Management of head and neck trauma in a developing country

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Abstract

Purpose To investigate cases of trauma in head and neck region; to elucidate the characteristic problems in a developing country.

Design and setting Prospective study; 324 patients with trauma related to head and neck analysed in a tertiary care center from August 1999 to August 2005

Results 33.6% of patients fell in 21–30 year age group. Road traffic accidents (41.4%) were the most common cause of trauma. Nasal bone fractures were the most common fractures. 72.84% presented with bleeding and 72.22% with pain. 92.9% had tenderness. Only 15% of the patients could afford a CT scan. Plain radiograph diagnosed fractures in 83.33% of cases. ORIF was the treatment of choice in cases of fractures of the zygoma, maxilla and mandible. Open reduction and internal fixation (ORIF) gave good long-term results with satisfactory cosmesis. Most of our patients did not have any significant sequelae. Cerebral concussion was the most common associated injury (35.48%).

Conclusion In developing countries, one cannot follow the approaches used for RTAs in developed countries. Treating surgeons will have to select investigation tools and treatment options according to the socioeconomical and cultural variations, which differ from country to country, and also within different parts of the country.

Keywords Trauma · Road traffic accidents (RTA) · Assault · Fractures · Open reduction and internal fixation (ORIF) · Closed reduction · Cosmesis

Introduction

Worldwide, trauma is the fourth ranking cause of death at all ages and the most frequent killer in the age group of 1–37 years. Developing countries account for over 85% of the deaths, and close to 90% of the disability caused by road traffic crashes globally [1]. Head and neck trauma is considered one of the most challenging areas in traumatology. Fractures of the nose, mandible and the middle third of the facial skeleton are most commonly the result of road traffic accidents, attempted suicide or physical combat [2]. In children, falls, accidents while playing and sports injuries are the major causes of facial fractures [3]. Often trauma to the head and neck region are given secondary importance as it is usually associated with trauma to vertebrae, long bones and brain. For all cases of trauma we follow a policy of early and accurate assessment in the trauma centre thereby formulating a comprehensive treatment plan, which is implemented for optimal functional and cosmetic results.

Ours is a study of 324 cases of head and neck trauma from August 1999 to August 2005, making it one of the largest studies on head and neck trauma in the recent years. In this paper we discuss the management dilemmas that a surgeon encounters while managing head and neck trauma in a developing country. The etiology, sites, clinical presentation, investigations, treatment modalities and sequelae of head and neck trauma are studied in detail and reviewed with the current literature.

Materials and methods

324 cases of trauma related to head and neck were reported to the Department of Otorhinolaryngology – Head

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and Neck Surgery, Kasturba Medical College, Mangalore, South India. Ours was a prospective study of all the cases from August 1999 to August 2005. Cases that were included for the study included cases of trauma to the faciomaxillary structures, ear and temporal bones, laryngeal framework and soft tissues in the head and neck. Cases of purely intracranial and spinal trauma were excluded from the study. The Institutional Review Board has approved this study.

A detailed history and clinical examination was done on presentation. Once the condition of the patient was stable appropriate investigations and treatment were given. Apart from complete blood profile the following investigations were done.

1. Plain X rays:
 - a) Skull (AP and lateral views)
 - b) Paranasal sinus (Water's view)
 - c) Nasal bones (Lateral view)
2. Orthopantomogram: for mandibular fractures
3. CT scan: faciomaxillary bones and temporal bone
4. Endoscopy: Diagnostic nasal endoscopy and direct laryngoscopy
5. Pure tone audiogram and immittance audiometry: for temporal bone fractures.

Depending upon the site and severity of trauma various treatment options were adopted.

Faciomaxillary trauma

Epistaxis was controlled by standard treatment protocols. Following the control of epistaxis thorough debridement of the wound was done for all lacerated wounds of the skin and mucosa under local or general anesthesia. Skin was closed in layers.

For fractures of the nose, maxilla, zygoma and mandible, two methods of reduction were adopted.

Closed reduction technique: The procedure was done under general anesthesia (GA) using Walsham's and Ashe's forceps for Class I fracture of the nasal bone. In all the cases, the nasal cavity was packed and a plaster of paris cast or splint was applied.

Open reduction technique: Fractures of maxilla, zygoma and mandible were reduced by this technique under GA. This technique was also employed for Class II (for septal correction) and III nasal bone fractures.

I. Maxilla: Approached by sublabial incision. The maxilla was disimpacted, reduced and stabilized using the mandible as the guide. The fractured fragments were stabilized by fixation with miniplates and Roger Anderson pins. Later intermaxillary fixation was done by interdental wiring. (Fig. 1)

II. Zygoma: The approach was by Gillie's approach. A Rowe's elevator was passed behind the body of the zygomatic bone. Controlled traction was applied to elevate the bone in place. The fractured fragments were stabilized by interosseous wiring or miniplate and pins.

III. Mandible: A submandibular or intraoral approach was employed for exposure. The fragments were disimpacted and stabilized using 0.35 mm steel wires or miniplate and pins. This was followed by interdental wiring for stabilizing the mandible to the maxilla (Fig. 2).

IV. Rhinoplasty: Open structure rhinoplasty was done for those patients who presented two months after the injury and had a deformity. For saddle nose deformity, dorsal augmentation was done by the conchal cartilage of the patient.

Ear and temporal bone trauma

After meticulous debridement and cleaning primary suturing was done in layers under LA/GA.

Pinnaplasty: Re-implantation was attempted within six hours of injury for a few cases. The amputated piece was reimplanted by suturing the soft tissue and cartilage. Decompression of the facial nerve was done for immediate onset facial nerve paralysis following temporal bone trauma.

Trauma of laryngeal framework and soft tissues of the neck

Airway was first secured by endotracheal intubation that was followed by a tracheostomy, when necessary. Primary closure was done under GA. Mucosa was sutured with 3-0 vicryl by using inverted, interrupted and interlocking sutures. The muscle layer was closed with 3-0 vicryl and skin was closed using 2-0 silk. For severe penetrating injuries of the larynx where the primary closure was impossible due to damage of epiglottis, hyoid bone and part of the

Fig. 1 Miniplate fixation of the fracture of anterior wall of the maxilla

thyroid cartilage, supraglottic laryngectomy was done under GA. In cases of subglottic trauma leading to stenosis, stenting with Montgomery 'T' tube was done. Primary suturing was done for superficial lacerations of the neck. All patients were put on antibiotic cover.

Fig. 2 Intermedullary nailing and miniplate fixation of mandibular fracture

Results and observations

324 patients presented in our hospital during the five-year period (August 1999 to August 2005) with head and neck trauma.

Age and sex incidence: A majority, 33.6% (109) of the patients fell in 21–30 year age group. The age range was 10 and 80 years. The overall male:female ratio was 4.5:1. The most common age groups for individual sites are detailed in Table 1.

Causes: Road traffic accidents (RTA) lead as the most common cause of head-neck trauma in all sub sites (41.4%) except in the nose, ear and temporal bone trauma where assault (34.31% %, 36.36%% respectively) was the most common cause (table 2).

Sites of trauma: Trauma to the nose alone that included soft tissue injuries, comprised 31.48% ($n = 324$). The most common fracture seen in trauma to head and neck were nasal bone fractures. Incidences of trauma to other sites in the head neck are shown in table 1.

Symptoms: Bleeding and pain were the most common symptom found in all cases of head and neck trauma with a frequency of 72.84% and 72.22% correspondingly except in the nose and ear (Table 3). Bleeding was the most common complaint in trauma involving the nose, ear and temporal bone.

Signs: Tenderness was the most commonly elicited sign in all cases of head and neck trauma, comprising 92.9% (table 4). In trauma to the ear and temporal bone the most common sign was deformity 84.1%.

Investigations: 270 patients were evaluated with radiographs. The most commonly done investigation was the plain radiograph (83.33%). Only 49 patients could afford a CT scan. The accuracy of a CT scan in detecting a fracture in the faciomaxillary region was 71.42% compared to plain radiograph and on table confirmation during surgery. In the nose and facial region the accuracy of plain radiograph was found to be 62.16% whereas CT scan offered the best accuracy of 80.65%. In the ear and temporal bone, the CT

Table 1 Age & sex incidence of head and neck trauma

Age	Nose		Zygoma + maxilla		Mandible		Ear and Temporal Bone		Laryngeal framework		Scalp		Multiple		Total	%
	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
0–10	3	2	-	-	1	-	1	-	2	1	-	-	1	-	11	3.4
11–20	10	1	2	1	3	1	3	-	-	-	3	1	9	-	34	10.5
21–30	34	6	12	1	6	2	10	3	1	-	8	1	23	2	109	33.6
31–40	10	9	4	1	6	3	12	1	-	1	3	1	21	2	74	22.8
41–50	14	2	6	3	3	3	7	-	1	-	7	-	10	1	57	17.6
51–60	5	1	2	-	1	-	3	1	1	-	1	-	3	2	20	6.2
>61	3	2	2	1	-	-	1	2	-	-	1	-	6	1	19	5.9
Total	79	23	28	7	20	9	37	7	5	2	23	3	73	8	324	100
%	31.48%		10.89%		8.95%		13.58%		2.16%		8.02%		25%		100%	

Table 2 Causes of head and neck trauma

Cause	Nose	Zygoma – maxilla	Mandible	Ear- Temporal Bone	Laryngeal Framework	Scalp	Multiple	Total	%
Assault	35	8	2	16	3	8	18	90	27.8
RTA	29	18	14	13	-	10	50	134	41.4
Falls	24	5	12	7	-	8	9	65	20.1
Human bite	2	-	-	4	-	-	-	6	1.8
Animal bite	1	1	-	2	-	-	1	5	1.6
Sports	11	1	1	-	2	-	-	15	4.6
Railway	-	-	-	-	-	-	1	1	0.3
Suicide	-	-	-	-	1	-	-	1	0.3
Blast	-	-	-	1	-	-	-	1	0.3
Others	-	2	-	1	1	-	2	6	1.8
Total	102	35	29	44	7	26	81	324	100

Table 3 Symptoms of head and neck trauma

Symptoms	Nose	Zygoma – maxilla	Mandible	Ear- temporal bone	Laryngeal framework	Scalp	Multiple	Total	%
Pain	56	31	23	28	4	19	73	234	72.22
Swelling	58	31	22	5	4	6	44	170	52.47
Deformity	32	19	17	15	3	-	31	117	36.11
Wound	25	23	11	18	3	14	62	156	48.15
Bleeding	77	16	17	33	6	16	71	236	72.84
Breathing difficulty	2	-	-	-	3	-	25	30	9.26
Noisy breathing	-	-	-	-	3	-	-	3	0.93
Facial weakness	1	-	-	6	-	-	1	8	2.47
Hearing loss	-	-	-	12	-	-	9	21	6.48
Fluid leak	-	-	-	2	-	-	2	4	1.23
Giddiness	-	-	-	-	-	-	36	36	11.11
Unconsciousness	2	-	1	2	-	1	29	35	10.8
Vomiting	-	-	-	-	-	-	4	4	1.23
Loss of organ	1	-	-	-	-	-	-	1	0.31
Impaired mouth opening	-	27	22	-	-	-	1	50	15.43
Impaired vision	-	-	-	-	-	-	1	1	0.31

scan offered an accuracy of 57.14% in comparison to the plain radiograph (9.09%). In the neck and larynx, the CT scan showed 50% accuracy compared to plain x-rays (13.33%).

Treatment: 35.09% and 28.96% were treated by primary suturing and open reduction, respectively. 38.51% cases of nasal fractures were managed by open reduction. Fractures of the zygoma and maxilla were managed most commonly by open reduction (28.57%). The most common modality of treatment in cases of mandibular trauma was open reduction (60.61%) (table 5). Primary suturing was the most common

mode of treatment adopted in cases of trauma to pinna, laryngeal framework and soft tissues of neck and scalp.

Associated injuries: 28.72% cases had associated injuries to other parts of the body. Cerebral concussion was the most common associated injury (35.48%). This was followed by the injuries of the upper limb (19.35%). Spinal injuries were seen associated in 3.23% cases.

Hospital stay: 56.17% (182/324) were managed successfully and discharged within 7 days of admission to the hospital. Only 7 of our cases required admission for more than 20 days (2.16%).

Table 4 Signs of head and neck trauma

Signs	Nose	Zygoma – maxilla	Mandible	Ear- temporal bone	Laryngeal framework	Scalp	Multiple	Total	%
Tenderness	100	32	24	29	4	22	90	301	92.9
Crepitus	40	2	13	-	3	-	15	73	22.53
Epistaxis	40	19	-	-	-	1	46	106	32.72
Deformity	45	26	24	37	2	-	37	171	52.78
Hematoma	2	3	3	-	1	-	1	10	3.09
Ecchymosis	23	34	-	-	-	-	39	96	29.63
Malocclusion	-	19	19	-	-	-	23	61	18.83
Trismus	-	18	18	-	-	-	23	59	18.21
Discontinuity	-	21	17	-	-	-	22	60	18.52
Hemotympanum	-	-	-	14	-	-	-	14	4.32
CSF leak	-	-	-	2	-	-	1	3	0.93
TM perforation	-	-	-	10	-	-	1	11	3.4
Stridor	-	-	-	-	4	-	-	3	0.93

Table 5 Treatment of head and neck trauma

Rx	Nose	Zygoma – maxilla	Mandible	Ear	Temporal bone	Laryngeal framework	Scalp	Total	%
Conservative	34	34	6	5	10	1	6	96	26.75
Primary suturing	37	38	7	12		7	25	126	35.09
Repair				8				8	2.24
Open reduction	52	30	20		2			104	28.96
Closed reduction	10	1						11	3.06
Rhinoplasty	2							2	0.56
Tracheostomy		2				3		5	1.39
Supraglottic laryngectomy						4		2	0.56
Others				2	3			5	1.39
Total	135	105	33	27	15	13	31	359	100

Sequelae: We could achieve good cosmesis in 303 cases (93.52%). The function of the affected part was restored in almost 98% of cases. Two patients (0.62%) with head-neck trauma admitted in our wards died (table 6).

Discussion

Though the health care sector in India is making giant strides in technology and infrastructure, there are very many problems that in our country that leads to unnecessary deaths in cases of trauma. The public health and emergency infrastructure is still woefully poor. Unlike in developed countries, where ambulances rush within minutes to accident spots and medical or paramedic personnel evacuate the injured, in developing countries it is the passer-bys who rush the injured to the hospital. Such people obviously lack

the knowledge and the skills in pre-hospital care and can unintentionally exacerbate the victim's injuries during the process of evacuation. There are also considerable delays in getting the patient to a facility with the appropriate level of health care. Studies have shown a strong correlation between time taken to receive treatment and likelihood of adverse immediate health outcomes as well as long-term disability. This is well documented in the developed world and has also been demonstrated in developing countries [4].

324 cases presented to us over a period of five years, making this one of the largest studies on head neck trauma in the recent past. Erol B et al. [5] did a study of 2901 cases over a period of 25 years, but he included only cases of maxillofacial trauma. Other interesting studies include those done by Al Ahmed et al. [6] and Adebayo ET et al. [7] who have studied 230 and 443 cases respectively. None of

Table 6 Sequelae of head and neck trauma

Sequelae	Nose	Zygoma – maxilla	Mandible	Ear- temporal bone	Laryngeal framework	Scalp	Multiple	Total	%
Total	102	35	29	44	7	26	81	324	100
Good cosmesis	95	35	29	39	7	26	72	303	93.52
Persisting deformity	6			5			9	20	6.17
Visual impairment	1							1	0.31
Function restored	102	35	29	35	7	26	81	315	97.22
Impaired hearing				7				7	2.16
Death				2				2	0.62

the studies include an analysis of cases of trauma to ear and temporal bone and scalp.

Age and Sex incidence: The age range in our study was 4–80 years. The most common age group affected by head and neck trauma was the 21–40 groups. This corresponds with the studies of Zargar M et al. [8] (53%) and Motamedi et al. [9] (59%) who also had the maximum number of cases in the 21–30 age group. This can be explained by the fact that the patients in the 21–40 age groups are the most socially and economically productive people [7]. Of the 324 cases, 265 were males (81.79%) giving a male: female ratio of 4.5:1. This corresponds well with the studies by Erol B et al. [5] Adebayo E.T et al. [7] and Zargar M et al. [8] who had a similar male: female ratio of 3.4:1, 3:1 and 4.5:1, respectively. But it is lower than the Motamedi et al. [9] series where the ratio was 11:1. This demonstrates geographic variations and the prevalent social customs in respective countries.

Causes: Road traffic accidents lead as the most common cause of head and neck trauma in our series. This was followed by assault and falls. This was consistent with most studies [5–9]. In the study of temporal bone fractures, Chen J et al. [10] found the most common cause as RTA (66.67%). Ron Cannon et al. [11] in his series had a similar observation. None of the authors studied soft tissue injuries in the ear but 6.67% of our cases had isolated pinna injuries, which are usually caused by minimal trauma as a result of assault. Hence we found assault was the most frequent denominator in ear (36.36%) trauma.

Sites: In the study by Zargar M et al. [8] he had an equal incidence of mandibular and nasal bone trauma. Motamedi et al. [9] studied cases of maxillofacial fractures and had 72.9% (173/237) cases of mandibular fractures. The incidence of nasal bone fractures was 2.1%. Most series had mandible as the most common site of facial trauma [6, 7]. We found the most common site of involvement as the nasal bones followed by the ear and temporal bone, mandible, zygoma and maxilla. The incidence of larynx and soft tissues of the neck trauma was found to be the least. In Canon's series [11], lacerations and avulsion injuries was the most common type of trauma to the pinna, which is con-

sistent with our series. We had 16 cases (4.94%) of isolated temporal bone fractures. Stucker et al. [12] did a study on bite injuries to the auricle. He had 32 cases of bites alone. Francis S et al. [13], studied 23 cases of laryngeal trauma and the incidence of isolated laryngeal trauma was found to be 52.17% cases. In our series, 2.16% had isolated larynx injuries.

Clinical features: In the study by Robert et al. [14], swelling, breathing difficulty, bleeding and deformity were the most common presenting symptoms. In our series, bleeding and pain were the most common symptoms. These were followed by swelling and wound. This may be due to non-inclusion of nose and ear trauma cases. Pain was the most frequent complaint in all cases of head and neck trauma except in the nose and ear. Bleeding was the most common complaint in traumas involving the nose, ear and temporal bone followed by pain. Sylvester et al. [15] found deformity (100%) as the most common complaint in contrast with ours. In trauma to the auricle the most common symptoms were pain and bleeding [12]. Hearing loss and bleeding were the most frequent presenting complaint in cases of fractures of the temporal bone [11]. Bleeding was the most common symptom in neck and laryngeal trauma as in Gussack et al. [16] study. Tenderness was the most commonly elicited sign in all cases of head and neck trauma. This was followed by deformity. In the nose, deformity was the most common sign [15]. In the maxillofacial region, Robert et al. [14] had ecchymosis and deformity as the most common signs. We found the most common signs as tenderness, deformity, discontinuity and ecchymosis. Deformity, tenderness and hemotympanum were the most commonly elicited signs in the ear and temporal bone region [11, 12].

Management: The management protocols must adapt to the socio-economic, cultural and political variations of the particular region. Road traffic injuries in developing countries mostly affect pedestrians, passengers, and cyclists as opposed to drivers, in whom most of the deaths and disabilities in the developed world occur [4]. Medical insurance cover to one and all is still a far of dream in developing countries. Most of the patients suffering trauma belong to a lower socioeconomic class. Most of them would not be able

Fig. 3 Facial nerve palsy due to temporal bone fracture following a bear attack and post-op recovery following decompression

to afford a CT scan. Many a times the patient is brought to the hospital by passer-by who will not be willing to pay for the preliminary investigations, especially a CT scan. Hence the X-ray becomes a crucial tool in the hands of the treating surgeon. Plain radiograph was the most frequently used diagnostic tool in all cases of head neck trauma in our series. Only 15% of our patients could afford a CT scan. Only 52.96% of the radiographs picked up a fracture. Majority of these cases were nasal bone fractures. Sylvester et al. [15] in his study of fracture nasal bones, advised 44 plain radiographs of which 77.27% showed a fracture. We had 80 cases of nasal bone fracture and the accuracy was 75.25%. This shows that in case of nasal bone fractures a plain radiograph of the nasal bones is fairly accurate and can be considered as the first line of investigation. Holmgren et al. [17] studied 9871 trauma cases where a CT scan was advised in 49.9% cases. The accuracy of CT scan was found to be 61.4%. We advised CT scan for 49 cases of head neck trauma and its accuracy was 71.42%. Holmgren et al. [17] advised a combination of head and facial CT in selected cases of trauma with soft tissue injury. Axial CT views of the cranium and face greatly enhance the ability to locate fractures [14]. In the ear the CT scan greatly increased the accuracy (57.14%) in comparison to the plain radiograph (9.09%). Griffin et al. [18] in his study took only plain radiographs and the accuracy was 29.41%. CT scan in the temporal bone fractures not only helps in localizing but also gives us an idea of the condition of middle and inner ear structures. In the neck and larynx, the CT scan showed 50% accuracy compared to plain xrays (13.33%), in our series. Gussack et al. [16] advised CT scan for three of cases and they all showed fractures. He recommended that a combination of plain radiograph neck lateral view, CT scan and direct laryngoscopy

are very effective in diagnosing the extent of injury.

Treating trauma also is constrained by different aspects in developing countries. Primarily, the problem has always been post-op care and follow up. Since many patients cannot afford long stays in the hospital, any solutions that require constant monitoring and long term post-op care needs to be compromised. In many centers around the world, closed reduction with immobilization for 3 weeks to 3 months is the treatment of choice for facial fractures. But we prefer ORIF to closed reduction in cases of maxilla and mandible fractures as this provides a quick and stable solution. The implants provide instant stability to the fracture segment and there is no need for intermaxillary wiring which prevents the patient from taking anything orally for 3 weeks to 3 months. The patient can safely be discharged with the advice that he should not chew hard. Oral intake is possible after the 5th post-op day. The danger of aspiration in case of an intermaxillary wiring is also alleviated.

The most preferred method for treatment of trauma in the maxillofacial region was by open reduction (36.23%). 29.63% cases were managed conservatively. In Erol B et al. [5] series 77.9% and 22.1% cases were managed conservatively and internal fixation techniques respectively. In the zygoma-maxilla region, 32.38% of our cases were managed conservatively and 28.57% cases were managed by open reduction and internal fixation (ORIF) using miniplates. Mandibular fractures in our series were managed most commonly by ORIF (60.61%). 18.18% cases were managed conservatively. Many other authors preferred a closed reduction technique followed by open reduction techniques [5–7] in that order. The standard treatment for a broken nose has been closed reduction since antiquity [19]. There have been conflicting opinions in the past as to the most effective

ways to manage nasal bone fractures [20]. Closed reduction was reported to have a high failure rate of 30–41% [21]. Sylvester et al. [15] reported that 62% patients with closed reduction had esthetic or obstructive concerns. 38.52% of our cases were managed by open reduction under GA and we have been able to achieve satisfactory cosmesis by this technique (table 6). Two of our patients had to undergo rhinoplasty to correct gross deformity of the nose. Tuncay Ulug et al. [21] studied 11 cases of temporal bone fractures, all required exploration for decompression of facial nerve. Darrouzet V et al. [22] managed 43.5% and 56.5% cases medically and surgically, correspondingly. Surgery is recommended in cases of total facial palsy, immediate onset palsy and when associated with a bad prognosis in electromyogram pattern [22]. Most cases of trauma to the auricle were managed by primary suturing in our series. Trauma to temporal bone in the absence of any complications, were all managed conservatively. Six patients presented with facial nerve palsy and five of them required transmastoid approach for facial nerve decompression (Fig. 3). Most cases of laryngeal and scalp trauma were managed successfully by primary suturing alone. In the larynx, one patient was managed conservatively. 23.08% of patients required tracheostomy for controlling the airway. Four patients with extensive destruction of the laryngeal framework required supraglottic laryngectomy. These findings correlate well with the study by Francis S et al. [13] who managed 63% of his patients by primary suturing, 21% by endotracheal intubation and 16% were observed. He recommends that the decision to repair injuries should be based on respiratory distress and the associated injuries.

Associated injuries: 28.72% cases had associated injuries to other parts of the body. Cerebral concussion was the most common associated injury (35.48%). This was followed by injuries to the upper limb (19.35%). Spinal injuries were seen associated in 3.23% cases. This corresponds well with the findings of Cook et al. [23] and Adebayo et al. [7]

Hospital stay: Jewett et al. [24] in his series found the average length of stay was 10 days and the longest duration of stay was 114 days. Majority of our patients had a mean duration of hospital stay of less than a week. Only 2.16% of our patients required more than 20 days of hospital stay. The longest hospital stay was 42 days and the average stay was six days. Those who stayed longer than 10 days had major surgical intervention at multiple sites. Most patients who had a short stay in the hospital had only soft tissue injuries or undisplaced fractures.

Sequelae: Dickson et al. [25] on treating nasal fractures obtained good results in 43% cases while the deformity persisted in 10% of cases. In concurrence with the above study we were able to obtain good cosmesis in 93% cases. Six of our patients had persisting deviation of the external nasal framework. We preferred open reduction techniques to closed reduction methods, which allows direct visualization, thereby aids in better alignment of fractured

fragments. In the ear and temporal bone trauma, our findings are consistent with that of Stucker et al. [13] and Griffin et al. [18] In the larynx and neck, Gussack et al. [15] revealed good airway in 10 cases and a good voice in nine of the 12 cases. We had a total of seven cases, all had good airway. Four patients had a rough voice

Conclusion

Our study is one of the biggest series in recent years. It is one of the only series that includes all the subsites in the head and neck viz. faciomaxillary, pinna, temporal bone, laryngeal framework and soft tissues of neck and scalp. The causes, mode of presentation, signs, investigations, management and sequelae were studied in detail and compared with other authors. A wide range of etiological causes has been discussed. We have found an excellent pick up rate of CT scan in head and neck trauma compared to other series. Most cases of nasal fractures were managed by open reduction. Open reduction internal fixation was preferred for fractures of maxilla, zygoma and mandible. Our results are satisfactory and most of our patients did not have any significant sequelae.

The approaches used in high-income countries need careful, critical evaluation before their application in the poor countries. In poor countries, the traffic mix is different, and so are the vulnerable population groups of road users. Moreover, the social, political, policy and economic context is different from that of high-income countries, and within the grouping of low-and middle-income countries, there are also individual country variations. Furthermore, even within a single country, there can be major differences between regions and between urban and rural settings that critically influence the design of interventions. These issues need to be addressed through a global agenda on road traffic injuries [4].

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