Rotation flap distraction osteogenesis for unicoronal synostosis

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Unicoronal craniosynostosis is notoriously difficult to treat, with long-term studies demonstrating high rates of relapse and the need for reoperation using open fronto-orbital advancement. Applying the principles of distraction osteogenesis to cranial vault remodeling has demonstrated promising short-term results that compare favorably with traditional methods, with simultaneous correction of both frontofacial and endocranial morphology, along with significant increases in intracranial volume. Here, the authors demonstrate their technique for rotation flap distraction osteogenesis in the treatment of unicoronal synostosis and provide case examples.

The video can be found here: https://vimeo.com/519505008
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slightly beyond the midline on the contralateral side and a curved back cut was designed anterior to the intact coronal suture. The apex of rotation is the lateral orbital rim of the contralateral side. The lateral orbital rim acts as the hinge and pedicle of the rotation flap and provides connection to the native vascularized bone and functional sutures.

3:05 Burr Hole Creation. Burr holes are then created to allow for insertion of the craniotome. Care is taken to ensure that the burr holes are kept off of the orbital bandeau.

3:19 Osteotomies. The dura is elevated off the sphenoid wing and temporal fossa, extending onto the bilateral orbital roofs. An osteotomy is performed along the greater wing of the sphenoid utilizing a reciprocating saw.

3:35 Ultrasonic Osteotomies. These osteotomies are then extended into the lateral orbital rim on the affected side with an ultrasonic saw. The orbital osteotomies along the medial wall are connected across the radix. The osteotomy is only partially completed through the unaffected zygomaticofrontal suture.

3:57 Bone Flap Rotation. At this point, the frontal craniotomy is allowed to remain in situ, and both it and the fronto-orbital bar are able to be hinged off the unaffected side. The bone flap is not advanced in a straight-line manner, but rather along a curvilinear vector. The osteotomized portion of advancement flap moves anteriorly while the nonosteotomized part stays in situ, giving a rotational movement.

4:18 Frontal and Bandeau Plating. The frontal craniotomy flap is then secured to the fronto-orbital bar with resorbable plating, restoring a more convex anatomical relationship between the superior rim and the frontal bone before both segments are rotated forward as a unit.

4:35 Placement of DistraCTOR. The distractor appliance is then introduced into the field and situated laterally between the craniotomy flap and the intact posterior vault and secured to allow for an anterior-inferior vector of advancement. While the same overall technique is used in each case, setting distraction vector and amount of over-correction requires clinical judgment.

4:53 Distractor Advancement. The distractor is advanced in situ to ensure the appropriate vector has been chosen. It is fully closed prior to temporalsis resuspension and closure.

5:11 Temporalis Resuspension. The temporalis muscle is resuspended to the fronto-orbital bar resorbable plates with a back cut to avoid tethering the frontal bone and fronto-orbital bar. The distractor is again activated to ensure that the temporalis was not tethering the advancement and also that there is no buckling along the bony flaps.

5:40 Closure. A drain is left beneath the scalp, and the scalp is closed with a series of buried galeal 3-0 Vicryl suture followed by a running 3-0 chromic.

5:48 Postoperative Care. Postoperatively, patients are admitted to a regular ward bed. Distraction is started on postoperative day 3 at a rate of 1 mm per day, aiming for overcorrection to compensate for more overall growth on the unaffected side over time. Patients are usually sent home on postoperative day 3. Total distraction averages 27 mm. Following distraction, patients undergo a consolidation period of 8 weeks after which the device is removed in a planned second operation.

6:12 Postoperative Result. Three months postoperatively, the patient demonstrates greatly improved forehead and supraorbital rim contour and symmetry and is ready for distractor removal.

6:25 Postoperative CT. Postoperative CT scan approximately 3 months postoperatively demonstrates excellent restoration of cranial and facial proportions and osteogenesis occurring in the distracted area.

6:37 Long-Term Clinical Example—Preoperative. Here we demonstrate a clinical example of a patient with right unicoronal synostosis who underwent rotational flap distraction osteogenesis.

6:49 Long-Term Clinical Example—4 Years Postoperative. Four years following completion of distraction and removal of distractors, the patient demonstrates excellent overall symmetry and durability of repair.

7:12 References

References


Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this publication.

Author Contributions


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