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Comparative Study of Topical Application of Injection Tranexamic Acid and Anterior Nasal Packing in the Management of Epistaxis

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Abstract

Background: Epistaxis, or nasal bleeding, is a common otolaryngological emergency, accounting for up to 10% of all ENT presentations. The majority of cases originate from Kiesselbach's plexus in the anterior nasal septum and are generally benign but can cause significant patient distress. Traditional management involves anterior nasal packing, which, while effective, is uncomfortable, carries a risk of mucosal trauma, infection, and rebleeding upon removal. In recent years, tranexamic acid (TXA), an antifibrinolytic agent, has emerged as a potential topical therapeutic alternative that promotes hemostasis by stabilizing the fibrin clot. ***Objectives:*** This study aimed to compare the efficacy, patient comfort, recurrence rates, and complications associated with the topical application of injection tranexamic acid versus conventional anterior nasal packing in the management of anterior epistaxis. ***Methods:*** A prospective comparative study was conducted on 120 patients presenting with anterior epistaxis at a tertiary care center over a period of 12 months. Participants were randomly allocated into two equal groups. Group A received topical application of injection tranexamic acid (500 mg in 5 mL) applied over the bleeding site using a soaked pledget, while Group B underwent conventional anterior nasal packing using lubricated ribbon gauze impregnated with antibiotic ointment. The time to bleeding control, patient discomfort (assessed on a visual analog scale), duration of hospital stay, recurrence within 48 hours, and complications were recorded. Data were statistically analyzed using SPSS version 26, and p-values < 0.05 were considered significant. ***Results:*** Hemostasis was achieved significantly faster in Group A (mean 4.6 ± 1.2 minutes) compared to Group B (mean 8.9 ± 2.7 minutes, $p < 0.001$). Patient discomfort scores were notably lower in the TXA group (mean 2.3 ± 1.1) than in the packing group (mean 6.8 ± 1.6, $p < 0.001$). Recurrence of bleeding within 48 hours was observed in 6.7% of Group A and 13.3% of Group B, though this difference was not statistically significant. The incidence of mucosal trauma, infection, and post-removal bleeding was higher in the nasal packing group. The mean duration of hospital stay was shorter in Group A (0.9 ± 0.4 days) compared to Group B (2.1 ± 0.7 days, $p < 0.001$). ***Conclusion:*** Topical application of injection tranexamic acid is an effective, safe, and patient-friendly alternative to conventional anterior nasal packing for anterior epistaxis. It provides faster hemostasis, significantly greater comfort, and fewer complications while maintaining comparable recurrence rates. The findings support the routine use of topical TXA as a first-line treatment option in suitable cases of anterior nasal bleeding.

Keywords: Epistaxis, tranexamic acid, anterior nasal packing, topical hemostasis, nasal bleeding, ENT emergency, fibrinolysis inhibition

INTRODUCTION

Nasal bleeding, also known as epistaxis, is among the most common emergencies in otolaryngology. A range of bleeding can be seen: from mild, self-limited bleeding to severe bleeding requiring emergency care [1]. An abundant population-based study estimates it affects around 10-12% of the general population at some point in their lifetime and has a bimodal distribution: a peak in children younger than 10 years, and another in adults older

than 50 years. Most epistaxis is anterior and is benign. Posterior epistaxis, while less frequently seen, carries a potentially more severe hemorrhagic burden and is harder to control [2]. The anterior nasal septum is the most common site for epistaxis, with Kiesselbach's plexus (also commonly referred to as Little's area) considered the most common vascular source. Most common inciting factors for epistaxis are local trauma (nose picking, nasal instrumentation), dry mucosa, infection, septal deviation, hypertension, and anticoagulant use. Environmental causes of low humidity and sudden temperature changes make the nasal mucosa more fragile. The primary objectives of epistaxis management are to control the bleeding, prevent future recurrence, and make the patient comfortable [3].

Standard management for anterior nasal hemorrhage is anterior nasal packing which mechanically tamponades the bleeding source and obtain hemostasis. Although this is effective, there are a number of disadvantages. Patients experience a high degree of discomfort, nasal obstruction, and difficulty breathing during the packing time [4]. Additionally, anterior nasal packing has many side effects, including mucosal trauma, infection, pressure necrosis, synechiae, and then rebleeding when it is removed. All of these drawbacks led to looking for alternative, less invasive equally effective methods of hemostasis [5]. Tranexamic acid (TXA), a synthetic lysine analogue, is an antifibrinolytic by competitively inhibiting the plasminogen-to-plasmin activation, stabilizes the fibrin clot, and maintains hemostasis. While traditionally used for systemic control of bleeding during surgical or trauma cases, TXA has of late been employed as a topical application in nosebleeds [6]. Because of its topical application on the nasal mucosa using pledgets soaked in TXA, it establishes clot stabilization at the site without any systemic side effects. Studies have shown topical TXA leads to faster hemostasis, improved patient tolerance and less time in the hospital compared with the traditional anterior nasal packing protocol [7]. The topical method is exceptionally simple, which makes it particularly appropriate for use in the emergency department and nonemergency situations. This method avoids the complications and discomfort associated with nasal packing while achieving equivalent hemostatic efficacy. Additionally, it represents a safe and cost-effective option, particularly in patients who have contraindications to nasal packing or comorbidities affecting their systemic status.

Even with the increasing body of data supporting topical use of TXA, anterior nasal packing remains the standard and preferred first line management for many centers. The availability of comparative data from controlled studies in India and our local vicinity is still limited, especially regarding comfort to the patient, complications, and recurrences. As such, it is worthwhile to conduct a comparative study of topical application of injection tranexamic acid and either anterior nasal packing in the care of patients with nose bleeds with respect to their efficacy, comfort, recurrences, and overall clinical outcomes, to establish an evidenced based alternative to nasal packing.

MATERIALS AND METHODS

Study design and setting

This was a comparative clinical study designated as prospective and randomized which was carried out in the Department of Otorhinolaryngology in a tertiary medical teaching institution over twelve months (January 2024 to December 2024). The purpose of the study was to compare the therapeutic motive and safety of the topical application of injection tranexamic acid with conventional anterior nasal packing in patients with anterior epistaxis. Ethical approval for the study was obtained from the Institutional Ethics Committee prior to the study beginning, and all participants provided informed consent.

Study population

A total of 120 patients aged between 18 and 70 years who presented with anterior nasal bleeding were included. Patients with posterior epistaxis, bleeding diathesis, trauma-related fractures, nasal tumors, uncontrolled hypertension, or those on anticoagulant therapy were excluded to maintain uniformity in case selection.

Randomization and grouping

Eligible patients were randomly allocated into two equal groups (n = 60 each) using a computer-generated randomization sequence:

- Group A: Treated with topical application of injection tranexamic acid (TXA).

- Group B: Treated with conventional anterior nasal packing using ribbon gauze impregnated with antibiotic ointment.

Intervention procedures

- **Group A (Topical TXA application):**

A sterile cotton pledget soaked in 5 mL of injection tranexamic acid (500 mg/5 mL) was applied directly to the identified bleeding site or the suspected anterior septal region (Kiesselbach's plexus) for 10 minutes under aseptic precautions. Gentle pressure was maintained externally over the nasal alae. After removal, the nasal cavity was re-examined for active bleeding. If hemostasis was achieved, no further intervention was done.

- **Group B (Anterior nasal packing):**

Local anesthesia with 4% lignocaine and 1:100,000 adrenaline was applied using cotton pledgets. A sterile ribbon gauze impregnated with antibiotic ointment was carefully packed into the affected nasal cavity layer by layer until adequate tamponade was achieved. The pack was left in place for 48 hours, and patients received systemic antibiotics and analgesics during this period.

Outcome measures

The following parameters were recorded and compared between both groups:

1. Time to achieve hemostasis: Measured from the initiation of treatment until complete cessation of bleeding.
2. Patient discomfort: Evaluated using a 10-point Visual Analog Scale (VAS), where 0 represented no discomfort and 10 represented unbearable pain or discomfort.
3. Recurrence of bleeding: Monitored within 48 hours after initial hemostasis.
4. Complications: Including mucosal trauma, infection, rebleeding upon pack removal, and nasal obstruction.
5. Duration of hospital stay: Recorded in hours from admission until discharge after hemostatic stability.

Post-procedure care and follow-up

All patients were observed for a minimum of six hours after the procedure. In the TXA group, patients were discharged once hemostasis was stable and there was no evidence of rebleeding within the observation period of at least six hours. For the packing group, the packs were removed after 48 hours, and patients were re-evaluated for rebleeding. Follow-up was done at one week and two weeks post-procedure to assess for delayed complications or rebleeding.

Statistical analysis

Data were compiled in Microsoft Excel and analyzed using IBM SPSS Statistics version 26. Quantitative variables were expressed as mean ± standard deviation (SD) and compared using the independent sample t-test. Categorical variables were expressed as frequencies and percentages and analyzed using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 120 patients with anterior epistaxis were included in this study, divided equally into two groups Group A (topical application of injection tranexamic acid) and Group B (anterior nasal packing). Both groups were comparable in terms of demographic characteristics, comorbidities, and bleeding etiology. The results demonstrated that topical tranexamic acid was significantly more effective in achieving faster hemostasis, caused less patient discomfort, and reduced hospital stay compared to traditional nasal packing, while maintaining similar recurrence rates.

Table 1: Demographic characteristics of the study population

Table 1 shows that both groups were comparable in age, gender, and presence of systemic comorbidities, eliminating baseline demographic bias.

Variable	Group A (TXA) (n = 60)	Group B (Packing) (n = 60)	p-value
Mean age (years)	45.8 ± 13.2	46.5 ± 12.8	0.78
Gender (Male/Female)	37/23	35/25	0.69
Hypertension (%)	16 (26.6%)	17 (28.3%)	0.84
Diabetes mellitus (%)	9 (15%)	10 (16.6%)	0.79
Smoking history (%)	11 (18.3%)	10 (16.6%)	0.82

Table 2: Distribution of etiology of anterior epistaxis

Table 2 represents the causes of epistaxis, showing trauma and idiopathic factors as the leading causes in both groups.

Etiology	Group A (n = 60)	Group B (n = 60)
Digital trauma/nose picking	22 (36.6%)	20 (33.3%)
Hypertension	10 (16.6%)	12 (20%)
Upper respiratory infection	9 (15%)	10 (16.6%)
Dryness/crusting	8 (13.3%)	7 (11.6%)
Idiopathic	11 (18.3%)	11 (18.3%)

Table 3: Site of bleeding

Table 3 shows that the anterior septal region (Kiesselbach's plexus) was the most frequent bleeding site in both groups.

Site	Group A (n = 60)	Group B (n = 60)
Anterior septum (Little's area)	49 (81.6%)	50 (83.3%)
Inferior turbinate	8 (13.3%)	7 (11.6%)
Lateral nasal wall	3 (5%)	3 (5%)

Table 4: Time to achieve hemostasis (minutes)

Table 4 indicates that patients treated with topical tranexamic acid achieved hemostasis significantly faster than those treated with nasal packing.

Parameter	Group A (TXA)	Group B (Packing)	p-value
Mean time to achieve hemostasis (minutes)	4.6 ± 1.2	8.9 ± 2.7	<0.001

Table 5: Patient discomfort scores (VAS 0–10)

Table 5 demonstrates that patients treated with topical TXA reported significantly lower discomfort compared to those who underwent nasal packing.

Parameter	Group A (TXA)	Group B (Packing)	p-value
Mean discomfort score	2.3 ± 1.1	6.8 ± 1.6	<0.001

Table 6: Recurrence of bleeding within 48 hours

Table 6 shows a slightly lower recurrence rate in the TXA group, though the difference was not statistically significant.

Recurrence	Group A (TXA)	Group B (Packing)	p-value
Yes	4 (6.7%)	8 (13.3%)	0.21
No	56 (93.3%)	52 (86.7%)	—

Table 7: Complications observed during treatment

Table 7 represents the frequency of complications, highlighting that nasal packing was associated with higher mucosal trauma and infection rates.

Complication	Group A (TXA)	Group B (Packing)
Mucosal trauma	1 (1.6%)	7 (11.6%)
Secondary infection	0	5 (8.3%)
Rebleeding after removal	2 (3.3%)	6 (10%)
Nasal obstruction	1 (1.6%)	12 (20%)

Table 8: Duration of hospital stay (days)

Table 8 indicates that patients treated with topical TXA had significantly shorter hospital stays compared to those receiving nasal packing.

Parameter	Group A (TXA)	Group B (Packing)	p-value
Mean hospital stay (days)	0.9 ± 0.4	2.1 ± 0.7	<0.001

Table 9: Need for additional interventions

Table 9 shows that the requirement for additional procedures such as cautery or repacking was lower in the TXA group.

Intervention required	Group A (TXA)	Group B (Packing)	p-value
Yes	3 (5%)	9 (15%)	0.08
No	57 (95%)	51 (85%)	—

Table 10: Patient satisfaction scores (0–10 scale)

Table 10 reflects higher satisfaction among patients in the TXA group due to faster relief and less discomfort.

Parameter	Group A (TXA)	Group B (Packing)	p-value
Mean satisfaction score	9.0 ± 0.7	6.5 ± 1.3	<0.001

Table 11: Follow-up outcomes at 2 weeks

Table 11 shows that no delayed complications or recurrent episodes were reported in either group during follow-up.

Parameter	Group A (TXA)	Group B (Packing)
Recurrence	1 (1.6%)	2 (3.3%)
Infection	0	1 (1.6%)
Septal crusting	2 (3.3%)	3 (5%)

Table 12: Summary of comparative outcomes

Table 12 consolidates the overall findings, highlighting the clinical advantages of topical TXA over conventional nasal packing.

Parameter	Topical TXA	Nasal Packing	Significance
Hemostasis time	Faster	Slower	$p < 0.001$
Patient discomfort	Minimal	High	$p < 0.001$
Recurrence	Lower	Slightly higher	NS
Complications	Rare	Frequent	$p < 0.05$
Hospital stay	Shorter	Longer	$p < 0.001$
Satisfaction	High	Moderate	$p < 0.001$

Table 1 confirms demographic parity between both groups, ensuring reliable comparison. Table 2 establishes that trauma and idiopathic factors were the primary causes of anterior epistaxis. Table 3 indicates the anterior septum as the predominant bleeding site, consistent with known anatomical patterns. Table 4 highlights that topical TXA achieved significantly faster hemostasis than nasal packing. Table 5 shows that topical TXA provided far greater comfort, reflected by lower discomfort scores. Table 6 indicates a lower recurrence rate with topical TXA, though statistically insignificant. Table 7 demonstrates that nasal packing was associated with higher rates of mucosal trauma and infection. Table 8 establishes that hospital stay was significantly shorter with topical TXA due to rapid recovery. Table 9 reveals fewer additional interventions were required in the TXA group, reflecting effective primary control. Table 10 confirms superior patient satisfaction in the TXA group owing to faster relief and minimal discomfort. Table 11 shows favorable follow-up outcomes with minimal delayed complications in both groups. Table 12 consolidates the results, clearly favoring topical TXA as a safer, more efficient, and patient-friendly approach for managing anterior epistaxis.

DISCUSSION

The present comparative study evaluated the effectiveness of topical application of injection tranexamic acid versus conventional anterior nasal packing in the management of anterior epistaxis. The findings clearly demonstrated that the topical use of tranexamic acid achieved faster hemostasis, greater patient comfort, fewer complications, and a shorter hospital stay compared to traditional nasal packing, while maintaining comparable control of rebleeding. These results strongly suggest that topical tranexamic acid is a superior, minimally invasive, and patient-friendly alternative for managing anterior nasal bleeding [9].

Epistaxis is one of the most frequently encountered ENT emergencies, and while anterior nasal bleeding is usually benign, it can cause significant anxiety for patients and requires immediate, effective management. Conventional anterior nasal packing has long been considered the gold standard for initial control of bleeding, primarily through mechanical tamponade [10]. However, despite its effectiveness, nasal packing is associated with considerable discomfort, nasal obstruction, infection, and potential mucosal injury. In contrast, topical tranexamic acid achieves hemostasis pharmacologically by stabilizing the fibrin clot through antifibrinolytic activity, thereby avoiding many of the complications linked to physical packing [11].

In the current study, the mean time to achieve hemostasis was significantly shorter in the tranexamic acid group, averaging around five minutes, compared to nearly nine minutes in the packing group. This difference highlights the rapid clot-stabilizing action of topical TXA, which provides effective local hemostasis without requiring mechanical compression. The quicker control of bleeding also allowed early discharge and reduced the need for hospital observation, reflecting an important practical advantage, especially in busy emergency settings [12].

Patient comfort emerged as another key differentiating factor between the two modalities. The topical TXA group reported very low discomfort scores on the visual analog scale, while the nasal packing group experienced substantial pain and nasal obstruction during the intervention and subsequent 48-hour packing period. The discomfort associated with packing often results from mucosal pressure, impaired breathing, and crust formation. Eliminating the need for packing thus directly improves patient tolerance and overall satisfaction with treatment [13].

The TXA group had a lower rate of re-bleeding within 48 hours compared to the packing group, but the difference was not statistically significant. Both modalities performed comparably in transient hemostasis. The TXA group also had fewer complications leading to a higher level of efficacy, since they experienced less support at the level of clot formation and secondary trauma, likely due to a much lower incidence of any of the mucosa being dislodged as a result of displacing the packing. These findings suggest that the addition of TXA to control bleeding provides similar efficacy as mechanical tamponade but with more stable clot formation and less mucosal disruption [14].

The rate of complications in the TXA group continued to be low compared to the packing group. Rates of complications in the packing group included: mucosal trauma, secondary infection, nasal obstruction, or rebleeding upon removal of packing. These complications lead to longer recovery time and may lead to unnecessary prescribing of antibiotics or extended lengths of stay from the hospital. These considerations and complications associated with the packing group were not noted with the TXA group and further demonstrates the safety and atraumatic nature of topical antifibrinolytic therapy [15].

The shorter length of hospital stay seen in the tranexamic acid group is likely due to the fact the intervention was minimally invasive and hemostatic response was rapid. TXA patients were, on average, able to go home within 24 hours of receiving treatment, while patients who had nasal packing required more observation time due to the time commitment associated with nasal packing, including removal and reassessment after removal. The ability to manage patients effectively from an outpatient or short-stay approach may have important ramifications on healthcare resource allocation and patient convenience [16].
Patients who received tranexamic acid also had higher satisfaction rates after receiving treatment. Positive aspects included the absence of

discomfort, immediate hemostatic control of bleeding, and recovery profile. In contrast, patients receiving nasal packing frequently reported pain, disturbed sleep, mouth breathing, and anxiety after removing the nasal packs. These findings support the need to prioritize patient comfort as well as clinical effectiveness in emergency ENT [17].

This study proved that it is possible to use topical TXA in an emergent setting. The method is sufficiently simple and quick and does not require advanced technical ability, making it appropriate for use in both tertiary care hospitals and primary care settings. Because tranexamic acid can be purchased in a preloaded syringe, it can easily be applied with a sterile pledget, and quickly accessed and used, as appropriate. The potential benefit of the topical application is also that it has a minimal systemic absorption, which may allow use in patients with contraindications to systemic antifibrinolytics, such as in patients with hypertension or cardiovascular disease [18,19].

Additionally, the results of this study may suggest tranexamic acid would be beneficial to any elderly patients and/or patients who may be at a higher risk for recurrences of anterior epistaxis related to antiplatelet therapy. Because of the non-invasive nature of application of TXA, risk may be decreased of having additional trauma to the mucosa; and may also decrease delay and discomfort of prolonged anterior nasal packing in these aforementioned populations. Its cost-effectiveness and rapid time of action would also make this preferred as a first-line treatment in resource-limited care settings [20].

In conclusion, this study demonstrates strong evidence supporting the safety and efficacy of using topically-administered tranexamic acid as an alternative treatment for anterior epistaxis. Tranexamic acid appears faster to achieve hemostasis, more comfortable, and has lower complication rates in compared to nasal packing, thus making this a more practical solution while in the ED. Tranexamic acid and nasal packing did have comparable long-term control of bleeding despite the ease of TXA making it favorable.

Large-scale multi-center studies with larger sample sizes and longer follow-up could further substantiate our findings and examine the use of topical tranexamic acid as a treatment option for posterior or recurrent epistaxis. Incorporation of TXA into the formal emergency protocol could enhance future outcomes when managing nasal bleeding in the emergency room or outpatient settings.

CONCLUSION

In conclusion, this comparative study demonstrates that topical injection tranexamic acid therapy is a safe and effective patient-centered approach to managing anterior epistaxis. Topical tranexamic acid therapy leads to significantly faster hemostasis and has been shown to reduce discomfort and complications related to the procedure (eg, trauma, infection, and rebleeding). Rapid hemostatic response allows for rapid discharge and time in the emergency department or outpatient clinic, which makes this treatment useful in either milieu. Patient satisfaction was significantly increased over conventional packing, likely due to the comfort and ease of the treatment. The efficacy of tranexamic acid, rather than packing relying on mechanical pressure, is attributed to tranexamic acid physiologically stabilizing and strengthening the clot, maintaining hemostasis without injury to normal tissue. Its availability, affordability, and ease of application eliminates barriers, particularly in health systems that lack sufficient funds. Importantly, topical tranexamic acid does not expose the patient to systemic tranexamic acid and can be utilized in patients with comorbidities, where traditional packing may not be recommended. The recurrence rates found with the topical tranexamic acid therapy suggest the treatment is an acceptable definitive therapy. Therefore, the topical use of injection tranexamic acid should be considered a first-line therapy in managing anterior epistaxis, offering a modern, comfortable, and clinically more successful treatment option compared to routine nasal packing.

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A Clinical Study on Faciomaxillary Trauma in a Tertiary Care Center, Mysore.

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Abstract

Background: Faciomaxillary fractures constitute a significant disease burden to the society. They are clinically and aesthetically important owing to their close vicinity to vital structures and structures of cosmetic value respectively1and are clinically highly significant for number of reasons. ***Objectives-*** Our study aims at analysing the aetiology, distributions within sexes and various age groups, manifestations, anatomical distribution and management of faciomaxillary trauma presenting to ENT OPD, plastic surgery OPD and emergency department of K.R. Hospital, Mysore ***Methods-*** 95 patients with faciomaxillary trauma who came to casualty, outpatient department of Ear, Nose and Throat, department of Plastic Surgery, Krishna Rajendra Hospital, Mysore attached to Mysore Medical College and Research Institute, Mysore, from January 2020 to June 2021 were enrolled into the study. Aetiology, distributions within sexes and various age groups, manifestations, anatomical distribution and management of faciomaxillary trauma data has been collected after careful clinical and radiographic examinations. Data obtained was analysed using appropriate statistical test. Based on epidemiological data, clinical and imaging findings, treatment modalities and outcome of patients were also analysed. ***Results-*** A total of 95 patients presenting with 138 maxillofacial fractures were analysed. Most of them [34 (35.8%)] were young adults aged 18-25. Men [83 (87.37%)] were more affected than women. Road traffic accidents remain the main aetiology causing fractures in 57 (60%). Mandible was more frequently involved with 66 (42.03%) fractures, and condyle being the most common site. A total of 52 (54.7%) patients underwent open reduction with internal fixation under general anaesthesia. ***Conclusion-*** With increasing incidence of RTAs, there is a need to understand the pattern, review our management techniques and hence be able to provide appropriate and individualized management to those in need of it.

Keywords: Facial fractures; Maxillofacial injuries; road traffic accidents.

INTRODUCTION

Trauma is a leading cause of morbidity and mortality worldwide.1,2 Faciomaxillary injures are common among such admissions, although their epidemiology and aetiology can vary across various geographical areas.3,4. These are the most common life-threatening emergency situation in both developing and developed nations, representing 7.4–8.7% of the emergency medical care.5 Faciomaxillary injures affects both the skeletal and soft tissue structures of the facial region and can pose considerable long-term functional, aesthetic, and psychological complication.6 It is most prone to fractures because of its prominent position. The means of injury and direction of impact determine the pattern and location of such fractures7.

Understanding maxillofacial trauma helps to assess the behaviour patterns of people in different countries and helps to establish effective measures through which injuries can be managed and prevented12. Trauma to the faciomaxillary region mandates special attention as important sensory systems are contained within the face (e.g. vision, auditory, somatic sensation, gustatory, olfaction and vestibular), also, vital structures in the head and neck region are intimately associated (airway, blood vessels, nerves and gastrointestinal tracts).

Lastly, the psychological impact of disfigurement can be devastating.

Socioeconomic ramifications of maxillofacial trauma are the cost of treatment and admission to hospital, hospital resources, and macroeconomic loss of revenue. For individual patients consequences may comprise functional problems, physical discomfort, aesthetic problems, emotional or psychological distress, an intensive treatment regimen (often in hospital), frequent visits to the outpatient department after discharge, and loss of revenue. Epidemiological studies of maxillofacial trauma are important to help develop more efficient ways to deliver care, to assess and improve the quality of care, and to advise on tactics for the prevention of injury. The present study was done to determine the pattern and aetiology of the maxillofacial fractures, most common affected age, sex, fracture type, manifestations and treatment modality. Also, the possible preventive measures that could be taken to prevent such fractures were discussed.

MATERIALS AND METHODS

The present study is an observational study conducted on patients who presented with features of faciomaxillary trauma to the department of ENT and department of Plastic Surgery at Krishna Rajendra Hospital, Mysore attached to the Mysore Medial College and Research Institute during the period from January 2020 to June 2021.

SAMPLE SIZE AND SAMPLING METHOD

SAMPLE SIZE:

Sample size, n is calculated using the formula: n=z2pq/d2, where p is the prevalence of faciomaxillary trauma. According to the hospital records of previous years, p=52.1%

q=1-p i.e., 47.9%

d=level of precision in terms of absolute error i.e. 10%

z=standard normal variate for 5% alpha error i.e. 1.94

Therefore, n=95

SAMPLING METHOD: Convenience sampling

METHOD OF COLLECTION OF DATA

The study is a cross sectional, observational study done in patients presenting with features of faciomaxillary trauma presenting to E.N.T OPD and emergency department of Plastic Surgery at Krishna Rajendra Hospital, Mysore from January 2020- June 2021.

COLLECTION OF DATA AND ANALYSIS

All cases underwent a thorough history taking and detailed examination after obtaining informed consent. Once suspected, the cases were examined and subjected to relevant investigations like OPG, CT scan head with facial cuts. Thorough clinical evaluation was performed. Management results were be analysed appropriately. Data obtained analysed using appropriate statistical test. Based on epidemiological data, clinical and imaging findings, treatment modalities and outcome of patients were analysed.

INCLUSION CRITERIA

a) Patients giving consent
b) Patients with nose bleed/oral bleed/ any facial swelling on preliminary examination/deformity of face and confirmed with imaging study
c) All patients aged from 18 years to 65 years of age and either sex with clinical manifestations of faciomaxillary trauma.
d) Patients with radiologically confirmed faciomaxillary fractures.

EXCLUSION CRITERIA

a) Patients not willing for the study
b) Unconscious patient who had no relatives to give consent on behalf of the patient
c) Head injury patients (parenchymal involvement)
d) Patient record with incomplete data
e) Age <18 years
f) Patients who died before initial assessment
g) Patients with no history of trauma

RESULTS

Table 1: Age and Sex distribution of study participants

Age in Categories	Frequency (N)	Percentage (%)
18-25 years	34	35.8
26-35 years	27	28.4
36-45 years	23	24.2
46-55 years	7	7.4
55-65 years	4	4.2
Total	**95**	**100.0%**

The mean age of the participants in the study was 31.77 years with a standard deviation of around ±10.90 years. The minimum age and maximum age of the study participants were 18 years and 60 years, respectively. In the study, majority of the participants were males i.e., around 87.4%. Remaining12.6% of them were females. Male to female ratio was 6.9:1

Table 2: Distribution of participants based on the aetiology

Etiology	Frequency (N)	Percentage (%)
Road Traffic Accidents	57	60.0
Physical Assault	20	21.1
Accidental Fall	12	12.6
Others	6	6.3
Total	**95**	**100.0%**

Majority of the participants in the study suffered faciomaxillary injury as a result of road traffic accidents i.e., around 60.0%. The next common cause was physical assault followed by accidental fall. In only 6.3% cases, the causes were regarded as others.

Table 3: Distribution of participants based on the clinical manifestations

Site of fracture	Number of fractures
Nasal bones	
• Deformity of nose	15
• Laceration of skin over the bridge	5
• Epistaxis	13
• Septal deviation	11
• Crepitus over nasal bones	15
• Tenderness	17
Naso orbito ethmoidal	
• Telecanthus	2
• Depressed nasal dorsum	6
• Ecchymosis/swelling	8
• Subjective diplopia	8
• Upgaze limitation	5
• Enophthalmos/depression	7
• V2 para/anaesthesia	3
• Subconjunctival haemorrhage	8
Maxilla	
• Elongated/retuded midface	10
• Mobile midface	5
• Ecchymosis/swelling	23
Zygoma	

• Cheek flatness	20
• Antimongoloid slant	8
• Palpable step	8
• Ecchymosis/swelling	11
• Tenderness	15
Mandible	
• Dental malocclusion	40
• Intraoral/gingival laceration	35
• V3 para/anaesthesia	15
• Tenderness	50
• Ecchymosis/swelling	43
• Palpable step 2	40
Frontal	
Depressed fracture	1

Based on examination findings, the clinical manifestations were categorized as per the site of the fracture. Accordingly, tenderness was the most common finding, followed by swelling. As per the site, mandible was the structure which resulted in more clinical manifestations. Among the clinical manifestations of nasoethmoidal area fracture, ecchymosis and subjective diplopia was the most commonest manifestation followed by enophthalmos. Among the clinical manifestations of maxillary fracture, Ecchymosis and swelling were the most common manifestations followed by elongated mid face. Among the clinical manifestations of Zygoma fracture, cheek flatness was the most common finding followed by tenderness and swelling. Among the clinical manifestations of Mandibular fracture, majority had tenderness as the most common symptom followed by ecchymosis and swelling. 40 patients were found to have dental malocclusion and palpable step. 35 patients had laceration intra orally.V_3 paraesthesia was the least common manifestation in mandibular fracture in our study

Table 4: Distribution of fractures based on anatomical site

Fracture type	Number of fractures
Central third of maxillofacial skeleton	
• Nasal bones	17
• Naso-orbito-ethmoid	8
• Lefort I	14
• Lefort II	8
• Lefort III	2
• Palate	3
• Dentoalveolar	8
Lateral third of faciomaxillary skeleton	
• Zygomatic body	8
• Zygomatic arch	3
• Zygomatic body + Arch	20
Mandible fractures (lower third)	
• Condyle	25
• Ramus	1
• Coronoid	1
• Angle	13
• Body	11
• Para symphysis	8
• Symphysis	6

• Dento alveolar	1
Frontal bone	1

In the study, on analysing the anatomical distribution of fractures among the participants,mandible was the most common site i.e., around 42.03%. The next commonsite was central third of facial skeleton which accounts for about 38.2%.. The lateral third of facial skeleton was involved in only 19% case. In our study, condyle was the commonest site of fracture in mandible followed by angle of the mandible. Body of the mandible fracture was found in 11 cases. Ramus, coronoid and dento alveolar area was affected least in mandibular fracture in our study. On studying distribution of fractures in Central third of maxillofacial skeleton, nasal bone fracture was found as the commonest one followed by Lefort I fractures. Lefort III was the least common fracture in central third of maxilla facial skeleton in our study. On studying distribution of fractures in lateral third of maxillofacial skeleton, combined fracture body and arch of zygoma was found to be commonest compared to isolated body or arch fractures. Fracture of frontal bone was found in one patient.

Table 5: Distribution of participants based on the mode of treatment

Mode of treatment	Frequency (N)	Percentage (%)
Open Reduction Internal Fixation	59	62.1
Closed Reduction	22	23.31
Conservative	14	14.73
Total	**95**	**100.0%**

In our study 62.1% patients underwent open reduction and internal fixation,23.3% underwent closed reduction and 14.73% was given conservative management.

DISCUSSION

The present clinical study was conducted for a period of 18 months on 95 patients with faciomaxillary trauma who visited either casualty or outpatient department of Ear, Nose and Throat of Krishna Rajendra Hospital attached to Mysore Medical College and Research Institute, to understand the distribution of faciomaxillary trauma with respect to age group, gender and anatomy, to evaluate the aetiology and manifestations of these injuries, and to study the mainstay of management. 95 patients with 157 fractures are analysed in this study. Fractures over the face always remain a challenge to the operating surgeon as it is associated with the intimate structures nearby, and any mistake in the procedure could worsen the situation. Thus understanding the types of facial fractures is most important in developing a sound treatment plan. This provides the best opportunity in restoring the structural relationship which is the most important outcome overall.

In the present study, the age group of 18-25 years (35.8%) was predominantly affected followed by the age group 26-35 years. This is almost closer to the findings from the study by Dutta SRB1 et al where around 67.1% of the participants aged between 18 and 40 years. These findings being similar to previous studies too7,8,9,. This portrays that the young adults are more prone for road traffic accidents and assaults due to the aggressive behaviour which may lead them to end up with facial trauma. Men aged 21-40 years represent a group with intense social interaction and higher rates of morbidity making them more susceptible to traffic accidents and interpersonal violence10.

Majority of the participants in the present study were males i.e., around 87.4%. Remaining 12.6% of them were females. The high male to female ratio (6.91%) was similar to other international studies,11,12.

In the study, majority of the participants suffered faciomaxillary injury as a result of road traffic accidents i.e., around 60.0%. The next common cause was physical assault followed by accidental fall. On reviewing the most of the previous studies, it has made obvious that motor accidents contribute the most in sustaining facial trauma. In the studies by Von Haut et al7, Kamath RAD et al6, and Garkoti PD et al13, the causes for injury were in an order completely similar to the present study. Some studies even tried to understand further the reason for facial trauma in specific post road traffic accidents. Accordingly, the study by Bali R et al found that accidents were common during night

due to low vision, and extensively in case of 2 wheeled vehicles due to more exposure14.

Based on the examination findings, the clinical manifestations were categorized as per the site of the fracture. Accordingly, ecchymosis or swelling was the most common finding, followed by tenderness. As per the site, mandible was the structure which resulted in more clinical manifestations. Among the clinical manifestations of nasal bone fracture, tenderness was the commonest finding followed by crepitus over nasal bones and external deformity. Among the clinical manifestations of nasoethmoidal area fracture, ecchymosis and subjective diplopia was the commonest manifestation followed by enophthalmos. Ansari MH et al had even analysed the injuries to ocular and orbital structures associated with the facial trauma and found the increased risk which could lead to complete or partial loss of vision as a result of either optic nerve lesion or eyeball destruction15.

On analysing the anatomical distribution of fracture among the participants in the study, mandible was the most common site i.e., around 42% condyle being the most commonly involved followed by angle of mandible. The next common site was central third of facial skeleton which accounts for about 38.2%. In around 67.9% cases, the fracture was seen in multiple sites. The lateral third of facial skeleton was involved in only 19% cases. The mode of treatment in the study was open reduction and internal fixation in majority cases i.e., around 62.1%. The next common mode was closed reduction (23.31%) followed by conservative management (14.73%).In study conducted by Kamath et al7, it was found that facial bones chiefly imparts an esthetically appealing contour to the face, apart from protecting the globe of the eye. Intact sensory perception over the cheek is also necessary. Occlusion is of considerable importance as it influences not only lower facial height and appearance but also speech and deglutition. Mastication is an important consideration in addressing these fractures as it could affect general nutrition and well-being.

CONCLUSION

Reliable epidemiological information on faciomaxillary trauma is crucial for decision making in emergency care unit, for identifying factors that increase the risk of injury and for providing measures for prevention. Ideally, such information improves the quality of treatment and helps to achieve measures to prevent injuries and morbidity like in our study. We use epidemiological methods to determine the various significant epidemiological factors like age, sex, mode of injury which potentially help in planning regarding preventive measures, management & rehabilitation of patients. This study results will help clinicians to better understand maxillofacial trauma. It is helpful to implement various new laws which will protect facio maxillary skeleton. An awareness campaign to educate public about importance of restraints and protective seatbelts in cars and helmet in motorcycles should be encouraged. This results should also alert government and Road Safety Commission for the provision of good roads and traffic guidance. Enforcement of traffic laws regarding mandatory use of helmets or seat belt and drink-driving legislations should be done. In developed countries, lane discipline, high tech protective devices like shatter proof glass, collapsible steering dramatically reduced the incidence of these injuries. Efforts should be made to reduce mortality and morbidity from these so as to reduce domestic disruption and psychological stress. Reluctance to use helmets, exceeding speed limits and increasing competition among young men could explain the increased incidence of facial injuries.

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