Surgical Telementoring: A New Model for Global Surgical Training

Carl Snyderman, MD, MBA & Paul Gardner, MD, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA
Bostjan Lanisnik, MD & Janez Ravnik, MD, University of Maribor, Maribor, Slovenia

Abstract

Objective: Assess the efficacy of a surgical telementoring program for endoscopic endonasal surgery of the skull base.

Study Design: Prospective case series with surveys of surgeons.

Methods: A surgical telementoring program was established for mentoring of a skull base team (otolaryngology and neurosurgery) at the University of Maribor in Slovenia by an experienced skull base team (otolaryngology and neurosurgery) at the University of Pittsburgh. Two-way video and audio streaming provided real-time communication with the surgical teams. Over a period of three years, 10 endoscopic endonasal surgeries of the skull base were monitored preoperatively and during the key part of the procedure.

Results: Procedures included endoscopic endonasal approaches to the sella, anterior cranial fossa, posterior cranial fossa, and orbit. Diagnoses included benign and malignant neoplasms, cerebrospinal fluid leak, and inflammatory disease. In 9 of 10 cases, adequate audio and video communications were maintained. The most frequent monitoring interventions were for identification of anatomy, extent of exposure, extent of resection, and surgical technique. The median perceived value by the junior surgical team was 9.5 (range 8-10). A model for surgical telementoring is proposed.

Conclusions: Surgical telementoring provides the ability to help surgeons develop their surgical skills to a greater level of proficiency for complex surgeries when experienced mentors are not available locally. The technology is reliable and available at most institutions. Perceived benefits of surgical telementoring include improved surgical exposure, increased extent of tumor resection, and decreased duration of surgery.

Background

Stages of Acquiring New Surgical Skill

- Course
  - Anatomical models
  - Laboratory skills sessions
  - Observation/assisting surgeons
  - Performing cases with supervision
  - Performing cases independently
  - Residency training

Learning Curve for Endoscopic Endonasal Surgery (EES) of Cranial Base

- Endoscopic anatomy
- Instrumentation
- 2D visualization
- Functioning as a team
- Dealing with complications

Methods

Telementoring Model for EES

- Team of surgeons
  - Basic endoscopic surgical skills
  - Adequate resources
  - Potential to be Center of Excellence
- UPMC Course and curriculum
  - Anatomical dissections
  - Observation of multiple cases
- On-site international visit
  - On-site training
  - Assessment of resources
- Remote telementoring
  - Follow-up visits (as necessary)

Telementoring Process

- Case selection
  - Review of medical records, scans, pathology
  - Discuss surgical plan
- Schedule session
  - Accommodation for time difference (personnel, facility)
- Technology needs
  - Text connection
- Live session
- Debriefing and evaluation
- Follow-up
  - Outcome
  - Review scans

Surgical Teams

- University of Pittsburgh
  - Carl Snyderman - Otolaryngology
  - Paul Gardner - Neurosurgery
- University of Maribor
  - Bostjan Lanisnik - Otolaryngology
  - Janez Ravnik - Neurosurgery

Results

Case Series

<table>
<thead>
<tr>
<th>Case</th>
<th>Diagnosis</th>
<th>Approach</th>
<th>Video</th>
<th>Audio</th>
<th>Intervention Results</th>
<th>Complications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pituitary macroadenoma</td>
<td>Endoscopic endonasal</td>
<td>Good</td>
<td>Good</td>
<td>Improved exposure</td>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Malignant tumor in pterygopatine</td>
<td>Endoscopic transpterygoid</td>
<td>Good</td>
<td></td>
<td>Decreased duration of surgery; Improved exposure; Increased extent of tumor resection</td>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Neurofibroma of orbit</td>
<td>Transmaxillary</td>
<td>Good</td>
<td>Adequate</td>
<td>Decreased duration of surgery; Improved exposure</td>
<td>None</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Glial chordoma</td>
<td>Endoscopic endonasal</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Decreased duration of surgery; Improved exposure; Increased extent of tumor resection</td>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Olfactory neuroblastoma</td>
<td>Open/endoscopic CFR</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Increased extent of tumor resection; Prevented complication</td>
<td>None</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Apagrioma of sphenoïd sinus</td>
<td>Endoscopic sphenoïdotomy</td>
<td>Good</td>
<td>Good</td>
<td>Improved exposure</td>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>CIF leak</td>
<td>Endoscopic endonasal</td>
<td>Good</td>
<td>Adequate</td>
<td>Decreased duration of surgery; Improved exposure</td>
<td>None</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>Pituitary tumor with vision</td>
<td>Endoscopic endonasal</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Decreased duration of surgery; Increased extent of tumor resection</td>
<td>None</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>Olfactory meningioma</td>
<td>Endoscopic transcribriform/transplanum</td>
<td>Poor</td>
<td>Adequate</td>
<td>Prevented complications</td>
<td>None</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Meningioma</td>
<td>Endoscopic transcribriform/transplanum</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Increased extent of tumor resection</td>
<td>None</td>
<td>9</td>
</tr>
</tbody>
</table>

Discussion

Advantages of Telementoring

- Actual operative environment
- Real-time communication
- Shared endoscopic view
- Telestration capability
- Active problem-solving

Limitations of Telementoring

- Availability
  - Coordination of schedules
  - Time commitment
- Cost
- Quality of connection, data transmission
- Types of communication
- Legal issues
  - Privacy
  - Liability
- Financial: business model

Surgical Applications

- Mentoring of junior surgeons
- Intraoperative consultation
- Routine & emergency
- Transfer of latest advancements
- Professional practice evaluation (credentialing)
- FPPE: focused
- OPPE: ongoing

Conclusions

- Telementoring of endoscopic surgery with effective real-time 2-way communication is possible.
- Surgical telementoring may be an effective technique for developing surgical proficiency at remote sites.
- Cost-effective model?
- Unknown challenges need to be resolved.

The authors have no conflicts of interest related to this presentation.