Original Article

SOFT TISSUE INVOLVEMENT IN MAXILLOFACIAL TRAUMA AND ITS FINANCIAL IMPACT ON HEALTH RESOURCES

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ABSTRACT

Objective: *The purpose of this study is to find out the frequency and pattern of soft tissue injuries in maxillofacial trauma and to document its financial impact on health resources.*

Methodology: *A total of 765 patients with maxillofacial soft tissue injuries were recruited in this study from December 1st, 2011 to June 30th, 2014, in the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry Peshawar. An approval of the institution ethical research committee and informed consent from each study subject was obtained prior to collection of data. Necessary information were recorded using specially designed Performa. Using the basic concept of Gustilo and Anderson classification of soft tissue injuries, a modified classification system was designed so that injuries were classified into 4 types and further subtypes. Total time spent by a surgeon in repairing soft tissue wounds as well as cost involved was collected. All the variables were analyzed using SPSS version 17.*

Results: *Out of 765 patients, 73.07% were male and 26.93% were female. Majority were in age group 21-30 years (25.10%) followed by 31-40 years (21.05%). Most of them were Labor class (26.01%) with poor socioeconomic status (55.82%). Road traffic related injuries (63.92%) were reported to be the most common injuries. Out of total, 410(53.59%) patients sustained soft tissue injuries. Among these, majority were Type 3c (26.09%) followed by Type 3b (21.95%). In majority of cases (54.88%) wounds were closed primarily and by advancements and rotations (27.32%). The most frequent time duration for repair was up to two hours (n=128, 31.22%) with an expenses range of Rs. 4000-6000 (40-60 US $) in the majority of cases (26.83%).*

Conclusions: *Male in their 3rd decade with poor socioeconomic status was predominant in this study. Road traffic related accident was reported to be the most common cause of soft tissue injuries. Type 3c injuries were common and were closed either primarily or by advancements and rotations in majority of patients. The most frequent time duration for repair was up to two hours with an expenses range of Rs. 4000-6000 (40-60 US $).*

Key words: *Soft tissue injuries, Maxillofacial trauma, Cost effectiveness, Health resources*

INTRODUCTION

Soft tissue injuries are among the most common traumatic facial injuries encountered by maxillofacial and plastic surgeons, accounting for nearly 10% of all accident and emergency department visits[1,2]. No other part of the body is as conspicuous, unique, or aesthetically significant as the face. Because an individual's self-image and self-esteem are often derived from his or her own facial appearance, any injury affecting these features requires particular attention[3].

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Despite this high incidence, there are no widely accepted classification schemes or treatment algorithms exist to guide evaluation and treatment. The decision regarding treatment is left to the discretion of the surgeon leading to disparate approaches to both short-term and long-term management[4].

The variable outcomes among different patterns of injuries with differing severities prompted the development of grading systems for soft tissue injuries which help guide treatment, improve communication and research, and predict outcome. One such classifications system which have been in use for some time is the Gustilo-Anderson classification that has become the most commonly used system for classifying open fractures and hence soft tissue injuries[5].

Early management of soft tissue injuries has been associated with improved postoperative results even in the presence of significant concomitant injuries[6]. Primary closure is difficult when the treatment of soft tissue is delayed, resulting in soft tissue swelling and obscured landmarks. Increased risk of infection is associated with increased soft tissue wound exposure and that's why closure should occur within the first 8 hours after injury preferably in the emergency room where meticulous cleansing is performed[7]. In cases where there is a lot of tissue damage whereby primary closure can only be performed under significant tension or with complex tissue rearrangement, primary closure should be defer until later. Secondary reconstructive procedures can then be employed to cover the soft tissue defects[8].

Maxillofacial soft tissue injuries represents an important and growing burden on health care facilities, earnings capacity of patients, and time contributed by health care workers. Cleansing, debridement and the closure of the soft tissue especially in the esthetic units of maxillofacial region are tiring and time consuming procedure. There is a worldwide rising trend in the incidence of hospital visits for maxillofacial soft tissue and hard tissue injuries over the past decade[9,10].

The purpose of this study is to find out the frequency and pattern of soft tissue injuries in maxillofacial trauma and to document its financial impact on health resources

METHODS AND MATERIALS

The study was designed to document all consecutive patients with maxillofacial soft tissue injuries that were treated from December 1st, 2011 to June 30th, 2014, in the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry Peshawar. A total of 765 patients were recruited in this study. Patients who needed major plastic surgical and occuloplastic intervention were not included in the study.

An approval of the institution ethical research committee and informed consent from each study subject was obtained prior to collection of data. Demographic variables such as age, gender, occupation and socioeconomic status of these patients were recorded. Socioeconomic categorization into poor, satisfactory and good was done on the basis of monthly income (MI). patients with MI of Rs. 10,000 -15,000 were consider in poor category. Patients with MI of Rs. 15,000-25,000 and Rs. 25,000 and above were grouped into satisfactory and good categories respectively. Clinical data of patients who sustained soft-tissue injuries to the maxillofacial region with or without bony involvement were recorded on a specially designed Performa. The cause, type, and site of the injuries were documented. Using the basic concept of Gustilo and Anderson11 classification of soft tissue injuries, a modified classification system was designed for maxillofacial soft tissue injuries to meet the requirement of the present study.

Type 1a= Soft tissue injury less than 2 cm in length without bony fracture

Type 1b= Soft tissue injury greater than 2 cm in length without bony fracture

Type 1c= Multiple soft tissue injuries without bony fracture

Type 2a= Soft tissue injury less than 2 cm in length with undisplaced fracture

Type 2b=Soft tissue injury greater than 2 cm in length with undisplaced fracture

Type 2c= Multiple soft tissue injuries with undisplaced fracture

Type 3a= Soft tissue injury less than 2 cm in length with displaced fracture

Type 3b= Soft tissue injury greater than 2 cm in length with displaced fracture

Type 3c= Multiple soft tissue injuries with displaced fracture

Type 4 = Extensive soft tissue loss with or without neurovascular damage and bony loss

All the subjects included in the study were operated by the same group of surgeons. Post operatively information regarding total time spent by a surgeon in repairing soft tissue wounds as well as cost involved was collected. Time and cost spent on management of bony fractures and closure of incisions made for this purpose were not included. All the variables were analyzed using SPSS version 17.

RESULTS

Upon scrutiny of the data, out of 765 patients, 559(73.07%) were male while 206 (26.93%) were female with a male to female ratio of 2.71:1.

The age distribution of these patients showed dominant groups in the age range of 21-30 years (25.10%) followed by 31-40 years (21.05%). Detail is given in table-1.

Occupations of these patients were such that 26.01% were labor class followed by students (20.39%). Distribution is given in table-2.

Majority of these patients belonged to poor socioeconomic category (427, 55.82%) followed by satisfactory (202, 26.40%) and good (136, 17.78%) groups.

Road traffic related injuries (63.92%) were reported to be the most common injuries followed by fall (13.20%). Details are given in Table 3.

Out of total study subjects, 410(53.59%) patients sustained soft tissue injuries. Among these, majority were Type 3c (26.09%) followed by Type 3b (21.95%). The smallest number of patients sustained Type 1c injury (1.46%). Details of these finding are given in Table-4.

Out of total injuries 54.88% wounds were closed primarily while 27.32% were closed by advancements and rotations. Skin graft was used in only 2 cases (0.49%). Detail of the remaining procedures are given in Table 5.

The most frequent time duration for repair was up to two hours (n=128, 31.22%) followed in frequency by one hour (n=110, 26.83%). Detail is given in Figure-1.

Table-1: Age Distribution

Age group	Frequency	Percentage
1-10	69	09.02
11-20	130	16.99
21-30	192	25.10
31-40	161	21.05
41-50	122	15.95
51-60	53	06.93
60 & above	38	04.96
Total	**765**	**100**

Table-2: Occupation

Occupation	Frequency	Percentage
Labors	199	26.01
Students	156	20.39
House wives	113	14.77
Drivers	107	13.99
Govt. Servants	102	13.33
Security services	40	05.23
Business	37	04.84
Others	11	01.44
Total	**765**	**100**

Table-3: Cause of the injury

Cause of injury	Frequency	Percentage
Road traffic accident	489	63.92
Fall	101	13.20
Fire arm	52	6.80
Bomb blast	38	4.97
Assault	35	4.58
Sports	21	2.75
Work related	20	2.61
Animal Bite	5	0.65
Others	4	0.52
Total	**765**	**100**

Table-4: Classification of soft tissue injuries

Type	Frequency	Percentage
Type 3c	107	26.09
Type 3b	90	21.95
Type 4	69	16.83
Type 3a	45	10.98
Type 2a	38	9.27
Type 1a	20	4.88
Type 2c	15	3.66
Type 2b	11	2.68
Type 1b	9	2.20
Type 1c	6	1.46
Total	**410**	**100**

Table-5: Types of closure

Type of closure	Frequency	Percentage
Primary closure	225	54.88
Advancement / rotation	112	27.32
W,Y,Z Plasties	41	10.0
Buccal Fat pad	15	3.66
Nasolabial flap	5	1.22
Temporalis Flap	5	1.22
Submental flap	3	0.72
Skin graft	2	0.49
Others	2	0.49
Total	**410**	**100**

Table-6: Estimated expenses (Surgical + Anesthesia)

Amount (Rs) Approx	Frequency	Percentage
1000 (up to)	67	16.34
2000-4000	36	8.78
4000-6000	110	26.83
6000-8000	48	11.71
8000-10000	80	19.51
10000 & above	69	16.83
Total	**410**	**100**

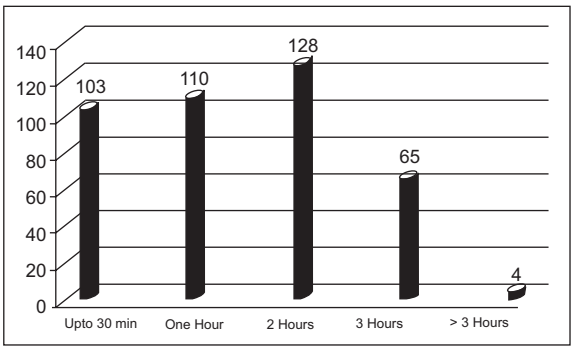

Figure-1: Time spent on repair

Estimation of the surgical and anesthesia expenses were approximately calculated. It was found that in majority of patients (26.83%), total expenses were in the range of Rs. 4000-6000 (40-60 US $) followed by Rs. 8000-10000 (80-100 US $) in 19.51% patients. Detail is given in Table-6.

DISCUSSION

As far as involvement in maxillofacial trauma and conditions is concerned, there is a worldwide[12,13] predominance of male population in their third and fourth decade as compared to their female counterpart in other age groups. The result of the present study also reflects this worldwide trend of gender and age distribution.

The present study shows that labors and students are the most vulnerable group of community involved in maxillofacial trauma, mainly as a result of road traffic accidents (63.92%). The second most common reason for injury is terrorism and terrorism related accidents (firearm injuries, bomb blast injuries and interpersonal assault) when taken as a group (16.35%). In a third world country like Pakistan especially Khyber Pakhtunkhwa province, failure to implement traffic regulations on part of the government and the reaction to war against terrorism are the major causative factors in maxillofacial injuries[14]. Labor or worker class and students are the prime victims because this group of community mostly uses public transport for their transportation purposes. Moreover their outdoor activities make them vulnerable to be involved in disasters like bomb blasts and assaults[15].

A development in sports activities is considered a positive sign in terms of social and economical values both in developed and developing countries. As a result sports related injuries are also common in these regions[16]. In the present study the frequency of sports related injuries are as low as 2.75% reflecting the effect of terrorism and international legislation against this country and a decrease interest in sports activities[17].

Majority of study population (82.22%) belonged to Poor and satisfactory socioeconomical status when taken together. Patients who cannot afford private health care facilities usually visit public sectors and there is a growing evidence that actually these socio-economic groups represent public sector facilities[14].

Injuries affecting facial structures require particular attention because such injuries range from a simple linear laceration to a massive tissue destruction leading to a significant disfigurement. The incidence of soft tissue involvement in maxillofacial trauma is variable worldwide[2,3,5]. In this study the frequency of soft tissue injuries is 53.59%. This high frequency may be due to the fact that maxillofacial surgery department is the only specialized unit in this province where patients from different areas with mild to severe maxillofacial trauma are being referred and managed.

Multiple soft tissue injuries usually greater than 2 centimeter in length with or without displaced bony fractures (Type 3c and 3b) was most commonly observed (26.09% and 21.95% respectively). The next most common type was those injuries with extensive soft tissue loss with or without neurovascular damage and bony loss or Type 4 injuries (16.83 %). Gatta et al18. contradict these findings and showed that soft tissue and vital structures like eye along with head injuries were classified as severe injuries and were noted in 29% cases. The reason for this difference is that the study was conducted in Iraq which in a true senses a war torn country, where human rights are badly violated first by dictatorship and onwards by foreign invasion. Although the results of some studies carried out in India[19] and Nigeria[20] are in agreement with our study, the reason being similar demographic

and social environment.

Different surgical methods were used for closure and repair of soft tissue injuries namely primary closure, advancement and rotation, Z-plasty and local flaps. The successful use of these flap were mentioned in their studies by many investigators. Wu[21] used some simple techniques with superior cosmetic results while Hove[22] and Roger[23] used Z-plasty and W-plasty respectively in facial trauma patients.

In the present study an average of 1.52 hours per patient were taken in soft tissue cleaning, debridement and repair. The average surgical and anesthesia expenses were approx. Rs.6000 (60 US$) in the management of soft tissues only. This does not include time spent to manage bony fracture or a clean surgical incision. It also does not include loss of earning capacity of patient or other indirect expenses e.g. traveling and stay. In United states time rather than direct cost is used to calculate surgical ad anesthesia expenses. According to Shippert [24] an average of 66 US $ is charged per minute including surgery and anesthesia charges.

Per capita income is often used as average income, a measure of the wealth of the population of a nation, particularly in comparison to other nations. Per capita income is often used to measure a country's standard of living[25]. It is usually expressed in terms of a commonly used international currency e.g.US$. According to World Bank 2013 data, Per capita income of United States is 53143 US$ as compared to Pakistan where this figure drops to as low as 4699 US$25. The per capita income of Khyber Pakhtunkhwa province is even less than half of the national per capita income[26]. This statistical data reflect a tremendous amount of financial burden of soft tissue injuries on both the surgeon in terms of operation time and on poor patients of comparatively low income population of Khyber Pakhtunkhwa Pakistan. Other expenses like transportation charges, hospital stay, definitive management of hard tissues with expensive armamentarium and inability to return to work after trauma, all contribute to the existing financial burden.

CONCLUSIONS

It is concluded from the present study that:

1. Male in their 3rd decade mostly labor class with poor socioeconomic status were predominantly affected.
2. Road traffic related accident was reported to be the most common cause of soft tissue injuries.
3. Multiple soft tissue injuries with displaced fracture (type 3c) occurred most frequently which were closed either primarily or by advancements and rotations in majority of patients.
4. The most frequent time duration for repair was up to two hours with an expenses range of Rs. 4000-6000 (40-60 US $).

RECOMMENDATIONS

In the light of the present study health policy makers should design better community friendly financial budgets of emergency care centers so that poor patients are entertained free of cost for their injuries. This modified soft tissue injury classification system can be used both for management and academic purposes as well as a guideline to design better classification systems to fit the need of maxillofacial surgeons.

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