp Med*. 2004;65:100-2. [\[CrossRef\]](#)
- Pal S, Hamon TS. Erythroderma: A clinico-etiological study of 90 cases. *Int J Dermatol*. 1998; 37: 104-7.
- Rubins AY, Hartman IV, Liebrich YM, Schwartz RA. Therapeutic options for erythroderma. *Cutis*. 1992; 49: 424-6.
- Stinco G, Errichetti E. Erythrodermic psoriasis: current and future role of biologics. *Bio Drugs*. 2015; 29: 91-101. [\[CrossRef\]](#)
- Wilson DC, Jester JD, King LE, Jr. Erythroderma and exfoliative dermatitis. *Clin Dermatol*. 1993; 11: 67-72.
- Karakayli G, Beckham G, Orenko I, Rosen T. Exfoliative dermatitis. *Am Fam Physician*. 1999; 59: 625-30.
- Sehgal VN, Srivastava G, Sardana K. Erythroderma/exfoliative dermatitis: A synopsis. *Int J Dermatol*. 2004; 43: 39-47. [\[CrossRef\]](#)
- Rosenbach M, Hsu S, Korman NJ, Lebwohl MG, Young M, Bebo BF Jr, et al. Treatment of erythrodermic psoriasis: from the medical board of the National Psoriasis Foundation. *J Am Acad Dermatol*. 2010; 62: 655-62. [\[CrossRef\]](#)
- Nicolis GD, Helwig EB. Exfoliative dermatitis: A clinicopathologic study of 135 cases. *Arch Dermatol*. 1973; 108: 788-97. [\[CrossRef\]](#)

Aortoenteric Fistula Causing Syncope and Gastrointestinal Bleeding

Aureliu Grasun¹ , Hector Alonso Valle¹ , María Andrés Gómez¹ , Luis Prieto Lastra¹ , Pablo Garmilla Ezquerra¹ ,
Francisco Manuel Mateos Chaparro¹ , Nuria Odriozola Romillo¹ , Elena Grasun¹ , Sergio Rubio Sánchez¹ , Luis Iglesias Oliva¹ ,
Patricio Alberto Seabrook Maggio² , Ricardo Jauregui Solorzano² 

¹Department of Emergency, The Marqués De Valdecilla University Hospital, Santander, Spain

²Department of Intensive Care Unit, The Marqués De Valdecilla University Hospital, Santander, Spain

Cite this article as: Grasun A, Valle HA, Gómez MA, Lastra LP, Ezquerra PG, Mateos Chaparro FM, et al. Aortoenteric Fistula Causing Syncope and Gastrointestinal Bleeding. Eurasian J Emerg Med. 2018; 17: 36-8.

Abstract

Aortoenteric fistula (AEF) is an uncommon and emergency clinical condition of intra-abdominal bleeding. Early diagnosis can be achieved by computed tomography and endoscopy exploration. Surgical reconstruction is an urgent and multidisciplinary treatment and is recommended after the surgical intervention. A 76-year-old man with a history of abdominal aortic aneurysm reconstruction presented to the emergency department with syncope and suspected upper gastrointestinal (GI) bleeding, which began approximately 30 min before. In the hospital, the patient's condition worsened and he developed cardiac arrest due to massive GI bleeding. The advanced cardiopulmonary resuscitation was initiated and with suspected active aortoenteric communication, an urgent laparoscopy was immediately performed.

Keywords: Aorto-enteric fistula, syncope, gastrointestinal bleeding

Introduction

The aortoenteric fistula (AEF) is a direct communication between the aorta and intestine (1). There are two forms of AEFs: 1) Primary, which usually occur due to the erosion of an abdominal aortic aneurysm (AAA) into the intestine and 2) Secondary, which are caused by reconstructive procedures on the abdominal aorta (2). The incidence of primary AEF ranges from 0.1% to 0.8% and that of secondary from 0.4% to 2.4% (1, 3). The mortality rate after surgical treatment of secondary AEFs is from 14% to 70% (1).

Case Presentation

In January 2017, a 76-year-old man was transported by the Emergency Medical Services to our emergency department (ED) after experiencing an attested episode of syncope at home approximately 30 min before. His past medical history included arterial hypertension, chronic pulmonary obstructive disease, hiatus hernia, and a gastric ulcer. At the beginning of 2015, he was diagnosed with Leriche's syndrome and later in September 2015 he underwent a bypass aortobifemoral without initial complications. Furthermore, in January 2016,

ORCID IDs of the authors: A.G. 0000-0003-4864-1475; H.A.V. 0000-0002-6070-8874; M.A.G. 0000-0001-7485-4939; L.P.L. 0000-0002-3057-617X; P.G.E. 0000-0002-3770-164X; F.M.M.C. 0000-0002-6915-7458; N.O.R. 0000-0001-8742-6140; E.G. 0000-0001-5871-5920; S.R.S. 0000-0001-7761-0067; L.I.O. 0000-0002-0912-5286; P.A.S.M. 0000-0003-1513-7176; R.J.S. 0000-0003-4678-5686.



Correspondence to: Aureliu Grasun e-mail: dr.aureliu@gmail.com

Received: 21.07.2017 • **Accepted:** 02.08.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com
DOI: 10.5152/eajem.2018.29290

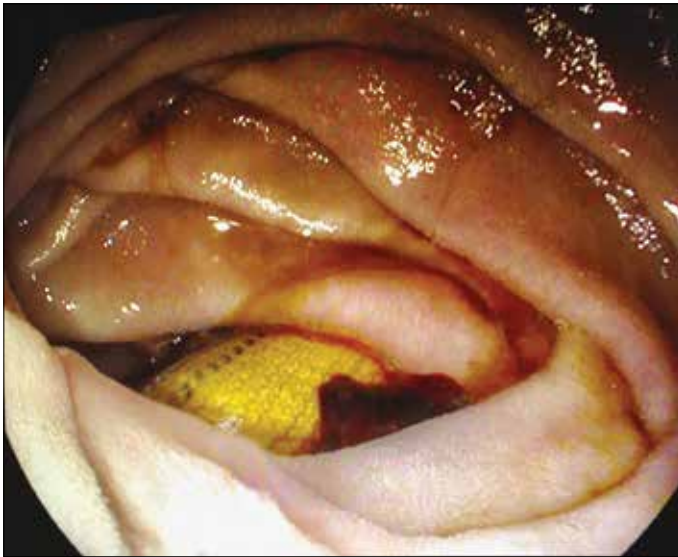


Figure 1. Upper digestive endoscopy: the Dacron prosthesis in the intestinal lumen is objectified

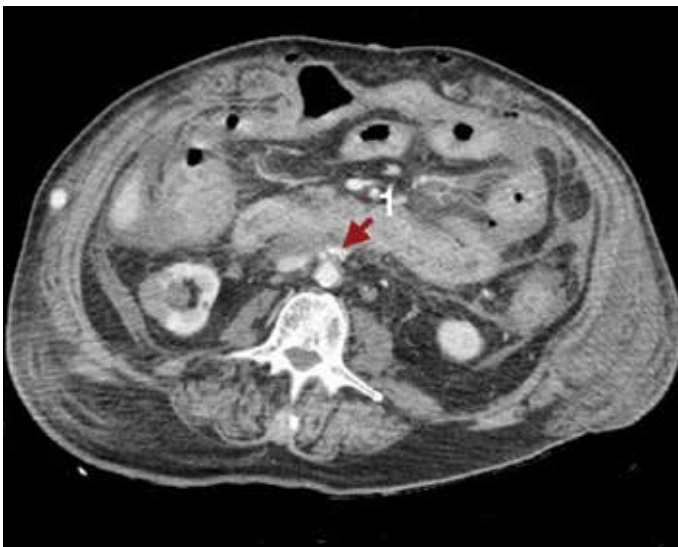


Figure 2. CT abdominal scan with extravasation of IV contrast (1) in relation to active bleeding around the surgical drainage catheter

the patient had a superficial femoral artery obstruction, and a left posterior tibial femoral bypass was performed. During the transfer to the hospital, the patient presented a self-limiting episode of hematemesis with fresh red blood. Upon arrival in the ED, the patient remained hemodynamically stable. Clinically, he complained of general sickness, weakness, and dizziness. The primary physical examination revealed paleness of the skin and tachypnea with simultaneous tachycardia; however, the remaining examination was unremarkable. The patient was connected to continuous cardiac monitoring and a complete analytical test was performed. Approximately 15 minutes after arriving at the hospital, the patient's condition worsened clinically with intense dizziness, profuse sweating, and arterial hypotension. Thereafter, the patient presented another episode of hematemesis together with hematochezia. Against maintained arterial hypotension, despite intensive fluid therapy, jugular vein access was obtained with associated noradrenaline perfusion in the doses of

up to 18 mL/h, which recovered the blood pressure and the patient was stabilized. Due to a suspicion of active upper gastrointestinal (GI) bleeding, an endoscopy (Figure 1) was performed and bleeding was observed in the distal part of the stomach (adrenaline was injected and clips were placed). After passing through the duodenum, a foreign body with a tubular morphology was observed (Figure 1). A few minutes after performing the endoscopy, the patient presented a new episode of hematemesis, associated with progressive worsening and decreased blood pressure until cardiorespiratory arrest (pulseless electrical activity) was confirmed. Therefore, we initiated cardiopulmonary resuscitation (CPR) and proceeded to intubate the patient. The CPR lasted approximately 7 min until the recovery of the pulse, during which 3 mg of adrenaline was administered. An emergent laparotomy confirmed the fistula between the bypass at the proximal level and duodenum with a dehiscent suture at that level. An axillary-bifemoral bypass with Dacron was implanted. After surgery, the patient continued to experience moderate bleeding through abdominal drainage in the context of coagulopathy, necessitating transfusion of blood products. Early signs of hypoperfusion were observed in the lower right limb after surgery, as well as signs of rhabdomyolysis, and a conservative treatment was initiated. However, finally, supracondylar amputation was necessary after the observation of established limb ischemia. Broad-spectrum antibiotic treatment with fungus coverage was used, with good clinical response at the beginning. After 7 days in the intensive care unit (ICU), the clinical situation of the patient was complicated with acute renal failure and signs of sepsis. A few days later, the patient again began to experience active bleeding from the abdominal drainage (Figure 2), and his hemodynamic status worsened terminating in death without further surgical re-intervention due to the family's wishes.

Discussion

AEF is a life-threatening and devastating cause of GI bleeding, which can be difficult to diagnose and treat. Although it is a clinical situation infrequently seen in daily practice, it is commonly seen as a late complication of aortic reconstruction due to AAA (2). AEF is divided into 2 types: primary AEF and secondary AEF. The primary AEF occurs when a large untreated aneurysm erodes into the bordering bowel. The third portion of the duodenum, immovable retroperitoneally to the descending aorta, is the most vulnerable bowel segment to this condition (2, 3). The development of AEF starts with ischemia and subsequent necrosis of the intestinal wall because of repetitive traumatic pulsations of a proximate aortic aneurysm. Conditions that can albeit less commonly lead to primary AEF include syphilis, tuberculosis, mycotic infection, and collagen vascular disease, where the chronic inflammation leads to aortitis, erosion, and formation of the fistula. In the absence of treatment, the mortality scale is almost 100%. With surgical intervention, survival ranges from 18% to 93%. Secondary AEF occurs as a complication of a previous aortic reconstructive surgery. An estimated 80% of secondary AEF cases affect the duodenum. As a result of perigraft infection and/or the continuous pressure on the bowel from aortic pulsations, fistulas are formed (2, 4). Secondary AEF is a rare but well-known complication after AAA repair, occurring in 0.4%-1.6% of cases (1, 3). The most common characteristics of primary AEFs are GI bleeding (64%), abdominal pain (32%), and a pulsatile abdominal mass (25%). These 3 clinical situations are jointly present in only 10%-23% of patients. The patients with a secondary AEFs habitually present

with GI bleeding (80%), sepsis (44%), abdominal pain (30%), back pain (15%), groin mass (12%), and abdominal pulsatile mass (6%) (2, 5). The diagnosis can be established based on the symptomatology and with the support of the following diagnostic tests: abdominal computed tomography (CT) with intravenous (IV) contrast, esophagogastroduodenoscopy, and arteriography. The CT scan is superior because it is less invasive, more readily available, and more expedient than other tests (2). Also, the CT scan may detect abnormal communication between the aorta and the bowel, may uncover loss of continuity of the aneurysmal wall, and may reveal air bubbles in the aneurysm wall that are pathognomonic for the existence of a fistula (2). The treatment of AEF repair is controversial. The explanation of the infected graft and perforated bypass remains the gold standard. Recent studies have suggested that in situ aortic reconstruction using antibiotic-impregnated graft, cryopreserved allograft, or autogenous vein are associated with fewer amputations, conduit failures, re-infections, and a lower rate of early and late mortalities compared to extra-anatomic bypass. Surgical treatment must be combined with antibiotic therapy, but no guidelines exist on the exact duration of treatment (4).

Conclusion

AEF is a rare but life-threatening complication occurring after endovascular AAA repair that is difficult to diagnose and treat. In patients with active GI bleeding and a history of aortic reconstruction, the possibility of AEF must also be considered. AEF requires decisive and urgent surgical management. The supporting role of emergency physicians in the ED includes optimally resuscitating the patient with fluids and blood components while initiating broad-spectrum IV antibiotics as part of sepsis management. The optimal method of management of this condition is surgery in the initial phase and later a multidisciplinary approach in ICUs.

Informed Consent: Written informed consent was obtained from patients' family who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – A.G., H.A.V., M.A.G., L.P.L., P.G.E., F.M.M.C., N.O.R., E.G., S.R.S., L.I.O., P.A.S.M., R.J.S.; Design – A.G., H.A.V., M.A.G., L.P.L., P.G.E., F.M.M.C., N.O.R., E.G., S.R.S., L.I.O., P.A.S.M., R.J.S.; Supervision – A.G., H.A.V., M.A.G., L.P.L., P.G.E., F.M.M.C., N.O.R., E.G., S.R.S., L.I.O., P.A.S.M., R.J.S.; Resources – A.G., H.A.V.; Materials – A.G.; Data Collection and/or Processing – A.G., M.A.G.; Analysis and/or Interpretation – A.G., H.A.V.; Literature Search – A.G., H.A.V.; Writing Manuscript – A.G.; Critical Review – A.G., H.A.V.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Davidovic LB, Spasic DS, Lotina SI, Kostic DM, Cinara IS, Svetkovic SD, et al. Aorto-enteric fistulas. *Srp Arh Celok Lek.* 2001; 129: 183-93.
2. Singh M, Koyfman A, Martinez JP. Abdominal Vascular Catastrophes. *Emerg Med Clin N Am.* 2016; 34: 327-39. [\[CrossRef\]](#)
3. Busuttil SJ, Goldstone J. Diagnosis and management of aorto-enteric fistulas. *Sem Vasc Surg.* 2001; 14: 302e11.
4. Chenu C, Marcheix B, Barcelo C, Rousseau H. Aorto-enteric fistula after endovascular abdominal aortic aneurysm repair: case report and review. *Eur J Vasc Endovasc Surg.* 2009; 37: 401-6. [\[CrossRef\]](#)
5. Eldrup-Jorgensen J, Hawkins RE, Bredenberg CE. Abdominal vascular catastrophes. *Surg Clin North Am.* 1997; 77: 1305-20.

Ketoacidosis due to Starvation

Nalan Metin Aksu , Zehra Akcora , Bugra Ilhan , Ozgur Bayar , Meltem Akkas

Department of Emergency Medicine, Hacettepe University School of Medicine, Ankara, Turkey

Cite this article as: Metin Aksu N, Akcora Z, Ilhan B, Bayar O, Akkas M. Ketoacidosis due to Starvation. Eurasian J Emerg Med. 2018; 17: 39-40.

Abstract

Poor dietary intake, prolonged fasting, malnutrition, alcoholism, and protein-based diets may induce ketoacidosis without diabetes mellitus. This is called "starvation ketoacidosis." Here we present the case of a patient diagnosed with starvation ketoacidosis. A 38-year-old female was admitted to our emergency department because of chest and back pain. Electrocardiography and chest X-ray showed no abnormalities. On taking her past medical history, we learned that she had been diagnosed with anorexia nervosa. Anion gap metabolic acidosis with ketone bodies in urine was detected. A diagnosis of starvation ketoacidosis was considered for the patient, and she was treated with dextrose solution for 15 h, and improved acidosis was observed. To the best of our knowledge, there are few case reports on starvation ketoacidosis. Emergency physicians should be aware of the complications of starvation and should immediately start the appropriate treatment.

Keywords: Starvation ketoacidosis, high anion gap, emergency department

Introduction

Ketoacidosis is a metabolic state wherein ketone bodies increase with decreasing serum bicarbonate level and pH. Ketosis may occur during starvation because of poor carbohydrate intake, which leads to lipolysis and ketogenesis (1). Here the brain and other tissues use ketone bodies as an alternative energy source instead of glucose. Although ketoacidosis may be frequently seen as diabetic ketoacidosis in association with type I diabetes mellitus, poor dietary intake, prolonged fasting, malnutrition, gastric banding disorders, alcoholism, therapeutic ketogenic diets (used for the treatment of epileptic seizures, Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis), Atkins diet, and last decade's famous Dukan diet may induce ketoacidosis without diabetes mellitus (2-8). This is known as

starvation ketoacidosis. Here, we present the case of a 38-year-old female with anorexia nervosa who was diagnosed with starvation ketoacidosis.

Case Presentation

A 38-year-old female was admitted to our emergency department because of chest and back pain. Her initial vital signs were normal. Electrocardiography (ECG) and chest X-ray showed no abnormalities. Serum myoglobin, CK-MB, and troponin I levels were within reference ranges. Because of her chest pain and shortness of breath, we ordered her arterial blood gas (ABG) analysis. ABG values were as follows: pH: 7.26, pO₂: 96 mmHg, pCO₂: 24 mmHg, HCO₃⁻: 10.8 mEq/L, and lactate: 1.1. mEq/L. Her serum electrolyte levels including Na

ORCID IDs of the authors: N.M.A. 0000-0003-2256-5187; Z.A. 0000-0051-5296-0220; B.I. 0000-0002-3255-2964; O.B. 0000-0003-2307-8882.



Correspondence to: Nalan Metin Aksu e-mail: nametaksu@yahoo.com.tr

Received: 31.03.2017 • **Accepted:** 05.05.2017 • **Available Online Date:** 09.08.2017

©Copyright 2018 by Emergency Physicians Association of Turkey - Available online at www.eajem.com

DOI: 10.5152/eajem.2017.29591

Table 1. Arterial blood gas, serum electrolytes, and glucose values

	At admission	After treatment
pH	7.21	7.33
pCO ₂ (mmHg)	31.3	37.9
HCO ₃ (mmol/L)	12	20
Na ⁺ (mEq/L)	137	135
K ⁺ (mEq/L)	4.13	3.3
Cl ⁻ (mEq/L)	108	112
Anion gap	17	3
Glucose (mg/dL)	62	103

(137 mEq/L) and Cl (108 mEq/L) as well as blood urea nitrogen and creatinine levels were normal. We investigated the reason for her anion gap metabolic acidosis. She had no diabetes mellitus and her glucose was 99 mg/dL, and there was no lactate level elevation. There was no history of alcohol intake. Her urine test showed 4 (+) ketone bodies. On taking a detailed past medical history, we learned that she had been diagnosed with anorexia nervosa. Her family stated that she had not eaten anything for several days. Therefore, we suspected that the patient was in a state of ketoacidosis due to starvation. We consulted the patient to the nephrology department and then started treatment with 50 cc/h of 10% dextrose. We measured blood glucose levels every 2 h and serum electrolytes, ABG, and urine tests every 4 h. After 15 h of treatment initiation, ABG values became normal, and there were no ketone bodies in her urine test (Table 1). Her complaints also ceased. We discharged the patient with the recommendation to follow up with psychiatry and nephrology.

Discussion

To the best of our knowledge, few case reports have been published on starvation ketoacidosis. Blood glucose level decreases with decrease in insulin and increase in glucagon during starvation (3). Decreased insulin level leads to increased activity of lipase. Lipase breaks down triglyceride into free fatty acid chains (FFAs). These FFAs oxidize ketone bodies in the liver. A literature search revealed case reports on ketoacidosis due to several reasons, the most common reason being diabetes mellitus. However, our patient had no history of diabetes and nor was she pregnant. She also had no intractable vomiting. She had also no history of alcohol or medicines that may lead to metabolic acidosis. Sepsis may lead to ketoacidosis without diabetes, but her clinical condition did not indicate sepsis (9). Further, she had no history of gastric banding operation. In these conditions, ketoacidosis may be explained by the lack of insulin and poor metabolic function. Ketoacidosis may be life-threatening during lactation. There was a case report on a nondiabetic woman who fasted during lactation (10). There were case reports of ketoacidosis due to low carbohydrate-high protein diets such as Atkins and Dukan (7, 8). We found another case report of severe diabetic ketoacidosis with anorexia nervosa and type I diabetes (11). We investigated the reason for the ketoacidosis in our patient by detailing her past medical history. We finally concluded the diagnosis to be starvation ketoacidosis. The goal of the treatment is to reduce gluconeogenesis. This can be achieved by administering combined dextrose and insulin infusion

or dextrose infusion alone (3). Insulin can switch off ketogenesis and provide a more rapid recovery. But during insulin infusion, glucose levels have to be closely observed to avoid hypoglycemia. The recommended treatment time varies from 24 h to 72 h. Occasionally, acidosis state recovers in 24 h following the treatment (3, 8). Our patient recovered after 15 h of her treatment.

Conclusion

Starvation ketoacidosis may present as high anion gap metabolic acidosis and may be life-threatening. Because of this reason, emergency physicians should be aware of the complications of starvation and also immediately start the appropriate treatment.

Informed Consent: We didn't use the patient's photograph or identification informations in this case report so we didn't obtained the informed consent form.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – N.M.A.; Design – N.M.A., M.A.; Supervision – N.M.A., M.A.; Resources – Z.A., B.I., O.B.; Materials – O.B.; Data Collection and/or Processing – B.O., Z.A., B.I.; Analysis and/or Interpretation – N.M.A., M.A., B.I.; Literature Search – N.M.A., M.A., B.I.; Writing Manuscript – N.M.A., M.A.; Critical Review – N.M.A., M.A., Z.A., B.I., B.O.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Cartwright MM, Hajja W, Al-Khatib S, Hazeghazam M, Sreedhar D, Na Li E, et al. Toxicogenic and metabolic causes of ketosis and ketoacidotic syndromes. *Crit Care Clin.* 2012; 28: 601-31.
- Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN. Hyperglycemic crises in adult patients with diabetes. *Diabetes Care.* 2009; 32: 1335-43.
- Lulsegegg A, Saeed E, Langford E, Duffield C, El-Hasani S, Pareek N. Starvation Ketoacidosis in a patient with gastric banding. *Clin Med (Lond).* 2011; 11: 73-5.
- Wheless J. The history of the ketogenic diet. *Epilepsia.* 2008; 49: 3-5. [CrossRef]
- Gasior M, Rogawski MQA, Hartman AL. Neuroprotective and disease modifying effects of the ketogenic diet. *Behav Pharmacol.* 2006; 17: 431-9.
- Henderson ST. Ketone bodies as a therapeutic for Alzheimer's disease. *Neurotherapeutics.* 2008; 5: 470-80.
- Chen TY, Smith W, Rosenstock JL, Lessnau KD. A life threatening complication of Atkins diet. *Lancet.* 2006; 367: 958.
- Freeman FT, Willis B, Krywko DM. Acute intractable vomiting and severe Ketoacidosis secondary to the Dukan diet. *J Emerg Med.* 2014; 47: 109-12.
- Nakamura K, Inokuchi R, Doi K, Fukuda T, Tokunaga K, Nakajima S, et al. Septic Ketoacidosis. *Intern Med.* 2014; 53: 1071-3.
- Geijer L, Elelund M. Ketoacidosis associated with low carbohydrate diet in a non-diabetic lactating woman: a case report. *J Med Case Rep.* 2015; 9: 224.
- Espes D, Engström J, Reinius H, Carlsson P. Severe diabetic Ketoacidosis in combination with starvation and anorexia nervosa at onset type 1 diabetes: A case report. *Ups J Med Sci.* 2013; 118: 130-3.



Ўзбекистон шошилич тиббий
ёрдам Ассоциацияси
Association of Emergency Physician of Uzbekistan

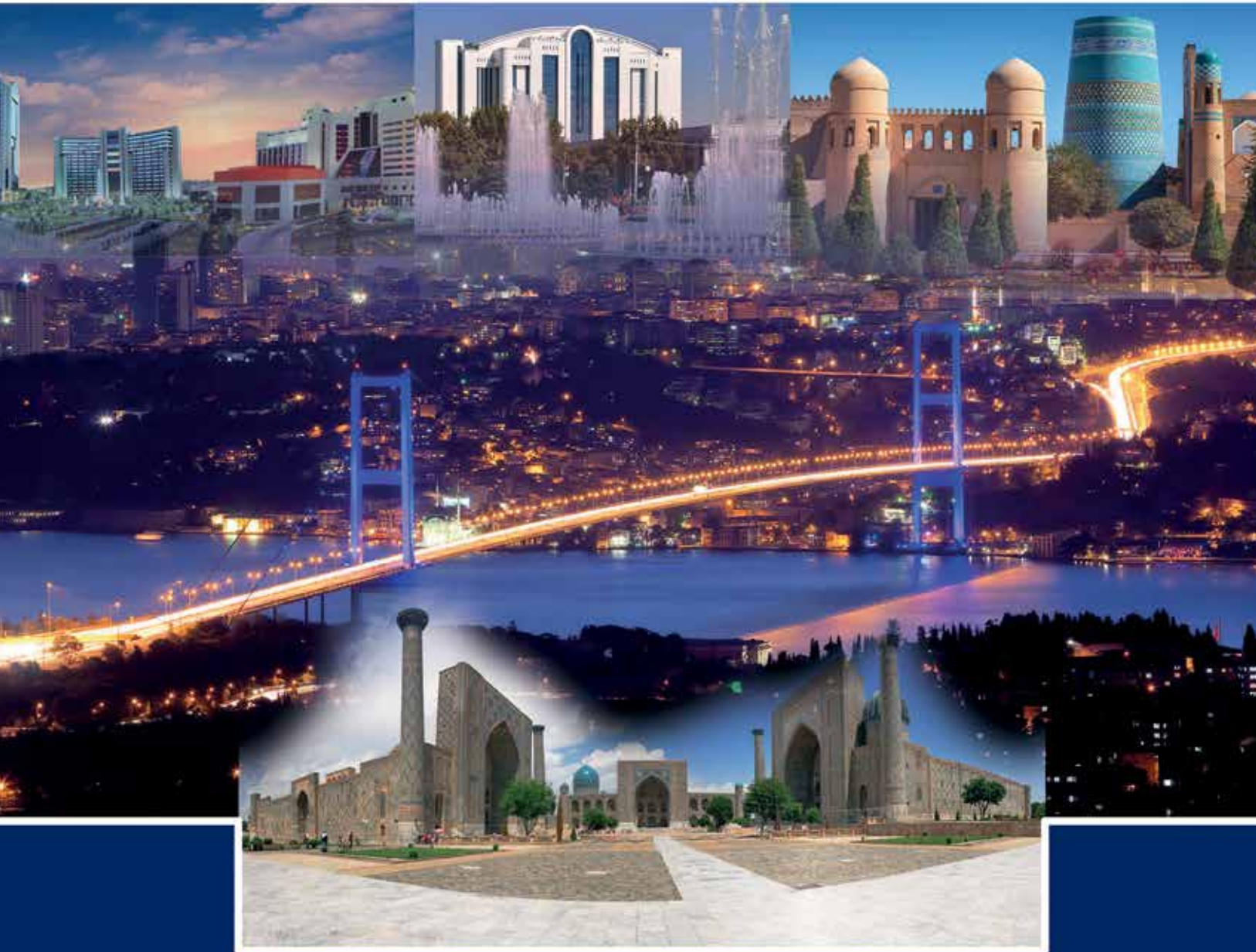


Туркия шошилич тиббий
ёрдам Ассоциацияси

6th International Emergency Medicine Symposium и Халқаро шошилич тиббий ёрдам симпозиуми

Tashkent, Uzbekistan / Тошкент, Ўзбекистон

06-08 April 2018 / 06-08 апреля, 2018 йил



www.atuder.org.tr

SCIENTIFIC SECRETARIAT



EPAT
Emergency Physicians
Association of Turkey

Yukarı Ayrancı Güteryüz Sk.
No: 26/19 06550
Çankaya / ANKARA / TURKEY

Tel : +90 312 4261214
Fax : +90 312 4261244
E-Mail : info@atuder.org.tr