Clinical Application of Different Surgical Navigation Systems in Complex Craniomaxillofacial Surgery: the Utilization of Multi-Surface Three-Dimensional Images and a Two-Plane Reference System

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Disclosure of Relevant Financial Interests

• Nothing to disclose

Inform Consent of Photo Release

• All patients in this presentation granted us permission to use their images for the academic purpose
Objective of The Study

- Demonstrate the clinical application of intraoperative 3-D navigation in complex craniomaxillofacial surgery
- Introduce the application of multi-surface 3-D images and a simple two-plane reference system
- Compare advantages and disadvantages of different navigation systems
- Propose an algorithm of navigation in craniomaxillofacial surgery
Materials and Methods

• 15 patients from November of 2010 to July of 2014
• Complex craniomaxillofacial surgery with assistance by three different navigation systems
• Utilization of multi-surface 3-D images in all cases
• Utilization of two-plane reference system in 10 cases to get symmetric outcome
Surgical Navigation
Multi-surface 3D image guidance
2-plane reference system
Results and Conclusions

- 3 cases with infrared-based navigation
- 12 cases with electromagnetic technology
- Mean follow-up time: 16.7 months
- Most of the patients have satisfactory results
Patients Classification by Location

- **Primary Trauma**
- **Secondary Trauma**
- **Tumor**

<table>
<thead>
<tr>
<th>Location of the operation</th>
<th>Case number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zygomatic</td>
<td>2</td>
</tr>
<tr>
<td>Intraorbital</td>
<td>2</td>
</tr>
<tr>
<td>Frontotemporal</td>
<td>1</td>
</tr>
<tr>
<td>Maxilla</td>
<td>1</td>
</tr>
<tr>
<td>Nasal</td>
<td>1</td>
</tr>
</tbody>
</table>

Legend:
- **Green Bar:** Primary Trauma
- **Red Bar:** Secondary Trauma
- **Blue Bar:** Tumor
The advantages and disadvantages of electromagnetic navigation system

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Smaller and more portable emitter</td>
<td>• Large ferrous and conductive metals may interfere with the electromagnetic field</td>
</tr>
<tr>
<td>• No problem of line of sight</td>
<td>• Limited distance between electromagnetic emitter and surgical field</td>
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<tr>
<td>• Tract true position at deep anatomical structures</td>
<td></td>
</tr>
<tr>
<td>• Very small reference and sensors</td>
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Thank you for your attention!