

Maxillofacial and Cervical Spine Injuries - A Cross Sectional Study on Prevalence and Association of the Both in Maxillofacial Trauma Patients

Research Article

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Abstract

Aim: To assess the prevalence, and association of maxillofacial and cervical spine injuries in patients sustaining maxillofacial trauma.

Background: The severity of maxillofacial injuries in a trauma might divert the surgeons' attention from other concomitant injuries that could be potentially life threatening if neglected [1]. This study aims to highlight the importance of cervical spine injuries that are often overlooked during maxillofacial examination

Methods: A cross sectional retrospective analysis of trauma patients reported to the emergency department of a tertiary care centre in Tamil Nadu during March 2015-March 2020 was done. A detailed review of the maxillofacial trauma cases was done. Details related to the demography, trauma, injury sustained, primary and secondary survey, records pertaining to the diagnosis of cervical spine injuries were studied, recorded and subjected to statistical analysis.

Result: 888 out of 6350 patients sustained maxillofacial injuries. Majority of them belonged to the age range of 20-39 years and the population was predominantly male. 61% of them presented with soft tissue injuries. Among the hard tissue injuries, mandibular fractures were highest followed by isolated zygomatico-maxillary complex fractures. Cervical spine injuries existed concurrently in 5.63% of the total number of patients. Prevalence was found higher in combined mandibular and middle third of face fractures (1.35%) followed by pan facial fractures (1.12%).

Conclusion: Though reported incidence is low, underestimation of these injuries could lead to significant morbid states as management of the facial fractures essentially involves manipulation of neck that might increase the chances of worsening the situation further.

Keywords: Maxillofacial Trauma; Cervical Spine; Fractures; C-Spine Injury.

Introduction

Maxillofacial trauma generally occurs with concomitant injuries to other systems of the body and adequate expertise and sound knowledge is expected of every maxillofacial surgeon in the front-line of trauma care to avoid unnecessary catastrophe. Stephens et al reported that every 13th polytrauma patient sustained cervical spine injury with or without neurological symptoms and German trauma society highlighted the prevalence of 25% of the maxillofacial injuries in a poly-trauma patient. Rogers et al., [3] reported that 10% of patients developed neurologic symptoms or their exacerbation post-emergency care due to failure of recognition or inadequate immobilization. The Advanced Trauma Life Support

emphasises suspecting cervical spine injury during the management of patients with injury above the clavicle [4]. All the maxillofacial trauma cases are thus bound to such an assumption during the primary and secondary survey. This study aims to assess the prevalence of cervical spine injury and its association with maxillofacial trauma.

Materials and Methods

A retrospective cross-sectional unicenter analysis was done on patients who reported post trauma to the emergency department of our institution during the period of March 15 to March 2020. Out of a total of 6350 patients, patients who had sustained maxillofacial trauma were included in the study and their medical records

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were studied in detail. Clinical records from the emergency department, maxillofacial surgical treatment data, interdepartmental management if present, radiological data including computed tomography were reviewed. Data including age, gender, type of injury, frequency of various types of maxillofacial fractures, prevalence of cervical spine injuries and their frequency and association with these fractures were analysed. In cases of unavailability of any of the data pertaining to the information required for analysis, they were excluded from the study population. All the data was recorded and subjected to statistical analysis.

Statistical Analysis

The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables. Chi square test was applied and Pearson's correlation was used to find significance between the variables. In all the above statistical tools the probability value 0.05 is considered as significant level.

Results

There were 888 patients with maxillofacial injuries out of 6350 reported trauma cases. Of these 888 patients, 683(75.8%) were

males and 215 (24.2%) were females. About 529 (59.6%) of the study population belonged to the age group of 20-39 years, while (194) 21.5% were between 40-60 years, (134) 15.1% were less than 20 years and 31 (3.5%) above 60 years. 545(61.4%) of them sustained soft tissue maxillofacial injuries and 343 (38.6%) of them hard tissue injuries. Out of these 343 hard tissue injuries, 148 (16.7%) sustained mandibular fractures, 77 (8.7%) zygomatico-maxillary complex fractures, 67 (7.5%) combined fracture of mandibular and middle third of face, 37 (4.2%) maxillary and finally 17 (1.9%) with pan facial fractures. Cervical spine injuries associated with maxillofacial injuries was observed in 50 (5.6%) of the study population. No significant association was found between the prevalence of cervical spine injuries and the gender. A significant positive correlation ($p < 0.000$) was found between the age and prevalence of the injuries. Figure 1 depicts the frequency of cervical spine injuries observed in soft and hard tissue maxillofacial injuries. The frequency of existence of c-spine injuries in various maxillofacial fractures is given in Table 1 and Figure 2. Patient with combined fractures of mandibular and middle third of the face ($n=12$, 1.3%) has the highest prevalence of c-spine fractures, followed by pan facial fractures ($n=10$, 1.1%), isolated mandibular, zygomatico-maxillary complex and maxillary fractures. The prevalence of cervical spine injuries among the facial fractures bore a statistical significance with $p < 0.000$.

Figure 1. Prevalence of C-spine injuries in maxillofacial trauma.

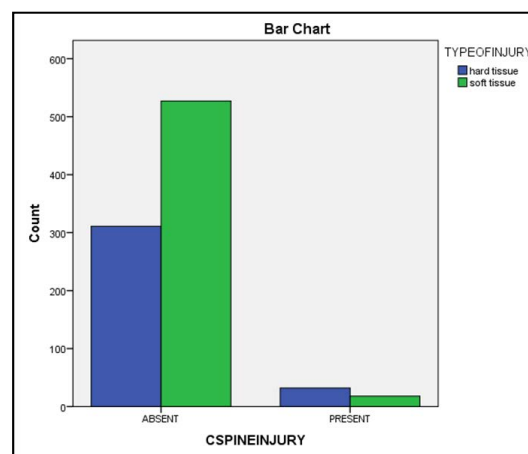


Figure 2. Prevalence of C-spine injuries in different maxillofacial fractures.

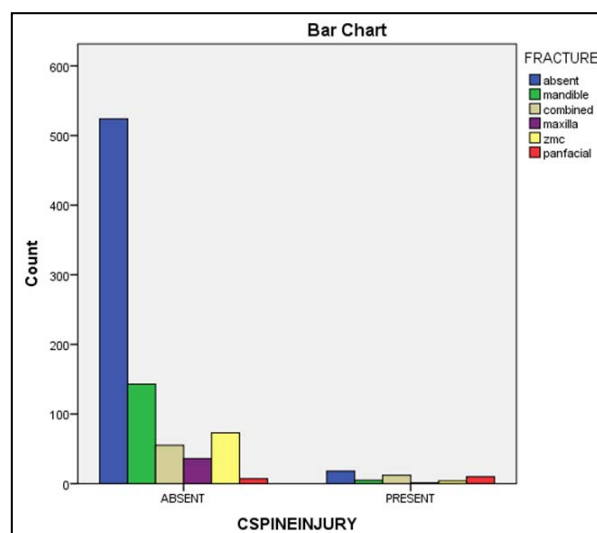


Table 1. Prevalence of C-Spine injuries in different Maxillofacial Fractures.

C-spine injury	Fracture						Total
	absent	mandible	combined	maxilla	zmc	panfacial	
Absent	524	143	55	36	73	7	838
Present	18	5	12	1	4	10	50
Total	542	148	67	37	77	17	888

Discussion

The association of maxillofacial fractures and the cervical spine injuries has been reported to range between 1 to 6%. Also such injuries especially if minor and asymptomatic are missed during the initial assessment by both the trauma surgeon and the maxillofacial surgeon due to the narrowed focus on larger life threatening injuries. But it is important to rule out the occurrence of cervical spine injuries so as to proceed with the maxillofacial treatment plan and to avoid any delayed, debilitating exacerbation resulting from the injury. This is especially crucial when the maxillofacial fracture is indicated for open reduction and internal fixation, where active mobilization of cervical spine is done during the anaesthetic procedures. Such active motions can worsen the missed cervical spine injury that can lead to devastating neurologic consequences.

In our study, out of 889 patients with maxillofacial injuries, 50 of them had concomitant cervical spine injuries. This forms about 5.6% of the total sample. Previous studies by Follmer et al reported a prevalence rate of 13%, Alvi et al reported 7.3%, Rocci et al 0.8% [1]. Also they reported a positive correlation of cervical spine injury with motor vehicle accident and attributed to the greater impact force to the face that is eventually transmitted to the neck or a direct force to the neck. This can be explained by the unfavourable hyper-flexion or hyperextension of the neck in such sudden trauma that can potentially cause a cervical spine injury [13]. This is supported by Robertson et al, as they reported the higher prevalence of these injuries in motor vehicle accidents than the others and thoracic or lumbar spine was involved more next to cervical spine. Patients at risk for cervical spine injuries included those sustaining blunt craniofacial trauma or multisystem trauma, fall from heights or high impact injury to clavicle. Patients may or may not be symptomatic. Though the association is much lesser in proportion, any case of maxillofacial trauma should be suspected to have concomitant cervical spine injury unless proven otherwise. In case the patient presents with symptoms, it is wise to rule out the presence of injury before proceeding to the secondary survey of maxillofacial injury.

Hackl et al., reported that the risk to sustain additional cervical spine injuries in facial trauma increases every year by 1.7%5. Also a threefold increase in the risk of sustaining these injuries was inferred in road traffic accidents than other aetiologies of trauma. Again if there occurs a concomitant traumatic brain injury due to the trauma, the risk still rises by two fold. Hence it is expected of a maxillofacial surgeon to be aware of such emergency conditions and the importance of the timely catch because unlike facial trauma that presents with obvious symptoms, cervical spine injuries don't display any pathognomonic signs. A higher chance of missing it is evident especially if injuries to other systems dominate. A significant correlation was observed with the prevalence of cervi-

cal spine injuries and the type of maxillofacial fractures. 3.6% of the total 5.6% prevalence of c-spine injuries was associated with hard tissue injuries of the maxillofacial region. Patients sustaining fractures to the facial skeleton were found to have significant concomitant cervical spine injuries ($p < 0.000$), when compared to the soft tissue injuries though there was prevalence of c-spine injuries in the latter also. This could be attributed to the transfer of the higher magnitude of forces causing the fractures of facial skeleton, type of the fractures, and mechanism of trauma which is more complex in hard tissue injuries than the soft tissue injuries. When the spectrum of prevalence was studied in the hard tissue injuries, it was found that about 9.3% of the population sustaining maxillofacial fractures had added c-spine injuries which were statistically significant ($p < 0.000$). A positive correlation was found between the increasing complexity of facial fractures and the associated c-spine injuries in our study. 2% of association was found with pan facial fractures, 3.4% with combined multiple mandibular and mid-third of face fractures, 1.4% with isolated mandibular fractures, 1.1% with ZMC fractures and 0.2% with isolated maxillary fractures. Similar spectrum of association and prevalence was reported by Reich et al., in their study. But there exists controversy regarding the correlation of c-spine injuries to that of the type of fracture. While Merrit et al, Hackl et al, Bayles [6] et al., reported a positive correlation with mandibular fractures, Babcock et al reported it to be middle third of face fractures [7]. Interestingly Bonanthaya [8] et al., reported a model of association, where they reported that mandibular fractures were associated with upper cervical spine injuries while middle third of face fractures were associated with lower cervical spine fractures. In our study there was no significant association observed with the type of fracture and c-spine injuries.

In patients with suspected cervical spine injury, mobilization of the neck should not be attempted during the maxillofacial examination [10]. Meticulous examination should be done to identify the presence of local pain, ecchymosis overlying the fracture, contour deformity, oedema, and spasm of the neck muscles. Patients who are asymptomatic, alert and present no sensorimotor deficits on examination of the c-spine should be cleared with routine x-ray depicting all the seven cervical vertebrae. In patients with any of the symptoms and suspected to have sustained injury to the spine, a Computed Tomography of the region is preferred. But when associated with maxillofacial injuries, this poses a challenge during the procedure. Immobilization with cervical collar should be done prior to imaging. Magnetic Resonance Imaging (MRI) is preferred if disco ligamentous lesions or sensorimotor deficits are suspected [2].

Thus the maxillofacial surgeons should be aware of the risks of underestimating blunt cervical injuries during their initial assessment of patients sustaining maxillofacial trauma. Knowledge of these associated injuries provides useful strategies for patient care

and prevention of further complications. This also calls for multidisciplinary interdepartmental approach in managing a patient sustaining maxillofacial trauma than considering it an isolated entity.

Conclusion

Proper guidelines should be followed during the primary and secondary survey of maxillofacial region post trauma, to rule out the prevalence of associated cervical spine injuries. Though reported incidence is low, underestimation of these injuries could lead to significant morbid states as management of the facial fractures essentially involves manipulation of neck that might increase the chances of worsening the situation further. Proper immobilization of the neck especially in unconscious patients should be done until the spine is cleared of injuries. A collaborated approach by team of emergency physicians, maxillofacial surgeons, neurosurgeons, anaesthesiologists and orthopaedic surgeons should be followed in managing a polytrauma patient.

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