Real-time monitoring of the growth of the nasal septal cartilage and nasofrontal suture

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Nasal septal cartilage plays an active role in midfacial growth

“Craniofacial sutures serve as a major postnatal growth site” Opperman 2000

The nasal septal cartilage: “In its growth it separates the facial bones from one another and from the cranial portion of the skull and allows growth to take place at the sutures” Scott 1953

Septal cartilage extirpation may result in retardation of midfacial growth

Another interpretation

Extripation of the septal cartilage resulted in collapse of the nasal bone with no effect on AP growth

Need to utilize a new approach to assess the role of the nasal septal cartilage in midfacial growth

Aim of the study

• To measure in real-time the in vivo growth of the septal cartilage and nasofrontal suture

✓ To determine the growth rate of the septal cartilage and nasofrontal suture
✓ To determine if growth of the septal cartilage leads to separation of the nasofrontal suture
Materials and methods

- Subjects: 9 Minipigs (*Sus scrofa*)
  - Their large size offers better surgical accessibility
- Sensors: Differential variable reluctance transducer (DVRT)

Surgical method

Post surgical X-rays

Growth over a 20 hour period
Does the growth of the cartilage lead to growth of the suture?

A. Does the growth of the cartilage exceed the growth of the suture?  
B. Does the growth of the cartilage precede the growth of the suture?

A. The growth of the cartilage greatly exceeds the growth of the suture

Cross correlation analysis for time series

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Time lag range (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior cartilage</td>
<td>0.6-0.7</td>
</tr>
<tr>
<td>Posterior cartilage</td>
<td>-7-4</td>
</tr>
<tr>
<td>Averaged cartilage</td>
<td>0.6-0.8</td>
</tr>
<tr>
<td>Nasofrontal suture</td>
<td>0-30</td>
</tr>
<tr>
<td>Anterior cartilage</td>
<td>0.4-0.9</td>
</tr>
<tr>
<td>Posterior cartilage</td>
<td>0-100</td>
</tr>
</tbody>
</table>
Is growth of the septal cartilage pulsatile or continuous?

No diurnal variation in growth of the cartilage and suture

Summary

- The septal cartilage expansion rate is twice that of the suture
- Growth of the cartilage is uniform
- The suture growth never precedes that of the cartilage
- Growth of the cartilage and suture is pulsatile with no diurnal variation
- Results are consistent with an active role of the nasal septal cartilage in midfacial growth

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Thank you