A study on coronal incision for treating zygomatic complex fractures

Sujith Kumar Shetty¹ · Saikrishna D² · Santosh Kumaran³ ✉

¹ Professor

² Professor and HOD

³ Postgraduate Student

Received: 26 March 2009 / Accepted: 12 June 2009

© Association of Oral and Maxillofacial Surgeons of India 2009

Dept. of Oral and Maxillofacial Surgery,
JSS Dental College and Hospital, S.S.
Nagar, Mysore

Abstract

Objective To study the value of coronal incisions for treating zygomatic complex fractures and evaluate the advantages, indications and complications associated with it.

Method In this prospective study, 12 patients were randomly selected regardless of age, sex requiring open reduction and internal fixation of comminuted zygomatic complex fractures with or without other associated fractures of the midface. Patients were all treated by coronal approach for open reduction and internal fixation of fracture of the zygomatic complex. Other local incisions were used if required.

Results In all cases postoperative complications were relatively minor except in one case where the temporal branch of facial nerve weakness persisted at 3 months. Whereas 5 cases reported with slight weakness of the temporal branch of the facial nerve which resolved at the end of 3 months. The time taken for exposure of the fracture site via the coronal incision had a mean of 28.7 minutes. There were no cases of flap infection and just 1 case of stitch abscess reported. The same case later reported with a hypertrophic scar formation of greater than 0.5cm at 3months. In all other cases scar formation was negligible and well hidden within the hairline. There were no reported cases of paraesthesia at the operated site or hollowing of the temporal fossa.

Conclusion The coronal incision provides excellent access to the zygomatic arch and zygomatic complex, aiding in good anatomical reduction and also has the added advantage of the scar hidden in the hairline. It also has disadvantages like long operating time, risk of facial nerve injury, scarring in patients with male pattern baldness, paraesthesia of operated site etc. Therefore the incision should be judiciously used and not overused and indications strictly applied.

Keywords Zygomatic complex fractures · Coronal incision

Address for correspondence:

Santosh Kumaran

Dept. of Oral and Maxillofacial Surgery
JSS Dental College and Hospital
S.S. Nagar, Bannimantap
Mysore-570 015
Karnataka, India
Ph: +91 9886269275
Email: santoshkumaran@yahoo.com

Introduction

The zygoma, a major buttress of the facial skeleton, is the principle structure of the lateral midface. Since the gross shape of the face is influenced largely, by the underlying osseous structure, the zygoma plays an important role in facial contour.

Zygomatic fractures represent either the most common facial injury or the second in frequency after nasal fractures. The high incidences of these fractures probably relates to the zygoma's prominent position within the facial skeleton [14]. Collapse of the zygomatic arch following trauma results in inadequate anteroposterior projection of

the zygomatic body and an increase in facial width.

In treating fractures of the zygomatic complex, various approaches and surgical incisions have been described (Michelet et al. 1973), the coronal being one of them. Traditional closed techniques still compete with total exposure of all the fracture lines by multiple incisions (Manson et al. 1985), or routine coronal incisions (Gruss et al. 1990) [1].

The bicoronal flap (bifrontal, bitemporal) has been used by neurosurgeons to gain access to the anterior cranium for nearly a century. It was first described by Hartley and Kenyon in 1907, and two

decades later was advocated by Sachs for bilateral frontal lobe exposure [3]. However, it did not gain widespread acceptance in maxillofacial surgery until the 1970's when Tessier and later Henderson and Jackson reported excellent access that it provided for Lefort II and Lefort III osteotomies. The flap itself permits widespread exposure of the skull, and upper and lateral midfacial skeleton, with minimal morbidity [3].

The ideal surgical approach to treat fractures of the zygomatic complex should provide maximum necessary exposure of the fractured segments, minimize potential for further injury to facial structures and enable good cosmetic results [1].

This clinical study was to report the results of the coronal surgical incision to treat zygomatic complex fracture to evaluate and assess surgical access, advantages, indications and complications associated with it and to evaluate the value of the Coronal Surgical Incision for treating Zygomatic Complex Fractures.

Patients and methods

In this prospective study of coronal approach for treating zygomatic complex fractures, 12 patients were drawn from the department of oral and maxillofacial surgery, with the period of study being from July 2006 to August 2008.

Patients were randomly selected regardless of age, sex requiring open reduction and internal fixation of zygomatic complex fractures with or without other associated fractures of facial skeleton. Only patients with a well defined hairline were selected for this study.

Patients with preoperative facial nerve weakness, preoperative neurosensory deficits of the scalp and previously operated by the coronal incision were not included in the study.

Patients with comminuted zygomatic complex fractures, grossly displaced fractures and old fractures and other associated midface fractures were included in the study.

All cases were treated under general anaesthesia with naso-tracheal intubation. The coronal incision began at the upper attachment of the helix and extended transversely over the vault of the skull to the midline. The incision can be slightly curved forward at the vertex of the skull following the hairline, but posterior to it. The flap was raised leaving the periosteum intact. The periosteum was incised about 3 cm above the supraorbital ridges and the dissection was then completed subperiosteally.

The lateral dissection followed the outer surface of the temporalis fascia to approximately 2cm above the zygomatic arch. At that point where the temporalis fascia splits into 2 layers, an incision running anterosuperiorly at 45° was made through the superficial layer of the temporalis fascia to spare the frontal branches of the facial nerve. This incision was connected anteriorly with the lateral or the posterior limb of the supraorbital periosteal incision. Once the plane of dissection was established deep to the superficial layer of the temporal fascia the dissection was continued inferiorly until the periosteum of the zygomatic arch was

Fig. 1 Preoperative photograph

Fig. 2 Preoperative radiograph (Water's view)

Fig. 3 Fractured zygomatic arch

Fig. 4 Reduced and fixed fracture

Fig. 5 Postoperative radiograph (Water's view)

reached. The periosteum was then incised and reflected laterally over the arch, the body of zygoma and the lateral orbital rim. Reflection of this and the periosteal region provided exposure of the frontal bone, the upper part of the nose and the nasoethmoidal region, the roof, medial and lateral walls of the orbit, the zygomatic bone and the entire zygomatic arch. Other incisions like the intraoral vestibular and the infraorbital were added for further exposure when necessary.

After reduction and fixation of the fragments, the periosteum and the temporal fascia were sutured with 2-0 vicryl, galea and skin were closed in layers with 2-0 vicryl and surgical staples respectively. Suction drains were used in all patients and pressure dressing applied for 48 hours.

Patients were assessed for type of fracture, time for exposure, access, reduction of fracture (radiologically) and complications namely early complications like haemorrhage, haematoma, infection and swelling of the operated site, neurosensory loss of the operated site, temporary weakness of the temporal branch of facial nerve and late complications like, permanent paralysis of the facial nerve, obvious scarring of the incision, alopecia, depression of the temporal fossa.

All cases have been followed up for minimum of 3 months in intervals of 1 week, 15 days, 1 month and 3 months.

Results

All the patients within the series were male, with a mean age of 32.33years (range 22–55years). Etiological factors present in this

series of cases were road traffic accident (75%), others (self fall/occupational injury) 25%. More than sixty six percent of fractures (66.7%) were Zygomatic complex associated with zygomatic arch.

In more than forty one percent (41.7%) of cases the hemicoronal incision alone was sufficient for complete exposure of the fractures and adequate reduction, whereas in about fifty eight percent of cases (58.3%) additional incisions like the intraoral vestibular, infraorbital were required for complete exposure. The average time taken for exposure of the fracture site by the coronal incision was 28.7 minutes with values ranging from 25 minutes to 40 minutes. Surgical access to the fracture site as assessed by the operating surgeon was good in 41.7% of cases and excellent in 58.3% of cases.

More than ninety one percent (91.7%) of cases did not encounter any form of infection and stitch abscess was recorded in only 1 case (8.3%). There was no reported case of the coronal flap getting infected. Temporal branch of facial nerve weakness which persisted at 2 weeks postoperatively was encountered in 5 cases (41.7%) There was complete recovery of function in these cases at the end of 3 months. 1 case (8.3%) had a weakness of the facial nerve which persisted at the end of 3 months. No cases of postoperative haemorrhage, haematoma, neurosensory loss at the operated site, alopecia or temporal fossa hollowing were reported. Only one case of hypertrophic scar formation (8.3%) was reported. This was also the case which presented with the stitch abscess.

Discussion

In our study, we used the classical hemicoronal incision as advocated by Abubaker AO and colleagues in their study on the coronal incision for craniomaxillofacial injuries (1990) [5] and Zhang QB and colleagues (2006) [1]. Five (41.7%) cases were treated with the hemicoronal incision, whereas seven (58.3%) cases required additional local incisions. Whereas in the study mentioned above out of 83 patients, 69 were treated by the hemicoronal and the rest 14 via local incisions only.

Marshall MA et al. (1988) [11], Shepherd DE et al. (1985) [4], Abubaker AO et al. (1990) [5] have all reported excellent access to the upper midfacial skeleton, supraorbital margin, frontonasal

suture, nasoethmoidal suture, lateral orbital region by the coronal surgical incision, our results correlates with the above reported findings.

In our study we calculated the time taken for the exposure of the fracture from the moment the incision is placed and dissection is carried out upto the zygomatic arch. The timings ranged from a minimum of 25 minutes to a maximum of 40 minutes with a mean timing of 28.75 minutes. Marshall et al. (1988) [11], Zhang et al. (2006) [1] have reported long operating times with the coronal incision, especially for craniofacial procedures.

In our series of 12 cases no evidences on haematoma was recorded. Suction drains and pressure dressing for 24 hrs were applied for all cases in our study. Shepherd et al. (1985) reported just one case of haematoma formation in a series of 24 cases [4]. Abubaker et al. (1990) reported 2 cases out of 28 patients with haematoma [5].

We had no cases of flap infection. And in only one case we had a stitch abscess which resolved on removal of sutures and antibiotic therapy. The findings are similar to various studies published. Frodel et al. (1993) [10] reported that in the study conducted on 100 patients, no cases of flap infection occurred, whereas just 4 cases of stitch abscess was noted, which resolved on removal of sutures.

Frodel et al. (1993) [10] reported permanent neurosensory loss of the scalp apex in 4 patients and transient loss, which recovered in 14 cases out of 100 cases. Shepherd DE et al. (1985) [4] had 6 patients out of 24 who had sensory loss of the scalp apex out of which 3 returned to normal at 1 year, 1 persisted at 2 years and 1 patient lost to followup. In our series of cases none of the patients reported with any neurosensory loss.

In our study 5 patients (41.7%) had a facial nerve weakness which persisted at 2 weeks but resolved with one month. Only one case (8.3%) had a weakness persisting at 3 months. Patient reported slight improvement on subsequent appointments and needs to be followed up long term. In the series published by Frodel et al. (1993) [10] he reported 9 patients with temporary motor weakness and 2 patients with permanent facial nerve weakness.

In the present study only one case had a scar greater than 0.5cm at 3months. In the series by Zhang et al. (2006) [1] 6 cases suffered from scar wider than 0.5cm. in the series by Abubaker et al. (1990) [5] one case out of 28 suffered from a scar on 3cm.

Conclusion

The coronal flap has been found useful in the management of trauma of the midface and upper facial skeleton.

On one hand coronal incisions offer advantages like an excellent and extensive approach to the zygomatic arch and zygomatic complex, aiding in ensuring exact anatomical reduction of the fractures and also a well hidden scar within the hairline. On the other hand it also has its disadvantages like long operating time, risk of facial nerve palsy, obvious scarring in patients prone for male pattern baldness, paraesthesia of the operated site, depression of temporal fossa in a few reported cases.

Therefore patient selection and application of the indications for the coronal incision namely multiple fracture of the zygomatic complex and midface, comminuted fractures of the zygoma and old fractures are of paramount importance. This incision should be not be overused and should be judiciously used.

References

1. Zhang QB, Dong YJ, Li ZB, Zhao JH (2006) Coronal incision for treating zygomatic complex fractures. *J Craniomaxillofac Surg* 34(3): 182–185
2. Pogrel MA, Perott DH, Kaban LB (1991) Bicoronal flap approach to the temporomandibular joints. *Int J Oral Maxillofac Surg* 20(4): 219–222
3. Kerauola CJ, Grime RJ, Stassen LF, Perry M (2000) The bicoronal flap (craniofacial access): an audit of morbidity and a proposed surgical modification in male pattern baldness. *Br J Oral Maxillofac Surg* 38(5): 441–444
4. Shepherd DE, Ward-Booth RP, Moos KF (1985) The morbidity of bicoronal flaps in maxillofacial surgery. *Br J Oral Maxillofac Surg* 23(1): 1–8
5. Abubaker AO, Sotereanos G, Patterson GT (1990) Use of the coronal surgical incision for reconstruction of severe craniofacial injuries. *J Oral Maxillofac Surg* 48(6): 579–586
6. Thangavelu A, Ramesh C, Yoganandha R (2007) Frontotemporal approach for the management of zygomatic complex fractures. *J Maxillofac Oral Surg* 6(2): 11–13
7. Matic DB, Kim S (2008) Temporal hollowing following coronal incision: A prospective, randomized, controlled trial. *Plast Reconstr Surg* 121(6): 379e–385e

8. Fox AJ, Tatum SA (2003) The Coronal Incision: sinusoidal, sawtooth, and postauricular techniques. *Arch Facial Plast Surg* 5(3): 259–262
9. Posnick JC, Goldstein JA, Clokie C (1992) Advantages of the postauricular coronal incision. *Ann Plast Surg* 29(2): 114–116
10. Frodel JL, Marentette LJ (1993) The Coronal Approach: Anatomic and technical considerations and morbidity. *Arch Otolaryngol Head Neck Surg* 119(2): 201–207
11. Marschall MA, Cohen M, Garcia J, Schafer ME (1988) Craniofacial approach for the reconstruction of severe facial injuries. *J Oral Maxillofac Surg* 46(4): 305–310
12. Gruss JS, Van Wyck L, Phillips JH, Antonyshyn O (1990) The Importance of the zygomatic arch in complex midfacial fracture repair and correction of posttraumatic orbitozygomatic deformities. *Plast Reconstr Surg* 85(6): 878–890
13. Yavuzer R, Jackson IT (1999) Coronal incision extending postauricularly. *Plast Reconstr Surg* 103(5): 1532–1533
14. Fonseca Raymond J, Robert V. Walter (2005) *Oral and Maxillofacial Trauma*, Pennsylvania; W.B.Saunders Company, 2nd edition Vol 1: 569–642

Source of Support: Nil, **Conflict of interest:** None declared.