4.3 Surgical Management of anterior skull synostosis

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Today’s Topics
(Anterior Skull Synostosis)

✓ Trigonocephaly

✓ Anterior plagiocephaly
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Trigonocephaly

Premature fusion of the metopic suture.

Obvious ridge of the midline due to the ossification of the suture.

Restriction of the lateral growth of the frontal bone.

The number of this pathology is increasing.

Keel-shaped forehead

2nd single suture synostosis in terms of incidence.
Classification

Nasion-Pterion Angle (Oi et al. 1986)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Severe</th>
<th>Moderate</th>
<th>Mild</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 89°</td>
<td>90～85°</td>
<td>96～103°</td>
<td>104° &lt;</td>
</tr>
</tbody>
</table>

Frontal stenosis (Bottero et al. 1988)

Intra-parietal distance (IPD) / Intra-coronal distance (ICD)

<table>
<thead>
<tr>
<th>Final Mental Development</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>0.05</td>
<td>0.07</td>
<td>0.11</td>
</tr>
<tr>
<td>IPD/ICD (means)</td>
<td>1.21</td>
<td>1.27</td>
<td>1.29</td>
</tr>
</tbody>
</table>

Level 1 Normal child IQ ≥ 90
Level 2 70 ≤ IQ < 90
Level 3 Special program IQ < 70

Normal Children 1.21 (Shimoji et al. 2002)
✓ Missdiagnosed condition

Metopic Crest

Ridging of the metopic suture 10%
(n=2554)
Duncan and Shapiro 1989

25% estimated metopic ridging in
Kindergarten children
Gruss 1997

Courtesy of Dr. F Di Rocco (2013 ESPN course)
Imaging

Craniogram

CT imaging
Surgical Indication

Purpose

Obtain the normalization of the anterior skull fossa volume and to correct the abnormal position of the superior orbital ridges and the hypotelorysm.

Cases which has
  cerebral compression
  Hypoterolism
  deformation of the orbital roof

Metopic Ridges are not considered an indication for any surgery
History of treatment

1921  Mehner : removal of the fused suture
1960  Matson : Strip craniectomy (first 4 months of life)
1962  Anderson : simple cranial vault procedure.
1968  Shillto : “provide at minimal risk the best chances for the brain to expand the skull into its normal configuration”
1976  Hoffman & Mohr : advancement of the lateral canthal segment

*Fronto-supraorbital advancement*

“minimal invasive surgery”
Distraction osteogenesis
Springs
Endoscopic surgery
**Surgery**

This disease is caused not just by a closure of the metopic suture but resulted of a more widespread developmental problem involving the anterior skull base, causing posteromedial rotation of the upper lateral quadrant of the orbital rim.

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*Fronto-supraorbital advancement*

*Department of Neurosurgery Juntendo University School of Medicine*
Various procedures

Paris

Rome

Lilles

Fronto-supraorbital advancement
Our Surgery

Arterial Catheter
2 venous iv route

Zig zag skin incision.

Four Burrholes

Remove the frontal bone flap.

Fronto-supraorbital advancement

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Our Surgery

Cut the superior lateral side of the orbit.
Put small barrel stave in the orbital bar.
Leave the medial side intact.
Move the orbital bar anteriorly: Green stick fracture.
Our Surgery

- Cut out a bone flap
- Temporal muscle attached
- Fix the orbital bar, temporal bone flap and the skull with an absorbable plate.
Our Surgery

Barrel staves in the frontal bone flap, put it back with 180 degrees rotation. Fix it with absorbable plates.
Extending the orbital bar with blood supply.

Advance the temporal bone attached with the temporal muscle to avoid temporal hollowing.
Our Surgery

Pre-Op

Post-Op
Minimum Invasive?

Endoscope

Springs

Correction of the anterior fossa?  The less severe type of trigonocephaly?
Complication case

Case: 3 month old Boy

✓ Diagnosed Trigonocephaly at birth. (39w2d 2288g)

✓ No obvious anomalies except a keel shaped forehead and hypotelorism.

✓ Cranioplasty scheduled when he was 3 month old.
Patient History

✓ Uneventful gestational period.
✓ AV block recognize in ECG
✓ Normal lab data in preoperative exams.
Surgical procedures
Postoperative course

- Management in the ICU
- Vital signs stable.
- Blood loss from the subcutaneous drainage and from the incision.
- Transfusion (+).

- Although supplying blood, Lab data did not improve.
- HR ↓  BP ↑
Outcome

Pre Op (3M)  Post Op (2 y.o.)
Assessment & Analysis

✓ Post op bleeding in cranioplasty continues.

✓ Idea of DIC due to subcutaneous bleeding.

✓ Should be cautious for the risk of “greenstick fracture”
In the Literature

Perioperative Complications Associated With Intracranial Procedures in Patients With Nonsyndromic Single-Suture Craniosynostosis

Youssef Tahiri, MD, CM, * James Thomas Paliga, BA, † Ari M. Wes, BA, † Linton A. Whitaker, MD, † Scott P. Bartlett, MD, † and Jesse A. Taylor, MD †

Current complication rate: 0-16.5% (Including syndromic synostosis)

34 complications (4.6%)

Major 8 cases (1.1%)

1 mortality w/ congenital hypoplastic left-heart.
4 surgical site infection needed debridement
2 epidural/subdural hematoma
1 subarachnoid hemorrhage

746 procedures

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To avoid complications

Not a Super difficult skull base surgery & Not a fatal disease.

✓ Hemostasis, Hemostasis, Hemostasis!!

✓ Problems will occur during recovery.

✓ Do not hesitate to order a scan if something is wrong.

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mendations
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Plagiocephaly

The term “plagiocephaly” was introduced by Virchow in 1851 from the Greek word slanted or oblique.

This condition is complicated because it leads to an underdevelopment of the anterior fossa, flattening of the frontal bone and the orbit, also affects the facial bones.
Classification

Group I and IIA: Excellent outcome

Group IIB and III: Further correction needed

Di Rocco C et al 1988
✔ Missdiagnosed condition
Position Plagiocephaly
Summary of Clinical Examination

Synostotic
- Nasal root deviated towards side of deformity
- Ipsilateral ear pulled forward on side of deformity
- Orbital shape asymmetric

Deformational
- Nasal root straight
- Ipsilateral ear pushed back
- Orbital shape normal
- Check for skeletal or muscular torticollis

Courtesy of Dr. Solanki (2013 ESPN course)
Imaging

Craniogram

CT imaging
Surgery
☑ Outcome
Thank you for your attention
SAVE THE DATE