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CORONAL APPROACH FOR MANAGEMENT OF CRANIOMAXILLOFACIAL TRAUMA: A CASE REPORT AND LITERATURE REVIEW

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CASE REPORT

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The coronal approach with its modifications is considered to be the most versatile approach for skull and midface surgeries. It was first proposed by Tessier and since then has been used in head and neck trauma and reconstructive procedures. It gives the best aesthetic outcome since the surgical scar is hidden within the hairline. Although it has gained great momentum given its range of access to the forehead and most of the upper midface, it has certain drawbacks. We present a case of a patient with frontal bone fracture secondary to trauma where a coronal approach was used for internal fixation of fractures. This article also gives a brief description of the surgical procedure, merits, demerits and clinical application.

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INTRODUCTION:

The treatment of complex craniofacial fractures necessitates the selection of an appropriate surgical approach. The factors determining the surgical approach in this region include the degree of access, aesthetics and potential morbidity to critical structures of the face.(1,2) Although transoral and other

relatively inconspicuous incisions are available, they fail to provide access to certain areas of maxillofacial skeleton.

To overcome the above drawbacks, Hartley and Kenyon in 1907 described the coronal approach which was later modified by Babcock in 1912 (3,4). It was later popularised among cranio-maxillofacial surgeons. After

Tessier, Henderson and Jackson utilized it for Le Fort II and III Osteotomies, reporting its excellent access for these procedures (5,6).

The primary objective in the treatment of facial fractures is healing without postoperative morbidity or long-term deformities. Initially used in the treatment of nasofrontal injuries, the coronal incision later gained popularity for its wide visualization of the operative field. Subsequently, it was being used in cases of fractures involving frontal, naso-orbitoethmoid (NOE), severely comminuted or displaced zygomatic arch and its components; reduction and fixation to reestablish the facial contour as required.

Numerous indications for the coronal approach include severe craniomaxillofacial trauma, craniotomy procedures, management of craniofacial deformities, osteotomies of upper and middle third of face, harvesting of bone and fascial grafts when indicated (7,8), for improved access to condylar regions (9), and also for forehead rejuvenation (10).

The patterns of incisions have also varied over the years. From the routinely used bow-line incision it has progressed to geometric incision patterns like the wave-line pattern, zig-zag pattern, saw-tooth pattern all of which aim to minimise alopecia along the incision line and result in a better aesthetic outcome.

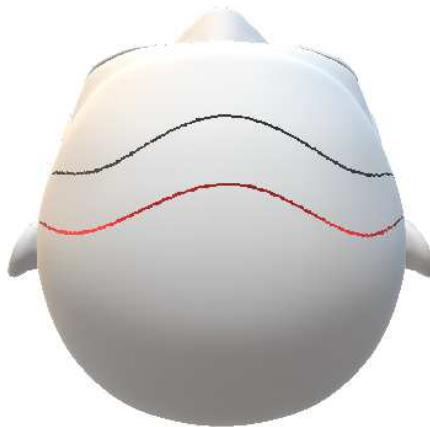


Fig. No. 01: Marking of coronal incision in bow-line pattern (red line) 4-5 cms behind the hairline (black line).



Fig. No. 02: Geometric patterns of coronal incision

CASE REPORT:

A 20-year-old male, presented at the emergency department sustaining facial injuries. He was involved in a road traffic accident and was semi-conscious at the time of examination. He had a history of epistaxis with no other injuries. There was no history of cerebrospinal fluid rhinorrhea/otorrhea. The patient was stabilized according to the Advanced Trauma Life Support protocol and

was then attended by the maxillofacial surgery team.

On examination, the patient had a visible depression of the forehead in the midline with a small overlying sutured laceration. On palpation there was step deformity palpable over bilateral supraorbital rims. CT scan of head and paranasal sinuses showed fracture of anterior table of frontal sinus with an intact posterior table and no underlying head injury.



Fig. No. 03: Axial section of CT scan showing anterior table of frontal bone fracture

The patient was taken up for surgery under general anaesthesia, 3 days' post-trauma. Frontal bone fracture was accessed through bicoronal incision which was marked anteriorly over the vertex, leaving 4 – 5 cm hairline in front in wave-line pattern. Inferiorly, it was extended upto the pre-auricular region. Local anaesthesia with vasoconstrictor was infiltrated into the subgaleal plane for hydrostatic dissection. The

initial scalp incision extended from one superior temporal line to the other and made with a No.10 blade. The dissection proceeded in the subgaleal plane 2-4 cm anteriorly. While raising of the anterior and posterior wound margins, bleeding vessels were cauterized and hemostatic forceps were sequentially applied. The dissection of the coronal flap in the subgaleal plane was continued to the level of the supraorbital rims and the pericranium was

incised horizontally across the forehead at a point 2-3 cm above the superior most fracture line. The dissection was then continued in the sub-pericranial plane to expose the fracture

site. The supraorbital foramen was found and converted into a notch using a small osteotome to remove a small bone wedge underneath the bundle and its subsequent release.

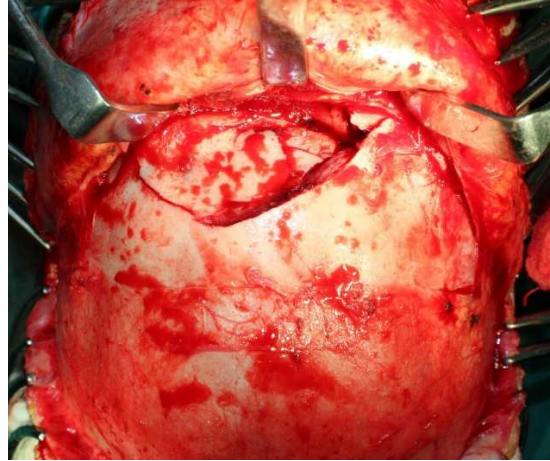


Fig. No. 04: Exposure of frontal bone fracture using coronal incision

The depressed fracture segment of the anterior table of frontal sinus was identified and elevated using fine tip periosteal elevators. The reduced anterior table was stabilized with 1.5 mm titanium mesh and 1.5 x 4 mm titanium screws. A no. 14 drain was secured in place and closure achieved in layers using 2-0 polyglactin resorbable sutures and skin closure using staples. A compressive head dressing was placed to prevent hematoma formation underneath the coronal flap. Post-operatively

no CSF leak was observed and projection was found to be adequate. Patient did not complain of sensory disturbances. However, patient complained of a headache which lasted for 2 days post-operatively. The scalp skin sutures/staples were removed 10 days postoperatively. Patient was followed up for 1 week, 1 month, 3 months and 6 months. The incision line was well hidden within the hair and no alopecia was noted along the hairline.

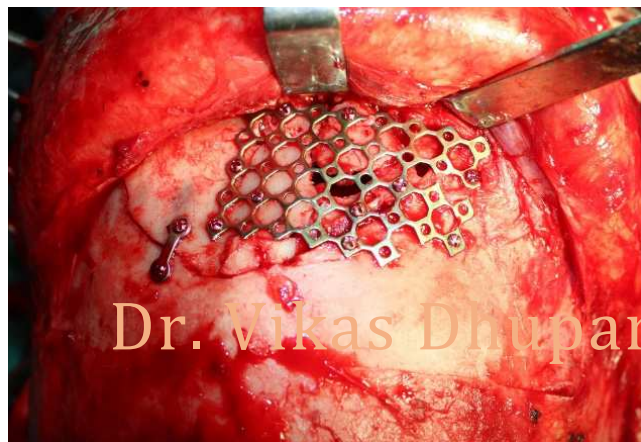


Fig. No. 05: Reduction and fixation of fracture segments**DISCUSSION:**

The coronal approach was routinely performed by the neurosurgeons to gain access to the neurocranium. It has gained popularity in the 21st century in the field of craniomaxillofacial surgery for exposure of the craniofacial skeleton including the orbit and nasal bones. The coronal flap provides access to the frontal, temporal and zygomatic regions, hence the reconstruction of orbit, zygoma, frontal and NOE regions is accomplished without the need for any facial incisions.

Shumrick *et al.*, demonstrated the role of extended access or internal approaches for the management of facial trauma and concluded the virtual possibility to expose the entire facial skeleton with subperiosteal dissection providing wide exposure with camouflage or internal mucosal incisions. This improved exposure allowed for accurate fracture reduction taking full advantage of various plating systems (11,12). Other studies on treatment of zygomatic complex fractures suggest that this approach facilitates accurate reduction and fixation of all the fractures fragments (13).

In this case, the bicoronal flap approach proved to be more efficient both in terms of access and exposure. There was minimal edema in first post-operative period which in turn reduced in subsequent days. Although literature suggests significant incidence of hair loss due to injury to hair follicles in the incision line (9), we never encountered this complication in this case. After hair growth there was no evidence of scar and it was found to give very aesthetic results. Other demerits include increased chances of blood loss intraoperatively, patient incomppliance to this apparently extensive surgery and meticulous followup.

Approximately one third of frontal sinus fractures involve the anterior table alone, with two thirds involving the combined anterior and posterior table, or frontonasal

approach helps in adequate management of these fractures as access is the key to successful treatment outcomes. Hence, in the standard treatment modality of frontal sinus fractures, repair is best performed by way of a coronal approach, which offers excellent access (14,15)

Within its merits this was the ideal approach for accessing anterior table of frontal sinus fracture and can also be used to access most structures of the midface.

CONCLUSION:

The Bicoronal flap is an indispensable approach for accessing the skull and mid facial region.

Although the procedure appears to be extensive, it is less likely to cause morbidity compared to other surgical access procedures used for exposure of midface. However, it requires careful attention to be paid to vital structures as well as a long learning curve to master this ingenious technique. Adequate presurgical planning of incision coupled with a skilled surgeon ensures a successful patient outcome.

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