ISSN: 3033-3555

Research Article

Journal of Stomatology & Dental Research

Sphenozygomatic Suture Key Landmark for Reduction of Zygomatic Complex Fracture: Retrospective Study

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Received: November 20, 2025; **Accepted:** November 26, 2025; **Published:** December 02, 2025

ABSTRACT

Zygomaticomaxillary complex (ZMC) fractures contributes magnificent effects on the facial width, projection as well as the integrity of the orbit. In this retrospective study performed between 2023-2024 by a group of 15 patients operated in service hospitals, the importance of SZ suture reduction and fixation is assessed as it improves the stability and precision of the fracture in ZMC management. Earlier Patients were either undergo fixed two-point, three-point but now days four-point, which included suture stabilization of SZ through subciliary, upper, or transconjunctival techniques. The outcomes showed that four-point fixation, which involved SZ suture stabilization, increased the displacement resistance and better postoperative reduction than the three-point fixation. The strategic location of the SZ suture in the orbital lateral wall provides the methodological method of reliable anatomical restoration with minimal tissue distraction and minimizes many of the risks, including temporal hollowing. Discussion points out its use in delivery of three-dimensional stability, positive aesthetic and functional results, and, as a repeatable landmark fractures. Although the small size of the study sample and short follow-up are limiting factors, the research substantiates the use of SZ suture fixation as a necessary supplement to traditional fixation points in ZMC fractures with lateral displacement that need to be confirmed in large studies.

Keywords: Zygomaticomaxillary Complex Fracture, Sphenozygomatic Suture, Four-Point Fixation, Zygomatic Buttress

Introduction

The most noticeable portion of the middle third of the facial bone structure, the ZMC fracture is essential for regaining facial width and projection. Because of its convex shape, it frequently fractures with other midface bones, disrupting important suture lines such as the Zygomaticofrontal, Zygomaticotemporal, Zygomaticomaxillary, and Zygomatic-sphenoid sutures. Clinical signs and symptoms vary depending on the displacement of the fracture site which also determines the location of the fixation, and surgical approach for open reduction and internal fixation. With the advent of advanced digital imaging high-resolution computed tomography (CT) scans in three-dimensional sections with bone and soft tissue windows provide a complete radiological visualization of the fracture, especially at the sphenozygomatic (SZ) suture region [1]. The SZ suture line is ranked as the most reliable positioning guide in the reduction of isolated fractures of ZMC or the rebuilding of the outer facial frame in major midface or panfacial trauma [2]. In most cases of severely fragmented, comminuted ZMC fractures, it is still feasible to achieve accurate zygoma reduction by controlling the gap and hinge at the SZ junction. The various research indicates that fixing a sphenozygomatic fracture improves strength and stability, although further comparisons are required to substantiate the theory. A trustworthy landmark during reduction is the zygomatic sphenoid suture, which is situated at the lateral orbital wall where it articulates with the sphenoid bone [3]. The idea behind this retrospective analysis was that SZ suture reduction and fixing are essential for reducing ZMC fractures.

Citation: Sneha Singh, Ajay Desai P. Sphenozygomatic Suture Key Landmark for Reduction of Zygomatic Complex Fracture: Retrospective Study. J Stoma Dent Res. 2025. 3(4): 1-4. DOI: doi.org/10.61440/JSDR.2025.v3.37

Material and Method

This study was performed between the years 2023 to 2024 and a total number of 15 cases of ZMC fracture treated in service hospitals by a multiple operator were retrospectively analyzed. Institutional review board approval was taken for the study. Out of 15 patients, females were 4 and the remaining were male patients. The average age ranged average females ranged from 21 to 45yrs and males from 16 to 55 years Table. All the cases underwent surgical intervention and were performed by multiple operating teams of surgeons.

Table 1

SNO	NAME	AGE	SEX	TYPE OF FRACTURE	TREATMENT DONE
1	SANTOSH	30	M	PANFACIAL #	ORIF UNDER GA
2	PARMESHWAR	25	M	ZMC COMPLEX #	4 POINT FIXATION
3	LILA	45	F	LT ZMC #	2 POINT FIXATION
4	SARWATE	32	M	RT ZMOC#	2 POINT FIXATION
5	NISHAN	27	M	PANFACIAL #	4 POINT FIXATION
6	SAGRIKA	31	F	ZMC COMPLEX #	3 POINT FIXATION
7	KAMLESH	29	M	ORBITOZYGOMATIC COMPLEX #	4 POINT FIXATION
8	AKASH	25	M	ZMOC# WITH ARCH	4 POINT FIXATION
9	YATENDRA	28	M	RT ZMOC#	2 POINT FIXATION
10	TRIBHUVAN BHAVYA	24	M	RT ZMC #	2 POINT FIXATION
11	MEENAL	30	F	RT ZMC #	4 POINT FIXATION
12	PRABHASH	25	M	PANFACIAL #	4 POINT FIXATION
13	RAMESHWAR	24	M	RT ZMC#	3 POINT FIXATION
14	KIRAN	31	M	LT ZMC#	2 POINT FIXATION
15	KUMBLE	28	M	RT ZMC#	3 POINT FIXATION

Inclusion Criteria

- Age greater than 16 years
- Availability of preoperative coronal and axial CT scans

Exclusion Criteria

- ZMC fractures along with orbital blowout fracture
- Individuals who exhibit obvious facial asymmetry
- Individuals who have already experienced a midface fracture
- Individuals with affected or medially rotated ZMC along the vertical axis, where the bony orbit's volume was altered.

ZMC fracture was analysed and treatment planning was determined according to the computed tomography before the surgery. Patients were divided according to the number of fixations, i.e., two-point fixation, three-point fixation, and fourth-point sphenozygomatic suture. We used the subciliary incision or upper eyelid approach to address the infraorbital rim, frontozygomatic and SZ sutures were reduced and utilized for fixation along with an upper vestibular approach for the zygomatic buttress (ZB) region (Figures 1, 2 and 3). The concept of fourth point fixation of sphenozygomatic reduction and fixation came into existence after 2012 [4] (Figure 4). The patients were clinically assessed intraoperatively after exposure of sphenozygomatic suture for anatomic reduction fracture segment realignment with greater wing of sphenoid and zygomatic bone. (Figure 5).

Figure 1: Panfacial Fracture

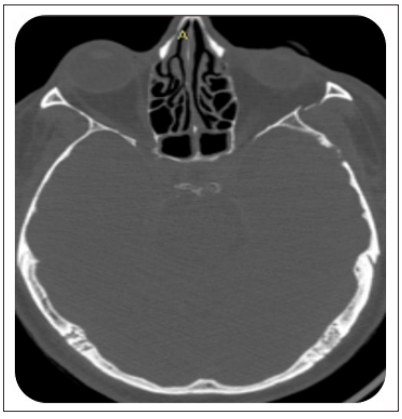

Figure 2: Sphenozygomatic Suture

Figure 3: Exposure of Sphenozygomatic Suture

Figure 4: Reduction and Palting of Sphenozygomatic Suture

Figure 5: Post OP PNS Veiw

Results

According to the study criteria, a total of 15 documented records for fracture ZMC were found. The total study sample consisted of 11 male patients and only 4 female individuals. The study sample's average age was 31.14 years (range = 23–47 years, SD = 6.87). Out of the fifteen cases, four had two-point fixation, five had three-point fixation, and six had four-point fixation, which includes sphenozygomatic suture, frontozygomatic suture, zygomatic maxillary buttress, and infraorbital rim fixation. The SZ suture was fixed and reduced at the fixation's fourth point using a subciliary incision, an upper eyelid approach, and a preseptal transconjunctival approach combined with lateral canthotomy. The average follow-up period for patients was between two weeks and six months. Post-operative PNS maxilla was taken to confirm that the amount of reduction was more significant as compared to three-point fixation.

Discussion

Despite of enormous literature on the epidemiology, incidence, and etiology of ZMC fractures, there is still a lack of information about a consensus in its treatment [5]. For proper reduction and fixation, severely comminuted ZMC fractures that require treatment of the ZA arch usually necessitate a broader exposure, primarily using a combination of anterior and posterior methods. This can be a 4-point or a 5-point fixation along with taking into consideration adequate reduction achieved at sphenozygomatic suture. To prevent functional and cosmetic failures such flattening of the malar eminence, ocular dystopia, diplopia, and enophthalmos, it is essential to accurately reduce and cure complex orbit zygomatic complex fractures. Adding sphenozygomatic suture reduction and fixation will add to a third-dimensional stability accurate reduction of the lateral orbital rim, which is crucial for maintaining orbital integrity, as well as for aesthetic and functional outcomes and reproducible landmarks in cases of pan facial or orbitzygomatic complex fracture, which improves precision and stability to the fixation. The exact force responsible for displacing the orbitozygomatic complex, whether muscle action, gravitational pull, soft tissue tension, swelling, or repeated trauma has yet to be clearly identified. In our case where the infraorbital rim and zygomatic maxillary buttress fractured, they cannot provide stability to the orbit zygomatic complex fracture so we used lateral orbital wall i.e sphenozygomatic suture as site for osteosynthesis making it more reliable and stable point for osteosynthesis. As we used titanium plates and screws being the most popular hardware materials due to their biocompatibility, strength, and ease of handling.

Additionally, buttresses are employed on a range of strength parameters. Although the frontozygomatic suture offers the strongest site for fixation, it serves as the least reliable reference for alignment. There is information on sphenozygomatic suture fixation, but not on fixation strength. According to cadaveric research by Rohner et al., sphenozygomatic suture fixation offers greater strength and stability than any other fixing point. There is insufficient information in our literature to compare standard four-point fixation with four-point fixation with sphenozygomatic suture, and standard three-point fixation with three-point fixation and sphenozygomatic suture. It has enormous significant importance in the alignment of fracture along sphenozygomatic suture as it helps in aligning of the orbit to zygomatic positioning.

With the advent of intraoperative CT along with Intraoperative three-dimensional C-arm imaging, many surgeons prefer to first reduce the fracture and then evaluate the appropriate reduction at sphenozygomatic suture which helps in evaluating ZMC fracture reduction. In addition, there appears to be no need for postoperative imaging. In medium-energy fractures, emphasis is given to confirming the SZ suture region reduction before fixation of the FZ suture region [6]. The approach of reducing and repairing the SZ suture was used to restore orbital bone volume in cases of laterally displaced ZMC fractures, where ZA fixation was deemed crucial via a lateroposterior route. SZ suture fixation should be carried out on the sphenoid bone's superior

temporal surface, with minimal tissue dissection and muscle elevation, to reduce the likelihood of temporal hollowing. The parietal bone of the skull is the known origin of the temporalis. Although challenges remain in complex fractures, the zygomatic sphenoid suture continues to be an essential tool in the surgical management of ZMC fractures, with ongoing research supporting its clinical utility.

We found in our study that four-point fixation including sphenozygomatic suture is more reliable and more resistant to displacement as compared to three-point fixation not involving sphenozygomatic suture. After clinical exposure of the fracture site, we can evaluate anatomic reduction which becomes confirmatory site adequate reduction of displaced ZMC component [7].

This study's short follow-up duration and small number of patients under investigation are its limitations. To validate the findings of this investigation, further individuals with ZMC fractures should be evaluated in the future.

Conclusion

In any fracture reduction that requires three-point fixation i.e. frontozygomatic suture, zygomaticomaxillary buttress, infraorbital rim fixation in a laterally displaced ZMC fracture adding third-dimensional stability by reduction and fixation of sphenozygomatic suture by using the same approach we used for fixation of either frontozygomatic suture or infraorbital rim using upper eyelid approach or subciliary approach to visualize the alignment of sphenozygomatic suture and better fixation strength can we achieve internally in the orbit.

Financial support and sponsorship: Nil

Conflicts of interest: There are no conflicts of interest

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