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Original Article

Comparison between Subtarsal and Infraorbital Approaches for The Management of Infraorbital Rim and Orbital Floor Fracture

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ABSTRACT

Background: Subtarsal or infraorbital incisions can be utilized for managing orbital fractures. The subtarsal technique typically offers superior cosmetic and functional results, while the infraorbital technique is quicker but can lead to more noticeable scars. This study evaluates the two methods regarding aesthetic outcomes, functional restoration, and surgical complications. **Methods & Materials:** This prospective study at Dhaka Medical College involved 30 patients with infraorbital fractures, categorized into subtarsal and infraorbital groups. All received CT evaluations and surgical correction using mini-plates. A follow-up at 1 week, 1, 3, and 6 months assessed complications, surgical duration, and cosmetic results. Data were examined to compare outcomes between the two methods. **Results:** In this study involving 30 individuals with infraorbital fractures, the majority were young men. Unilateral fractures occurred most frequently, with the primary cause being road traffic collisions. Complications occurring early and late were more prevalent in the infraorbital group. The operative duration was less for infraorbital access (45 ± 6 min compared to 52 ± 7 min), whereas the subtarsal method experienced fewer complications (26.7% versus 46.7%) and produced superior aesthetic results (good–excellent: 80% versus 53.3%). **Conclusion:** The subtarsal method for infraorbital fractures resulted in fewer early and late complications and better aesthetic results compared to the infraorbital method. Even though it was a bit longer, it delivered improved cosmetic outcomes, rendering it a safer and more aesthetically pleasing choice, particularly when appearance is a key concern.

Keywords: *Subtarsal Approaches, Infraorbital Approaches, Infraorbital Rim, Orbital Floor Fracture.*

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INTRODUCTION

The management of maxillofacial trauma follows established trauma care principles, with particular emphasis on the preservation of vision and ocular motility. The presence of an oculocardiac reflex, manifested by bradycardia, nausea, or syncope, necessitates prompt intervention, as it may precipitate potentially fatal cardiac arrhythmias if left untreated [1]. Orbital fractures are common in facial trauma, accounting for approximately 30%–40% of cases [2]. The orbital floor is formed by the maxilla, zygomatic, and palatine bones and contains the infraorbital groove, which transmits the infraorbital nerve and vessels, rendering this region particularly susceptible to injury during both trauma and surgical intervention [3].

Surgical access to the infraorbital rim and orbital floor can be achieved through transcutaneous or transconjunctival approaches, with postoperative cosmetic outcome being a major determinant in the choice of incision. Common external lower eyelid approaches include subciliary, subtarsal, and infraorbital incisions [4]. The subtarsal incision is placed just inferior to the tarsal plate, whereas the infraorbital incision is made within a natural skin crease near the infraorbital rim. Variations in eyelid anatomy, incision placement, and dissection planes can influence both functional and aesthetic outcomes, and each approach is associated with specific complications [5]. International literature comparing subtarsal and infraorbital approaches for infraorbital rim and orbital floor fractures suggests that both techniques provide adequate surgical exposure. However, the subtarsal approach is often favored due to its direct access, preservation of lower eyelid support structures, and lower incidence of complications such as eyelid malposition when compared with subciliary incisions [6].

Infraorbital incisions allow rapid and straightforward access to the fracture site but are more likely to result in visible scarring, although scar prominence generally diminishes over time [7]. Retrospective analyses of subtarsal incisions have demonstrated favorable long-term outcomes, with minimal complications, rare occurrences of ectropion, and scars that are largely inconspicuous by 12 months postoperatively [8]. In contrast, comparative studies involving infraorbital incisions have reported increased scar visibility and more prolonged postoperative edema compared with subtarsal and subciliary techniques [9].

In Bangladesh, a study by Hasan MZ et al. showed that the transconjunctival approach for infraorbital fractures resulted in superior cosmetic outcomes with no visible scarring, whereas the subciliary approach was associated with noticeable scars and transient lower eyelid malposition [10]. However, local evidence comparing subtarsal and infraorbital approaches remains limited. Most available studies focus on transconjunctival versus

subciliary incisions, with little data addressing long-term outcomes, patient satisfaction, or pediatric cases. Given these gaps in the literature, the present study aimed to compare the subtarsal and infraorbital approaches in the management of infraorbital rim and orbital floor fractures, with particular emphasis on cosmetic outcomes, functional recovery, and postoperative complication rates, in order to inform and improve surgical decision-making in the local context.

METHODS & MATERIALS

This prospective comparative study was conducted at Dhaka Medical College (DMC) over a 12-month period from January 2024 to December 2024. The study included 30 patients diagnosed with infraorbital rim and/or orbital floor fractures, who were equally divided into two groups: 15 patients underwent the subtarsal approach and 15 underwent the infraorbital approach.

Patient Selection: Patients of any age or gender presenting with unilateral or bilateral infraorbital fractures requiring surgical repair were eligible. Exclusion criteria included prior orbital or eyelid surgery, severe ocular trauma, uncontrolled systemic illnesses, or contraindications to anesthesia. Informed consent was obtained from all participants before enrollment.

Preoperative Assessment: All patients underwent detailed history-taking, physical examination, and radiological evaluation, including computed tomography (CT) scans of the orbit to assess fracture patterns and plan surgical intervention. Comorbidities such as diabetes mellitus, hypertension, cardiovascular disease, and asthma were recorded. The cause of injury—road traffic accident, fall, sports injury, assault, or other causes—was documented.

Surgical Procedure: Surgeries were performed by experienced maxillofacial surgeons under standard sterile conditions. The subtarsal incision was placed approximately 5–7 mm below the lower eyelid margin, while the infraorbital incision was made along the natural skin crease of the infraorbital region. Fracture reduction and fixation were performed using mini-plates and screws as indicated.

Postoperative Evaluation: Patients were monitored for early complications including bleeding, hematoma, edema, ecchymosis, and vision disturbances. Late complications, such as scarring, infraorbital nerve dysfunction, eyelid malposition, and persistent diplopia, were assessed during follow-up visits at 1 week, 1 month, 3 months, and 6 months post-surgery. Operative time was recorded, and aesthetic outcomes were evaluated based on patient satisfaction and surgeon assessment, classified as good–excellent or fair.

Data Analysis: Data were entered into statistical software and analyzed using descriptive statistics. Frequencies, percentages, and means with standard deviations were calculated to compare the outcomes between the subtarsal and infraorbital approach groups. Differences in complication rates, operative times, and aesthetic results were evaluated to determine the relative safety and efficacy of each surgical approach.

RESULTS

A total of 30 patients with infraorbital rim and/or orbital floor fractures were included in the study. Patients were equally allocated into two groups: the subtarsal approach and the infraorbital approach group.

Socio-demographic and Clinical Characteristics

Table I shows the majority of the participants were young adults. Thirteen patients (43.3%) belonged to the 18–35 years age group, followed by those aged >18 years (26.7%), 35–50 years (23.3%), and >50 years (6.7%). Male patients predominated, accounting for 18 cases (60%), while females comprised 12 cases (40%).

Table I
Socio-demographic characteristics of the study participants (n = 30).

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	≤18	8	26.7
	18–35	13	43.3
	35–50	7	23.3
	>50	2	6.7
Gender	Male	18	60.0
	Female	12	40.0

Table II presents regarding comorbid conditions, diabetes mellitus was present in 12 patients (40%), hypertension in 10 patients (33.3%), cardiovascular disease in 5 patients (16.7%), asthma in 3 patients (10%), and other comorbidities in 2 patients (6.7%). Some patients had more than one comorbidity.

Table II
Distribution of comorbidities among participants (multiple responses).

Comorbidity	Frequency (n)	Percentage (%)
Diabetes mellitus	12	40.0
Hypertension	10	33.3
Cardiovascular disease	5	16.7
Asthma	3	10.0
Others	2	6.7

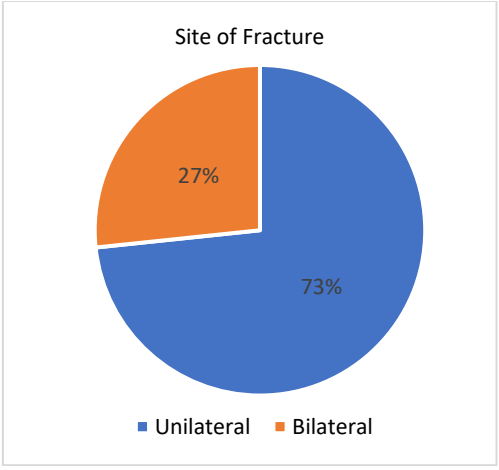

Figure 1 Laterality of infraorbital rim and orbital floor fractures

Figure 1 shows Unilateral fractures were more common, observed in 22 patients (73.3%), whereas bilateral fractures were identified in 8 patients (26.7%).

Etiology of Injury

Table III shows road traffic accidents were the most frequent cause of injury, accounting for 11 cases (36.7%). Falls were reported in 7 patients (23.3%), sports-related injuries in 5 patients (16.7%), assaults in 4 patients (13.3%), and other causes in 3 patients (10%).

Table III
Etiology of injury (*n*=30).

Cause of injury	Frequency (n)	Percentage (%)
Road traffic accident	11	36.7
Falls	7	23.3
Sports injury	5	16.7
Assault	4	13.3
Others	3	10.0

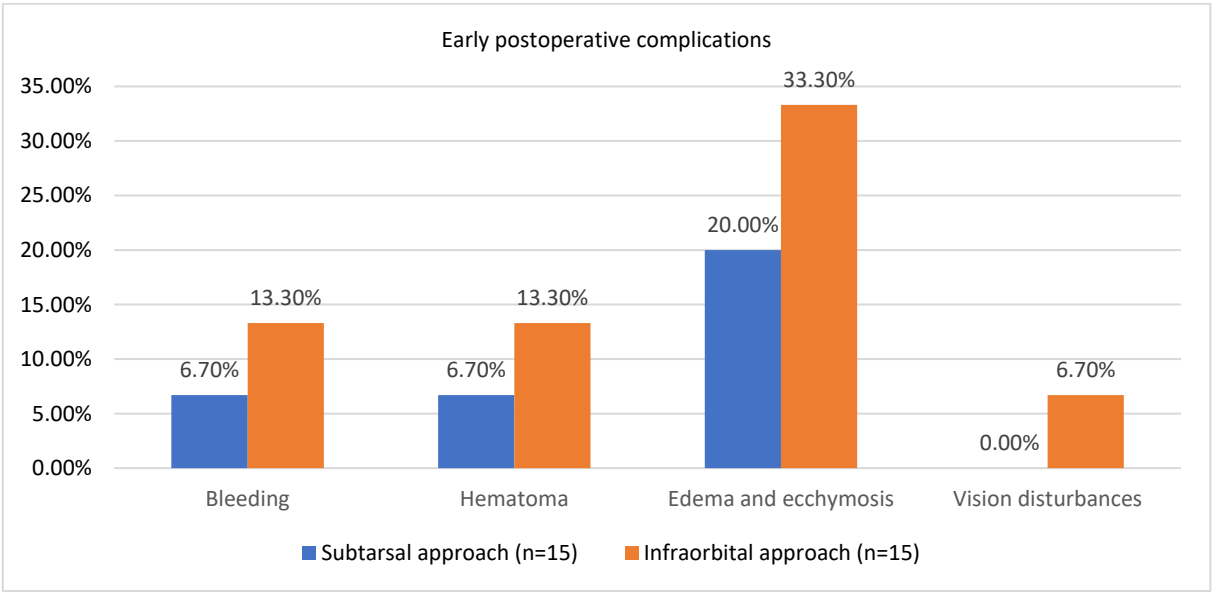

Figure 2 Early postoperative complications by surgical approach

Early Postoperative Complications

In *Figure 2*, early complications were observed in both groups, with a higher frequency in the infraorbital approach group. In the subtarsal group, mild postoperative bleeding occurred in 1 patient (6.7%), hematoma in 1 patient (6.7%), and edema with ecchymosis in 3 patients (20%). No cases of postoperative vision disturbance were recorded in this group.

In contrast, the infraorbital group showed postoperative bleeding in 2 patients (13.3%), hematoma in 2 patients (13.3%), and edema with ecchymosis in 5 patients (33.3%). Transient vision disturbance was observed in 1 patient (6.7%), which resolved within the early postoperative period.

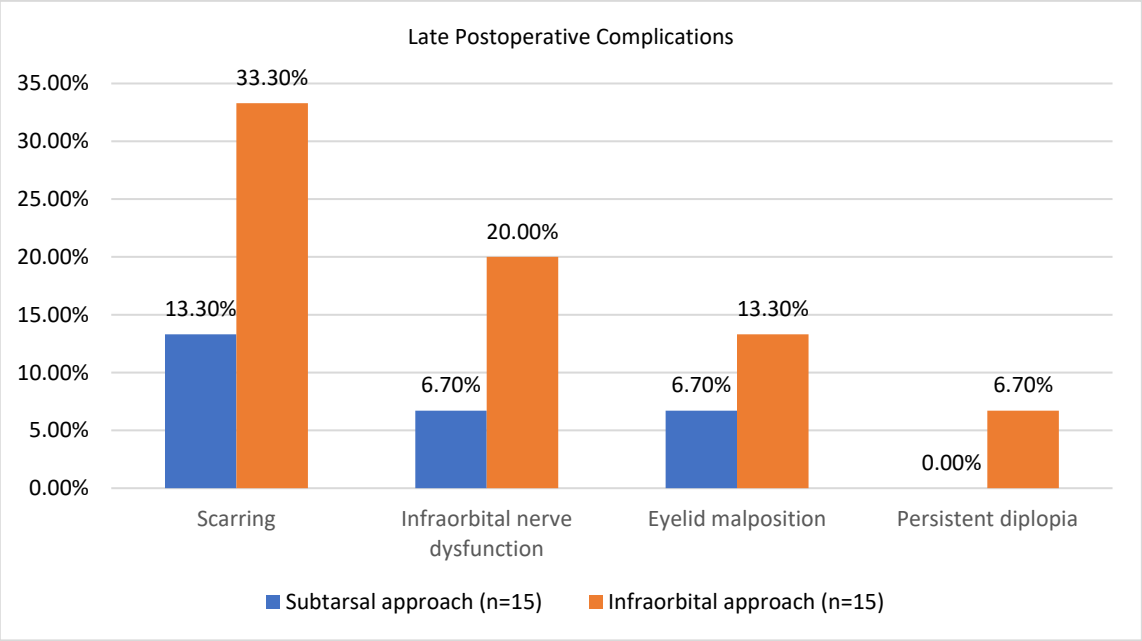

Figure 3 Late postoperative complications by surgical approach

Late Postoperative Complications

Figure 3 shows Late complications were less frequent in the subtarsal approach group shown in Figure 3 . Minimal scarring was noted in 2 patients (13.3%), infraorbital nerve dysfunction in 1 patient (6.7%), and eyelid malposition in 1 patient (6.7%). No cases of persistent diplopia were observed in this group.

In the infraorbital approach group, visible scarring was reported in 5 patients (33.3%). Infraorbital nerve dysfunction occurred in 3 patients (20%), eyelid malposition in 2 patients (13.3%), and persistent diplopia in 1 patient (6.7%).

Operative Outcomes and Aesthetic Evaluation

Table IV shows the mean operating time was shorter in the infraorbital approach group (mean ± SD: 45 ± 6 minutes) compared to the subtarsal approach group (52 ± 7 minutes). The overall complication rate was lower in the subtarsal group (26.7%) than in the infraorbital group (46.7%). Aesthetic outcomes, assessed clinically at follow-up, were rated as good to excellent in 12 patients (80%) in the subtarsal group, compared with 8 patients (53.3%) in the infraorbital group. Fair cosmetic outcomes were observed in 3 patients (20%) in the subtarsal group and 7 patients (46.7%) in the infraorbital group.

Table IV
Comparison of operative and aesthetic outcomes.

Outcome variable	Subtarsal approach,n(%)	Infraorbital approach, n (%)
Mean operating time (Minutes, Mean ± SD)	52 ± 7	45 ± 6
Overall complication rate	26.7%	46.7%
Good–excellent aesthetic outcome	12 (80.0)	8 (53.3)
Fair aesthetic outcome	3 (20.0)	7 (46.7)

Overall, the subtarsal approach demonstrated fewer complications and superior aesthetic outcomes, whereas the infraorbital approach offered shorter operating time but was associated with a higher incidence of visible scarring and late complications.

DISCUSSION

In this study, the majority of orbital fractures occurred in younger individuals, with 43.3% of patients aged between 18 and 35 years and nearly 70% aged 35 years or younger. This observation is consistent with a reference study of 504 cases, which also reported a predominance of fractures in younger age groups, with a mean age of 39.3 years [11]. Male predominance (60%) observed in our cohort aligns with previous findings, where males accounted for up to 77% of orbital fracture cases, with a male-to-female ratio of approximately 3.3:1, reflecting increased exposure to high-risk trauma [12].

Regarding comorbidities, patients in this study with infraorbital rim and orbital floor fractures presented with diabetes (40%), hypertension (33.3%), cardiovascular disorders (16.7%), and asthma (10%). In contrast, a large-scale review of 16,671 hospitalized patients indicated that most had no comorbid conditions (78.7%), with lower incidences of diabetes (9.85%), diabetes with complications (1.89%), chronic pulmonary disease (3.56%), cerebrovascular disease (3.18%), myocardial infarction (0.38%), heart failure (1.0%), and peripheral vascular disease (0.33%) [13]. These findings underscore the importance of considering systemic comorbidities in surgical planning and perioperative management.

Unilateral fractures of the infraorbital rim and orbital floor were more prevalent (73.3%) than bilateral fractures (26.7%), which is in agreement with a comprehensive review reporting 77.5% unilateral and 22.5% bilateral fractures, confirming the typical predominance of one-sided orbital injuries [12].

Mechanisms of injury in this study were led by road traffic accidents (36.7%), followed by falls (23.3%), sports-related trauma (16.7%), assaults (13.3%), and other causes (10%). These results are in line with broader trauma literature, which identifies road traffic accidents (54.7%),

falls (28.8%), assaults (3.8%), and other mechanisms (12.7%) as common contributors to orbital fractures [14].

Early postoperative complications were more frequent in the infraorbital approach, including bleeding (13.3%), hematoma (13.3%), edema/ecchymosis (33.3%), and transient visual disturbances (6.7%), compared to the subtarsal approach (bleeding 6.7%, hematoma 6.7%, edema/ecchymosis 20%, no visual disturbances). Late complications also favored the subtarsal approach, with the infraorbital group showing higher rates of noticeable scarring (33.3% vs. 13.3%), infraorbital nerve dysfunction (20% vs. 6.7%), eyelid malposition (13.3% vs. 6.7%), and persistent diplopia (6.7% vs. 0%). These findings are consistent with existing literature: subciliary approaches have reported diplopia (12–15%), corneal injury (7%), ptosis (1–5%), entropion/ectropion (3–9%), and visual impairment (1%), while transconjunctival approaches showed diplopia (10–11%), enophthalmos (7%), ptosis (5%), and subtarsal approaches generally demonstrated lower rates of scarring (8–16.7%), scleral exposure (8–10%), and eyelid swelling (1.4–8%) [8,15-17].

The mean operating time was slightly longer for the subtarsal approach (52 ± 7 min) compared to the infraorbital approach (45 ± 6 min), reflecting the meticulous dissection required for cosmetically favorable incisions. All approaches provided adequate exposure of the fractures, with the transconjunctival approach requiring the longest exposure time (~22 min) [9]. Overall complication rates were lower with the subtarsal approach (26.7%) compared to the infraorbital approach (46.7%), while rates for transconjunctival (36.19%) and subciliary (21.4%) approaches showed significant differences ($P < 0.0001$) [1]. Aesthetic outcomes were superior with subtarsal incisions, achieving good–excellent results in 80% of cases compared to 53.3% for infraorbital incisions, while fair outcomes were more common with infraorbital access (46.7% vs. 20%). Subtarsal incisions placed along natural lower eyelid creases demonstrated significant scar improvement over time, with POSAS scores decreasing from 7.33 ± 1.01 to 3.33 ± 0.64 ($p = 0.001$), supporting their superior cosmetic performance [18].

CONCLUSION

In this study, the subtarsal approach for infraorbital rim and orbital floor fractures was associated with fewer early and late complications, including lower rates of scarring, infraorbital nerve dysfunction, and eyelid malposition, compared to the infraorbital approach. Although the operative time was slightly longer with the subtarsal technique, it resulted in superior aesthetic outcomes, with most patients achieving good to excellent cosmetic results. Overall, the subtarsal approach appears to be a safer and more cosmetically favorable option for managing infraorbital fractures, making it preferable, especially in cases where aesthetic considerations are important.

REFERENCES

1. Palavalli MH, Huayllani MT, Gokun Y, Lu Y, Janis JE. Surgical approaches to orbital fractures: a practical and systematic review. Plastic and Reconstructive Surgery–Global Open. 2023 May 1;11(5):e4967.
2. Aleem MA, Nasyam FA, Reddy KP, Karpe T, Singh T, Shailaja AB. Management of infraorbital rim and orbital floor fractures: A comparison of subciliary and infraorbital approaches. Journal of International Oral Health. 2017 Mar 1;9(2):65-70.
3. Boyette JR, Pemberton JD, Bonilla-Velez J. Management of orbital fractures: challenges and solutions. Clinical ophthalmology. 2015 Nov 17:2127-37.
4. Al-Moraissi EA, Thaller SR, Ellis E. Subciliary vs. transconjunctival approach for the management of orbital floor and periorbital fractures: A systematic review and meta-analysis. Journal of Cranio-Maxillofacial Surgery. 2017 Oct 1;45(10):1647-54.
5. Giraddi GB, Syed MK. Preseptal transconjunctival vs. subciliary approach in treatment of infraorbital rim and floor fractures. Annals of maxillofacial surgery. 2012 Jul 1;2(2):136-40.
6. Mohamed FI. Subciliary versus subtarsal approach for the management of infraorbital rim and orbital floor fractures. An anthropometric analysis. Egyptian Dental Journal. 2020 Apr 1;66(2-April (Oral Surgery)):931-42.
7. Prince J, Shetty P, Ramanathan A, N S. A Comparative Analytical Study of Functional and Esthetic Outcomes of Infraorbital and Subciliary Incisions to Assess the Redundancy of the Infraorbital Approach. The Scientific World Journal. 2025;2025(1):9595176.
8. Mahajan RK, Gupta K, Srinivasan K, Tambotra A, Singh SM, Kaur A. Retrospective analysis of subtarsal incision in maxillofacial trauma. Journal of Maxillofacial and Oral Surgery. 2020 Sep;19(3):443-6.
9. Subramanian B, Krishnamurthy S, Suresh Kumar P, Saravanan B, Padhmanabhan M. Comparison of various approaches for exposure of infraorbital rim fractures of zygoma. Journal of maxillofacial and oral surgery. 2009 Jun;8(2):99-102.
10. Hasan MZ, Rabbani F, Hasnat A, Imam F, Saddam MM. Aesthetic Outcome of Transconjunctival versus Subciliary Approach for Infra-Orbital Rim and Orbital Floor Fractures. Journal of Dentistry and Allied Science. 2024;7(2):19-25.
11. Chiang E, Saadat LV, Spitz JA, Bryar PJ, Chambers CB. Etiology of orbital fractures at a level I trauma center in a large metropolitan city☆. Taiwan Journal of Ophthalmology. 2016 Jan 1;6(1):26-31.
12. Amin D, Al-Mulki K, Henriquez OA, Cheng A, Roser S, Abramowicz S. Review of orbital fractures in an urban level I trauma center. Craniomaxillofacial trauma & reconstruction. 2020 Sep;13(3):174-9.
13. Yang YH, Warnakulasuriya S. Effect of comorbidities on the management and prognosis in patients with oral cancer. Translational Research in Oral Oncology. 2016 Oct 21;1:2057178X16669961.
14. Goelz L, Syperek A, Heske S, Mutze S, Hosten N, Kirsch M. Retrospective cohort study of frequency and patterns of orbital injuries on whole-body CT with maxillofacial multi-slice CT. Tomography. 2021 Aug 17;7(3):373-86.
15. Bronstein JA, Bruce WJ, Bakhos F, Ishaq D, Joyce CJ, Cimino V. Surgical approach to orbital floor fractures: comparing complication rates between subciliary and subconjunctival approaches. Craniomaxillofacial Trauma & Reconstruction. 2020 Mar;13(1):45-8.
16. Baqain ZH, Malkawi Z, Hadidi A, Rajab LD. Subtarsal approach for orbital floor repair: a long-term follow-up of 12 cases in a Jordanian teaching hospital. Journal of oral and maxillofacial surgery. 2008 Jan 1;66(1):45-50.
17. Ridgway EB, Chen C, Colakoglu S, Gautam S, Lee BT. The incidence of lower eyelid malposition after facial fracture repair: a retrospective study and meta-analysis comparing subtarsal, subciliary, and transconjunctival incisions. Plastic and reconstructive surgery. 2009 Nov 1;124(5):1578-86.
18. Farooq S, Bhat MY, Rastogi R, Bansal A, Angel A, Hammannavar R, Chaudhari V, Chaudhari VV. Functional and Aesthetic Outcomes of the Subtarsal Approach in Zygomaticomaxillary Complex Fractures With Orbital Floor Involvement: A Prospective Cohort Study. Cureus. 2025 Sep 30;17(9).