



Investigating the Rate and Affecting Factors of Unnecessary Cervical Collar Use in Trauma Patients

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ABSTRACT

Objective: This study aimed to investigate the necessity of cervical collars in patients with neck problems.

Methods: This cross-sectional study was conducted on 114 patients who were admitted to the Haft Tir and Rasoul Akram Hospitals (Tehran, Iran) from August to September 2022. The Nexus protocol was used to select the patients with cervical collars. According to the protocol, a cervical collar was required for individuals who had at least one symptom. If none of these symptoms existed, the cervical collar was deemed unnecessary. The data were analyzed using the Chi-square test and Fisher's exact test.

Results: Of the 114 trauma patients, the cervical collar was used unnecessarily by 49 (43%) patients. Tenderness was the most common complication in 62 patients (54.4%). The prevalence of unnecessary cervical collar use was 37.5% in female trauma patients and 43.88% in male trauma patients, which was not statistically significant ($p=0.63$). The prevalence of unnecessary cervical collar use in trauma patients with multiple trauma was 39.42% and 80% in patients without multiple trauma, which was statistically significant ($p=0.018$). Patients with a medical history had a higher rate of unnecessary use of the cervical collar (47.96%) than those without a history (12.5%), and this difference was statistically significant ($p=0.008$).

Conclusion: The guidelines for using cervical collars need to be updated by the EMS. Due to the large number of trauma patients in Iran, cervical collars for necessary conditions can help to reduce the healthcare expenses and injuries caused by unnecessary cervical collars.

Keywords: Cervical collar; Nexus; Emergency medical services.

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Introduction

The rising expenses of medical care necessitate process modification [1, 2]. Health managers must cut expenses by modifying clinical methods and guidelines to rationalize the amount and manner in which hospital resources and equipment are employed [3, 4]. The provision of unnecessary services to patients is one issue that contributes to the waste of hospital resources, the deterioration of hospital efficiency, and the unnecessary increase of hospital expenses [5, 6]. In Iran, unnecessary services (11-13% of admissions and provided services) make up a large portion of the services provided in the health sector [7]. Therefore, it is vital to pinpoint issues with implementation methods and guidelines. One option for achieving this objective is to identify unnecessary services and equipment prescribed by the physicians. In several cases, a cervical collar might be one of the unnecessary services [8]. Cervical collars are a common treatment option for neck injuries, neck surgeries, and various cases of neck pain. They are used to support the spinal cord and head. The type of cervical collar required is determined by the type of neck injury or underlying cause of neck pain [9]. This strategy was adopted by several emergency medical services (ems) and trauma courses, such as prehospital trauma life support (phtls) and advanced trauma life support (atls) worldwide [10, 11].

The concept of cervical spine immobilization was developed to keep the spine in neutral alignment following a suspected injury and to prevent further harm by immobilizing a potentially unstable injury. The American College of Surgeons recommends immediate neck immobilization for all trauma patients, as they are all considered to be at risk of suffering cervical spine injury [11]. However, due to the low prevalence and incidence of spinal cord injury in trauma patients, the use of cervical collars for spinal cord injury in trauma patients is controversial. Although several advantages were reported associated with spinal immobilization, the neck collar could not completely restrict neck movement [12, 13]. Furthermore, it is suggested that cervical collars should only be used in very few cases and under special circumstances, and may even be replaced in the future by better techniques due to breathing difficulties, an increase in the temperature under the collar, and other problems [8, 14, 15].

For more than 30 years, cervical collars have been prescribed for patients with neck problems. There are, however, few investigations on their effectiveness, and also there has been growing evidence against using the cervical collar [8]. According to this evidence, cervical collars are harmful to patients and should be avoided [8]. Besides, the cervical collar may be unnecessary in many cases, or may even cause harm to the users, and impose large expenditures [14]. Some research claimed that

cervical collars might increase the risk of aspiration, make airway management more difficult, and increase intracranial pressure by reducing venous return [8, 14, 15]. Accordingly, since some previous studies demonstrated the unnecessary use of a cervical collar and its detrimental aspect, it is necessary to determine the necessity or lack of a cervical collar in different circumstances and traumas. [8, 14, 16]. As a result, prescribing and using the cervical collar in Iran may be unnecessary or even hazardous in many circumstances, and impose expenses on the health system and society. To the best of our knowledge, no material or supporting data in this field has been published in Iran. Therefore, this study aimed to investigate whether cervical collars are actually necessary for patients with neck problems or not.

Materials and Methods

This cross-sectional study was conducted on patients who were transferred by the EMS prospectively using the Nexus protocol. The NEXUS criteria include the following five major criteria: the absence of cervical spine tenderness, no focal neurological deficit, normal level of consciousness, and the absence of intoxication and distracting painful injury [17, 18]. This protocol states that closing the cervical collar is required if the patient has one of the stated conditions, but it is not necessary if he/she does not have any of these conditions. The sample size was selected from the patients who were admitted to the emergency ward in Haft Tir and Rasoul Akram Hospitals (Tehran, Iran), which were among the major centers for trauma patients, from August to September 2022. From a total of 600 patients, 114 patients who had their cervical collars fastened by EMS during the morning, evening, and night shifts were selected by simple randomization method. An emergency medicine specialist evaluated the necessity of using the collar in these patients. According to the protocol, a cervical collar was required for individuals who had at least one symptom of focal nerve disorder, tenderness in the neck's midline, change in the level of consciousness, intoxication, and distracting injury. If none of these symptoms existed, the cervical collar was deemed unnecessary. Using the NEXUS protocol, the patients were evaluated by the emergency medicine specialist as they were entered into the emergency department by the EMS. Then, the researchers recorded the required information in a specific form. Besides, ethical issues in all parts of the study were considered. The data were analyzed using SPSS software, IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp; 2016. The Chi-square test and Fisher's exact test were used to analyze the data. A p value of <0.05 was considered statistically significant.

Results

114 trauma patients were examined in the emergency

department of the stated hospitals. As indicated in Table 1, 16 patients (14%) were women, and 98 patients (86%) were men. The mean age of the participants was 33.91 ± 15.18 years, which ranged from 10 to 76 years. 16 patients (14%) had a prior medical history, and 4 patients (3.5%) had a history of diabetes. Accidents were the most frequent cause of trauma in these patients (56.1%), while DT was the least frequent (3.5%). The demographic characteristics of the patients are presented in Table 1.

The frequency of the patients based on the type of complication is shown in Table 2. According to the findings of the study, 62 patients (54.4%) had tenderness. Furthermore, the frequency of consciousness, deficit, distracting injury, and intoxication was 23 (20.2%), 17 (14.9%), 4 (3.5%), and 0 (0%), respectively. Besides, 49 patients (43%) used unnecessary cervical collars.

According to Table 3, the prevalence of unnecessary

use of the cervical collar in female trauma patients was 37.5%, and in men was 43.88%; however, this difference was not statistically significant ($p=0.63$). The prevalence of unnecessary collar use in trauma patients with multiple traumas was 39.42%, while it was 80% in patients without multiple traumas. According to the Fisher Exact test, this difference was statistically significant ($p=0.018$). As indicated in Table 3, there was a significant difference ($P=0.008$) between the prevalence of unnecessary cervical collar use in patients with a medical history (47.96%) and individuals without a medical history (12.5%).

Discussion

The purpose of this study was to determine whether the use of cervical collars was necessary for patients with neck problems. Since unnecessary healthcare

Table 1. Demographic characteristics of the patients

| Demographic characteristics | | Patients N (%) N=114 |
|-----------------------------|-------------------|-------------------------|
| Sex | Female | 16 (14.0) |
| | Male | 98 (86.0) |
| Multiple Trauma | No | 10 (8.8) |
| | Yes | 104 (91.2) |
| Past Medical History | No | 98 (86.0) |
| | Diabetes | 4 (3.5) |
| | Mental | 3 (2.6) |
| | Surgery | 3 (2.6) |
| | Rheumatism | 3 (2.6) |
| | Leukemia | 2 (1.8) |
| Mechanism of trauma | Hypothyroidism | 1 (0.9) |
| | Accident | 64 (56.1) |
| | MTCA ^a | 20 (17.5) |
| | CTCA ^b | 16 (14.0) |
| | ADI ^c | 5 (4.4) |
| | Crash | 5 (4.4) |
| | DT ^d | 4 (3.5) |

^aMTCA: Motor to car accident; ^bCTCA: car to car accident; ^cADI: accident direct injury; ^dDT: Direct trauma

Table 2. The frequency distribution of patients based on the type of complication

| Complication | Frequency | Percent |
|--------------------|-----------|---------|
| Tenderness | 62 | 54.4 |
| Consciousness | 23 | 20.2 |
| Deficit | 17 | 14.9 |
| Distracting injury | 4 | 3.5 |
| Intoxication | 0 | 0 |

Table 3. The distribution of the need to use collars based on the patient's demographic and clinical characteristics

| Clinical demographic characteristics | | Collar necessity | | p value |
|--------------------------------------|--------|------------------|-----------|---------|
| | | No | Yes | |
| Sex | Female | 6(37.5) | 10(62.5) | 0.63 |
| | Male | 43(43.88) | 55(56.12) | |
| Multiple Trauma | No | 8(80) | 2(20) | 0.018 |
| | Yes | 41(39.42) | 63(60.58) | |
| Past Medical History | No | 47(47.96) | 51(52.04) | 0.008 |
| | Yes | 2(12.5) | 14(87.5) | |

services are not always evident, it is essential to conduct studies to identify unnecessary services [19]. Many trauma patients do not require the cervical collar, yet the damage and its associated expenses are critical considerations. However, it is used to decrease cervical spine movement during transportation and initial examination of trauma patients [14, 20]. According to the findings of the present study, almost 43% of trauma patients didn't require cervical collars. Some studies reported wearing a cervical collar might not always be necessary, since the pain and discomfort experienced by trauma patients might exacerbate as a result of venous pressure and airway problems [21, 22]. As a result, in 43% of cases, we imposed unnecessary costs on patients and the healthcare system, as well as increased the risk of health complications in patients who did not require a cervical collar. The effect of cervical collar use on the clinical outcomes of patients who underwent a single-level anterior cervical fusion with a plate was investigated in two groups of patients, with and without cervical collars. Their findings were compared in terms of demographic characteristics and outcomes, and no significant difference was found in any of the clinical measures. Hence, the use of cervical collars had no effect on the outcomes of the study group. This finding implied that a cervical collar was not required for the groups under investigation [23].

Tenderness was the most prevalent complication among the patients in this study, followed by other issues such as loss of consciousness, functional impairment, and distraction. None of the patients, however, showed any signs of toxicity. The cervical collar greatly decreased the range of motion in the neck (about 53 degrees), which affected the jugular venous pressure. Different types of collars also contributed to some discomfort [24]. Another critical problem with the collar was difficulty with breathing through the respiratory passages [25]. Unnecessary collars can worsen the patients' conditions by restricting the motion of the neck, disrupting the air and respiratory channels, and increasing venous pressure, in addition to causing discomfort.

The use of cervical collars without indication was more prevalent among men, although the difference was not statistically significant. Patients without multiple traumas and patients with a medical history used cervical collars at much higher rates than patients with multiple traumas and patients without a history, respectively. The earlier studies on the cervical collar did not extensively investigate these aspects. Although assuming that the rate of unnecessary use of this service is comparable to that of other hospital services, there is similar evidence in the field of inappropriate use of services and related factors [26, 27]. The use of a cervical collar is justified in patients with multiple traumas who may require further restriction of their neck movement. However, for the majority of patients who did not

have multiple traumas or who had mild injuries, a cervical collar was unnecessary and overused.

The use of cervical collars in trauma patients is frequently based on inadequate criteria and involves various challenges. These include the lack of reliable predictors for the severity and extent of neck and spinal cord injuries, the optimal duration of collar application, and the proper practices of medical staff in applying cervical collars. These challenges might lead to overuse and misuse of cervical collars, which could harm the recovery of trauma patients [28-30]. To avoid unwarranted injury and resource waste, it is recommended to update the guidelines for cervical collar use and provide adequate training. Similar to other economic sectors, the health system struggles with constrained resources and growing and complicated healthcare needs. Therefore, it is essential to prioritize the allocation of resources to services that are beneficial and vital for patient health [7, 16, 19]. Cervical collars have been the subject of several studies that have questioned their efficacy and safety and concluded that they are frequently unnecessary or even harmful [8, 16]. Hence, the use of cervical collars in many trauma patients either has little impact or causes adverse effects, resulting in resource waste and patient harm. While some studies suggested reviewing the guidelines and enhancing the effectiveness of cervical collars, others recommended discontinuing their use and investigating alternative methods and solutions [8, 14, 15].

According to the findings of the present study, although the cervical collar was unnecessary for almost half of the trauma patients, it was prescribed. Apart from wasting hospital resources, the cervical collar can cause complications for patients rather than accelerating their recovery. Since the cervical collar causes problems and injuries in more than 40% of trauma patients, if alternative methods cannot be substituted, the guidelines for utilizing cervical collars should be reviewed and updated. These findings can be used to determine if the cervical collar is necessary or not in different situations, as well as to enhance processes and guidelines.

Declarations

Ethics approval and consent to participate: This study received approval from the Ethics Committee of Iran University of Medical Sciences (Tehran, Iran) with the ethics code of IR.IUMS.REC.1400.567. Written informed consent was obtained from all patients.

Consent for publication: All authors read and approved the final manuscript to be published and agreed to be accountable for all aspects of the work in terms of the accuracy and integrity of any of its parts.

Conflict of Interest: None declared.

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Authors' Contribution: Study concept, study design, and supervision: M.H., A.T.; acquisition

of data: M.A., M.V.; analysis and interpretation of data: H.H.; drafting of the manuscript, technical and material support: K.K.

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