

Aesthetic Approaches to Zygomatic Fracture Management: Achieving Optimal Outcomes With Minimal Scarring

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Abstract: The zygomaticomaxillary complex is integral to facial aesthetics and is frequently involved in facial fractures. These injuries often necessitate surgical intervention, with open reduction and internal fixation being the standard treatment. This article presents a novel philosophy for managing zygomatic fractures, emphasizing the “Scarless Surgery” technique. The authors’ approach prioritizes minimal osteosynthesis material and fixation points while utilizing the least visible surgical access. For isolated zygomatic arch fractures, an intraoral technique is preferred, whereas the frontozygomatic suture is approached through an upper eyelid crease for optimal aesthetic outcomes. The zygomaticomaxillary buttress is accessed through a vestibular mucosal incision and the infraorbital rim benefits from a transconjunctival approach. The findings suggest that fewer fixation points can still yield satisfactory stability and cosmetic results, aligning with literature supporting the efficacy of 1 and 2-point fixations. This modern technique not only minimizes visible scarring but also conforms to the contemporary push for minimally invasive surgical methods. The authors’ experience and the existing literature support the efficacy of this approach, reinforcing its viability as a standard practice in the surgical management of facial trauma.

Key Words: Aesthetic outcomes, minimally invasive techniques, scarless surgery, surgical approaches, zygomatic complex fractures

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The zygomaticomaxillary complex (ZMC) is a critical component of the midface, often involved in facial fractures due

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to its convex shape. It is essential for facial aesthetics and must be precisely restored when managing facial fractures. When fractures are displaced, surgical intervention with open reduction and internal fixation (ORIF) is the gold standard treatment.¹

Zygomatic complex fractures are among the most common facial fractures. Typically, these fractures involve the zygomatic bone articulating with the maxilla, temporal, frontal, and sphenoid bones. These fractures are often described as tripod fractures, with fracture lines near these suture lines requiring stabilization through ORIF. The choice of fixation points and surgical approach depends on the fracture type and the surgeon’s expertise.¹

Currently, there is no consensus on the optimal number and locations of fixation points, leaving these decisions to the surgeon’s discretion and experience. Various approaches are used to treat these fractures, often involving percutaneous methods for orbital rim and frontozygomatic (FZ) fractures. However, these methods can leave visible facial scars.²

Isolated zygomatic arch (ZA) fractures result from a force applied orthogonally to the bone segment, causing collapse and depression of the bone fragments. Reduction of these fractures is typically performed for aesthetic benefits only, except when the fracture impinges on the mandibular coronoid process, thereby limiting mandibular movement.³ Treatment often involves a temporal incision, which can leave visible scars or damage facial nerve branches, or an intraoral incision, which is less commonly used.

This paper outlines our philosophy for managing zygomatic fractures, focusing on surgical approaches and fixation points to avoid or minimize visible scarring.

TECHNIQUE DESCRIPTION

The “Scarless Surgery” technique for ZMC fracture treatment relies on 2 main principles: (1) using minimal osteosynthesis material and fixation points and (2) employing the least visible surgical access. In accordance with our philosophy, we prioritize single-point fixation using an intraoral approach in all cases where it is deemed sufficient to provide adequate stability. In instances where single-point fixation is insufficient, we employ a 2-point fixation strategy, utilizing one plate intraorally and another on the FZ buttress through an upper eyelid skin crease incision. Only in more severe cases do we resort to 3-point fixation, adding a third plate at the level of the inferior orbital rim.

To explain our technique, we consider that the zygomatic bone, with its pyramidal structure, can be approached at 4 locations: (1) the zygomaticomaxillary buttress, (2) the FZ suture, (3) the infraorbital rim (IOR), and (4) the ZA.

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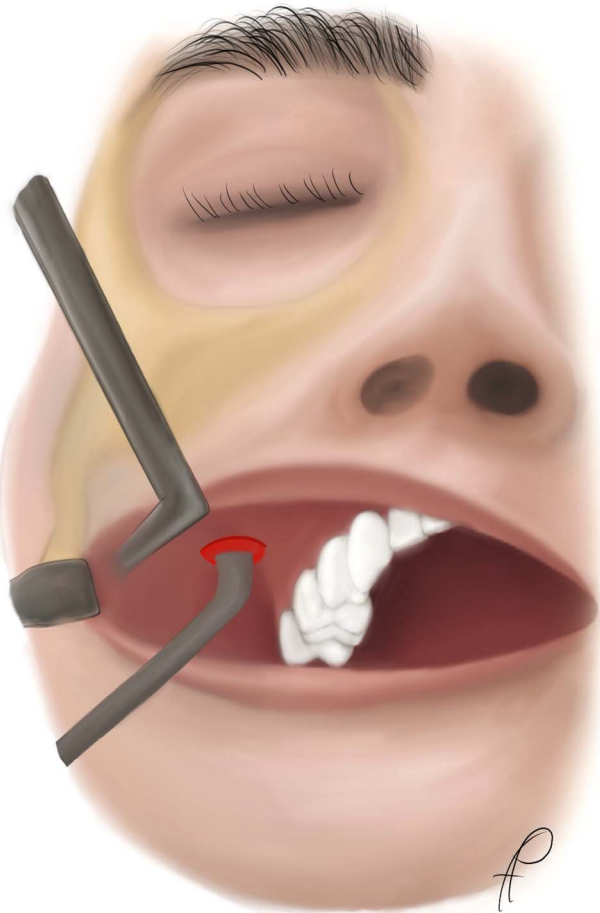


FIGURE 1. Intraoral approach to the zygomatic arch reduction.

Zygomatic Arch

For isolated ZA fractures, an intraoral approach is used. A small (~0.5 cm) mucosal incision is made in the upper vestibule of the mouth on the affected side, with no further dissection necessary. A bone elevator is inserted through the incision and used to elevate the ZA, with alignment verified intraoperatively by palpation (Fig. 1).

We recommend the intraoral approach for isolated ZA fractures not requiring exposure or fixation, as it is simpler, quicker, and avoids complications compared with the transcutaneous approach.⁴

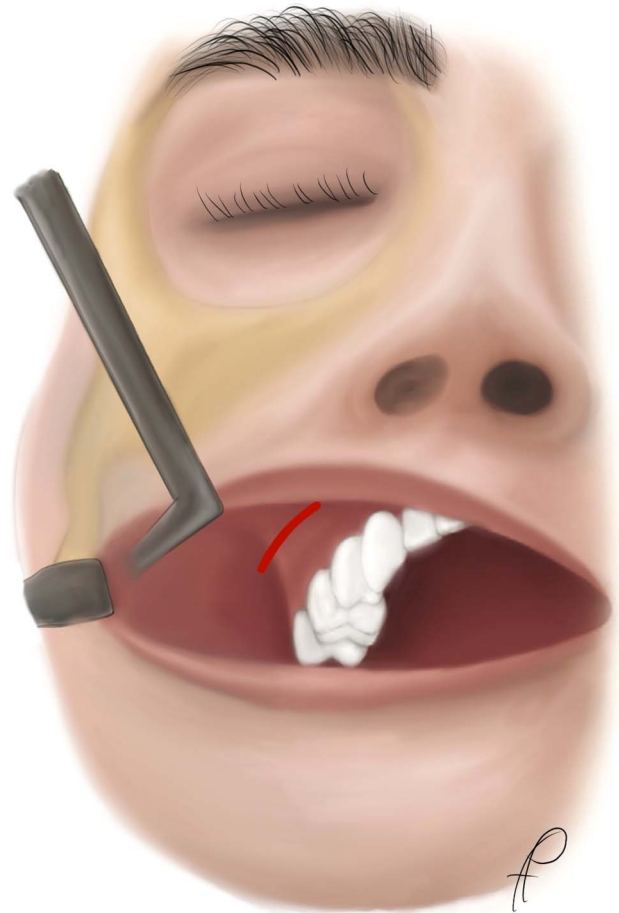


FIGURE 3. The intraoral approach to the zygomaticomaxillary buttress through vestibular mucosal.

Frontozygomatic Suture

For the FZ suture, we use an upper eyelid crease approach with lateral extension. This method provides optimal exposure with favorable aesthetic outcomes and avoids complications like eyebrow alopecia and noticeable scarring, which can occur with the lateral eyebrow approach (Fig. 2).

Zygomaticomaxillary Buttress

The zygomaticomaxillary buttress is accessed through a vestibular mucosal incision extending from the canine to the second molar (Fig. 3). Subperiosteal elevation extends to the



FIGURE 2. Upper eyelid crease approach to the frontozygomatic suture.



FIGURE 4. Transconjunctival retroseptal approach to the infraorbital rim.

infraorbital margin, preserving the infraorbital bundle. The pillar is then explored and fixed.

Infraorbital Rim

The IOR is approached transconjunctivally, usually with lateral canthotomy. We usually adopt the retroseptal approach due to its technical ease and lower complication risk compared with the preseptal approach (Fig. 4). When fixation of the IOR is unnecessary, but orbital floor exploration is needed, we use a transconjunctival approach without canthotomy. Alternatively, an intraoral approach with a wide vestibular mucosa incision can be used, though internal fixation is feasible only in patients with high tissue elasticity, typically elderly individuals.

DISCUSSION

Zygomatic complex fractures, also known as tripod fractures, are the second most common facial fractures after nasal fractures. The zygomatic bone's lateral prominence and convexity are crucial for facial aesthetics, contributing to facial width and prominence. However, these features also make it more susceptible to injury. Approximately 45% of midfacial fractures are zygomatic complex fractures.¹

Traditional treatment involves ORIF through various incisions, including lateral eyebrow, subciliary, subpalpebral, transconjunctival, temporal, or intraoral approaches.² Although 3-point fixation has been the gold standard, recent trends favor minimally invasive approaches with limited skin incisions to reduce visible scars.

Several studies support the use of fewer fixation points. Fujioka et al³ demonstrated that 1-point fixation at the ZMC provides adequate alignment and rigidity for noncomminuted fractures. Davidson et al⁶ reported that 3-point fixation with mini-plates or interosseous wires offers minimal displacement, whereas 2-point fixation provides acceptable stability. Other studies suggest that 2-point fixation provides considerable stabilization, and 3-point fixation offers the highest stability, though this may not be necessary in most cases.^{7,8} Studies have shown that 1-point fixation can yield excellent aesthetic and stabilization results.^{9,10} Chen et al¹¹ reported that high surgical stability could be achieved with 1-point fixation using a single vestibular approach. Kim et al¹² also found that in cases of ZMC fractures without compound fractures, one-point fixation provides sufficient stability.

The evaluation parameters included the visibility of the scar for aesthetic considerations and the alignment of the bone fragments for functional outcomes.

The lateral eyebrow incision can leave an unsightly scar and is at risk of palpability. Therefore, we prefer to use the upper palpebral skin crease access, which provides excellent exposure to the surgical area while minimizing visible scarring due to its location within a natural skin fold, resulting in virtually invisible residual scarring. In addition, Keen first described the intraoral gingivobuccal sulcus incision in 1909 for the reduction of depressed ZAs. We adopt Keen's intraoral approach for 1-point fixation in the zygomatic buttress region, as this method significantly reduces the risk of palpability and avoids the formation of extraoral scars, offering a superior cosmetic result.¹³ These techniques are selected to enhance the overall aesthetic outcome while maintaining surgical efficacy.

As the ZMC is not constantly subjected to forces, unlike the jaw with its opening and closing movements, and based on the literature, we believe it is reasonable to minimize fixation points to reduce surgical access and the amount of hardware required.

This approach decreases the invasiveness of the procedure and reduces the risk of complications associated with extensive surgical exposure. Although no literature, at the time of this writing, reports the feasibility of fixing the lower orbital rim through intraoral access, our experience suggests that this is possible in patients with high soft tissue elasticity, allowing us to achieve the necessary fixation with minimal scarring and reduced operative trauma. However, when intraoral access is not feasible, and fixation is required, we prefer the transconjunctival approach with canthotomy. This technique provides adequate exposure while minimizing visible scarring and preserving the aesthetic integrity of the patient's facial features.^{14,15} These choices are guided by the principle of achieving the best functional and aesthetic outcomes with the least invasive surgical interventions.

Isolated ZA fractures typically result from a direct orthogonal force to the temporal region, leading to a depression at the fracture site.⁴ This depression may not be immediately apparent due to significant swelling. When the fractured arch impinges on the coronoid process, it can restrict mouth opening and limit mandibular motility, although the primary concern with most fractures is aesthetic. The choice of treatment should be guided by the degree of displacement and comminution. For nondisplaced or minimally displaced fractures, reduction can often be achieved through a percutaneous hook, transcutaneous temporal approach, or intraoral approach, generally without the need for internal fixation.

While the transcutaneous approach typically presents minimal surgical challenges, it is time-intensive due to the need to isolate the temporalis fascia. Despite being performed within the hairline, this approach carries the potential for nonaesthetic scarring and poses a risk to the temporal branch of the facial nerve. Thus, when feasible, we prefer the intraoral approach, as it avoids visible scarring and minimizes the risk of nerve damage, providing a more cosmetically favorable outcome without compromising the effectiveness of the reduction.

CONCLUSIONS

Our experience and current literature affirm that our "Scarless Surgery" approach is safe and reliable. The main advantage of this approach is the possibility of avoiding extensive incisions and minimizing the use of synthesis hardware without additional risk to patients. This approach not only aligns with contemporary trends towards minimally invasive procedures but also sets a new standard in the management of facial trauma surgery, offering a safer and more aesthetically favorable alternative to traditional methods.

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