Determination of Appropriate Neck Collar Dimensions for Emergency Service Patients Through the Measurements Taken From Adult Volunteers

Gönüllü Erişkinlerden Alınan Ölçümlerle Acil Servis Hastaları İçin Uygun Servikal Boyunluk Ebatlarının Belirlenmesi

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Abstract

Objective: Initial care of neck trauma in emergency services is very important because of its seriousl results. Appropriate neck collar usage in these patients is necessary as in all trauma patients. We designed this study to determine the appropriate collar dimensions for our patients.

Materials and Methods: Our study was performed in Suleyman Demirel University Hospital by including four hundred and seventy-two (two hundred and seventy-six male, one hundred and ninety-six female) adult volunteers who had no visible neck deformity. In the neutral position, menthum-gonion, gonion-tragus, mentum-tragus, menthum-insicura jugularis and neck circumference distances were measured with a tape measure. These measurements were compared with the values obtained from the same anatomical contact points of currently used cervical collars.

Results: In our study mean menthum-gonion distance was 9.2 cm in our measurements of volunteers, 9 cm in the collar we currently use. Mean tragus-gonion distance was 3.1 cm and in the current collar 6 cm. Mean menthum-tragus distance was 12.5 cm and, in the currently used collar it was 15 cm. Cervical 7-occiput distance was 16 cm in the current collar, and 10.8 cm mean in our measurement. Menthum-insicura jugularis distance was measured 11.5 cm, 15 cm in the current collar. Gonion-midclavicula distance was 13.03 cm, 13.00 cm in the current collar. Neck circumference was 37 cm, 57 cm in the current collar.

Conclusion: Collar dimensions may vary among people and this data should be considered during the production stage. *(JAEM 2011; 10: 53-5)*

Key words: Neck trauma, neck collar, emergency service

Özet

Amaç: Boyun travması ölümcül sonuçlar oluşturabilmesi nedeniyle bunların acil servisteki ilk müdahaleleri çok önemlidir. tüm travma hastalarında olduğu gibi Bu hastalarda uygun boyunluk kullanılması gerekmektedir. Biz hastalarımıza uygun boyunluk ebatlarını belirlemek için bu çalışmayı dizayn ettik.

Gereç ve Yöntemler: Çalışmamız Süleyman Demirel Üniversitesi Tıp Fakültesi Hastanesi Acil Servis'inde gözle görünür deformitesi olmayan dörtyüzyetmişiki (ikiyüzyetmişaltı erkek, yüzdoksanaltı kadın) gönüllü erişkinin nötral pozisyonda mentum-gonion, gonion-tragus, mentum-tragus, mentum-insicura jugularis, boyun çevresi mesafelerinin mezura yardımıyla ölçülmesi yoluyla yapıldı. Bu ölçümler halihazırda kullanmakta olduğumuz boyunluğun aynı anatomik noktalara temas noktalarının ölçümleriyle karşılaştırıldı.

Bulgular: Çalışmamızda mentum-gonion mesafesi çalışma grubunda ortalamada 9.2 cm, kullandığımız boyunlukta 9 cm. Tragus-gonion mesafesi 3.1 cm, boyunlukta 6 cm olarak bulundu. Mentum-tragus mesafesi oratalam 12.5 cm bulunurken boyunlukta bu ölçüm 15 cm. idi. Servical 7-oksiput mesafesi boyunlukta 16 cm iken gönüllülerde 10.8cm bulundu. Mentum-insicura jugularis mesafesi gönüllülerde 11.5 cm, boyunlukta 15 cm olarak tespit edildi. Gonion-midklavikula mesafesi grupta 13.03 cm, boyunlukta 13.00 cm idi. Boyun çevresi çalışma grubunda 37 cm bulunurken bu ölçüm boyunlukta 57 cm idi.

Sonuç: Boyunluk ebatları kişiler arasında farklılıklar gösterebilmektedir ve bu durumun boyunluk üretim aşamasında göz önünde bulundurulması gerektiğini düşünmekteyiz. *(JAEM 2011; 10: 53-5)*

Anahtar kelimeler: Boyun travması, boyunluk, acil servis

Introduction

Neck traumas may result in death or persistant neurological deficit and neck collars are very important for these patients' initial stabilization. Spinal injuries are the most dangeous injuries among trauma-related injuries. 30 persons per million are at risk in the US. The estimated number of new cases is between 8000-10000. The real incidence is more than this data. Minor injuries are not recorded and spinal injuries are more often seen in males. Mean age is 33.5 (1, 2). Frequency increases at weekends, holidays and summer months. 90% of injuries occur after blunt trauma and motor vehicle accidents.

Neck collars are frequently used during the prehospital period and in emergency services for trauma patients (3, 4). With an accurately applied collar, meaningful results (up to3-25%) can be obtained (5, 6). Spinal immobilisation is a precaution in preventing the worsening of an unstable spinal fracture or spinal cord injury in trauma patients (7).

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With respect to this vital factor, use of collars appropriate for persons and communities' standards during emergency interventions is important for better stabilization of trauma patients and prevention of serious complications.

In our emergency service we currently use foreign standard dimensional collars. We attempted to assess whether these standard dimensional collars are large for our patients or not. For the best stabilization of these trauma patients our aim is to standardise the appropriate collar dimensions.

Materials and Methods

This cross-sectional clinical study was performed between 1.07.2008-01.07.2009, in 472 adult volunteers (276 male, 196 female), in the Suleyman Demirel University Emergency Medicine Department.

Approval and signatures of the volunteers were taken before the measurement. We received assistance from an anatomist specialized in anthropological measurements for the accurate anatomical measurement points and volunteer measurement positions. Measurements were carried out by three senior assistants with no knowledge of each other's results. In our study a tape measure (Inch 150cm-Germany) and a weighing machine (Seca 7001021998-Germany) were used.

The forms generated for volunteers were filled for each person. Age, gender, height and weight datas were recorded in these forms.

Contact of a thin chain attached to the ceiling, to earlobe and midclavicular point was provided and the volunteers were warned to stay immobile in neutral position. During this neutral position, menthum-gonion, gonion-tragus, menthum-tragus, menthum-insicura jugularis, C7-external occipital protuberance distances and neck circumferences (the plane passing through Adam's apple) were measured with a tape measure. These data were recorded to volunteers' forms and the results were compared with the measurements taken from the same anatomical points of the collar that we currently use.

Volunteers above 18 age were includud in our study with no regard to sex. These people were patients and their relatives, hospital workers, intern nurses and intern doctors. Basic inclusion criteria of our study was the absence of neck deformity in the volunteer. People who had a visible neck deformity and who were unwilling to join this study, were excluded.

SPSS 15.0 statistic program was used for evaluating the results in our study. One-sample T-test was used to compare the values carried out from our measurement results and the measurements of the current collar. For an accurate calculation, 472 values for each parameters were recorded to spss for each person. The values for the same anatomical points of the current collar were also recorded 472 times. Pearson correlation test was used to evaluate neck circumference and BMI relation. In all statistics $p < 0.05$ was accepted to be significant.

The first outcome measure of our study was measurements taken from volunteers, and the second one was measurements of same anatomical points taken from the current collar.

Results

Our study was performed in 276 (58.5%) male, 196 (41.5%) female, totally 472 adult volunteers. Mean age of our study group was 35±11.88.

In our study, menthum-gonion distance was 9.2cm mean (9.51cm in men, 8.79cm in female) in our measurements of volunteers, 9cm in the currently used collar (p<0.05). Tragus-gonion distance was 3.1cm mean (3.38 cm in men, 2.89 cm in female) and in the current collar, 6cm. Menthum-tragus distance was 12.5 cm mean (13.01 cm in male, 11.82 cm in female), in the currently used collar it was 15 cm (p<0.05). Cervical 7-occiput distance was 16 cm in the current collar, and 10.8 cm mean in our measurement (11.15 cm in men, 10.41 cm in female) (p<0.05). Menthum-insicura jugularis distance was measured 11.5cm (11.97 cm in men, 10.83cm in women), 15cm in the current collar (p<0.05). Gonion-midclavicula distance was 13.03 cm (13.46 cm in men, 12.43 cm in women), 13.00 cm in the current collar (p<0.05). Neck circumference was 37 cm (39.65cm in men, 35.03 cm in women), 57 cm in the current collar (p<0.05). These differences can be seen in Figure 1.

Discussion

Neck collar usage is vital for trauma patients in emergency services. Up tol now, several studies were performed on collars types to obtain the ideal collar. While the usage of the smallest collar for a patient has been suggested, there has been no exact data about suitable dimensions. So, in our study we tried to determine the dimensions of an appropriate collar that should be used for our community in our country.

276 male, 196 female, making a total of 72 adult volunteers were included in our study. Increments of number of people was important for getting more accurate results for us. The mean age of our study group was 35±11.88 years. Young and middle-age population dominance can be explained by their probability for attending the study when compared with old people.

Obtaining an anatomist's opinion before the study design helped us to carry out accurate measurements. In addition, we tried to obtain information about face and neck antrophological measurement but we could not find any information about neck dimensions. We tried to carry out as accurate measurements as possible.

Menthum-gonion distance was 9.2 cm (9.51 cm in male, 8.79 cm in female) in our study group, it was 9cm in the current collar. Menthum-gonion measurement was found larger in our measurement but in total, menthum-tragus distance mean was 12.5 cm, in the current collar it was 15 cm. This situation was related to tragus-gonion distance. This distance was found as mean 3.1 cm, in the
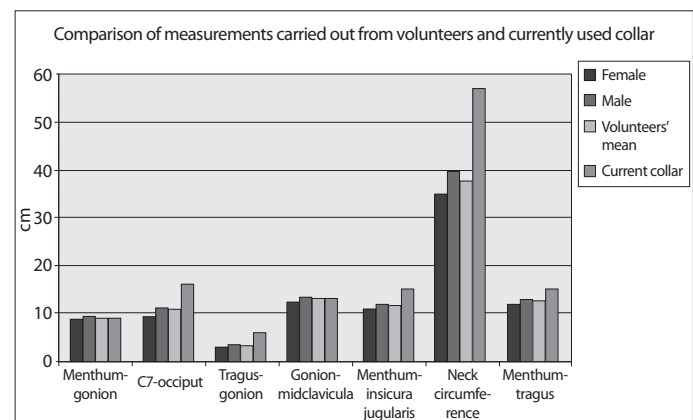

Figure 1. The comparison of measurements carried out from volunteers and currently used collar by gender

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current collar it was 6 cm. The anterior part of the chin of our study group was longer than the posterior part. Tragus-gonion distance was 3.1 cm mean (3.38 cm in men, 2.89 cm in women) and 6 cm in the current collar. When we consider that women use the same collar as men, this greater difference in women means that the risk for women is much greater than for men when a collar is applied.

Neck length measurement is one of the important factors for choosing the best collar and the patient's safety. So, we carried out the anterior and posterior length measurement of necks of our study group. C7- occiput distance was 10.8 cm (11.15 cm in men, 10.41 cm in women), 16 cm in the current collar. We can see a significant difference according to this result also. Menthum-insicura jugularis distance was 11.5 cm mean (11.97 cm in men, 10.83 cm in women) in our measurements, and this value was 15 cm in the current collar. Here again we can see a significant difference for men and women.

Gonion-midclavicula distance was 13.03 cm mean in our study group (13.46 cm in men, 12.43 cm in women), 13.00 cm in the current collar. This result shows that the current collar is more appropriate for males rather than females. Neck circumference was 37 cm mean (39.65 cm in men, 35.03cm in women), it was 57 cm in the current collar. Neck circumference is an important factor for stabilisation. Applying a wide collar allows the patient to move his/her neck easily and prevents stabilisation. This is an unsuitable situation for a trauma patient.

Mean BMI value of males was 26.64, and 25.63 of females. We determined a positive significant correlation between BMI and neck circumference. This situations suggests the need to consider the patient's weight when choosing the appropriate collar. Sertkaya et al and Liubov et al reported a similar correlation between BMI and neck circumference (8, 9).

The best collar choice studies show us the sensitivity of scientists on this issue. Until now many collar comparison studies have been performed. Johnson et al. compared 5 types of different collars by x-ray and they found the superiority of cervicothoracic orthosis (10). Fisher et al. compared the polyethylene collar, Philadelphia collar, four-poster ve SOMI type collars and they showed that four-poster and SOMI collars are more effective (11). However, there was only a small number of persons included in these studies. In addition, they did not explained their statistical method clearly.

Colachis et al. compared soft, chin pieced ve Queen-Anne collars and they determined that the chin pieced collar is the most effective (12).

Wolf et al. compared halo-cast and halo-vest types. Their study suggests that the halo vest provides the best stabilisation (13).

McGuire's study showed no superiority between Neclok and Stiff Nec type collars (14). Kauffman et al. studied on Neclok, Philadelphia and soft collar types and they found that the Neclok type the most effective (15). There is no report of a comparison of neck collars and antrophometric neck measurements in the literature. While there are many kinds of collars and the most appropriate collar is being discussed, variances among people should not be ruled out.

Today, studies are proceeding for detecting the prehospital neck collar usage criteria. In our country foreign collars are used and almostly especially in women, the best immobilisation is provided with pediatric collars. There is no study about this case and our study may be a guide for new researches.

Conclusion

In our study we determined a significant difference between measurements carried out in our study group and the currently used collar. These neck collars are frequently too big for our patients and they cannot provide accurate stabilisation for our patients. We suggest that, these vital immobilisation tools should be considered during the production stage according to the country's population standards and those with the most appropriate dimensions shoud be used for the patients.

Conflict of Interest
No conflict of interest is declared by the authors.

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