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University of Pavia
School of Medicine
ENT Clinic
Ronchopathy Surgery Course

University of Parma
School of Medicine
Maxillo-Facial Clinic
SDB Surgery Course

AIMS Board
&
ENT-Maxillofacial Joint Commission
TORS vs TCRS
Tab. I – Base of the Tongue Surgical Techniques proposed in Literature for OSAHS treatment

- LASER MIDLINE GLOSSECTOMY - MLG (Fujita & Woodson, 1991)
- LASER LINGUALPLASTY (Woodson & Fujita, 1992)
- PALATOPHARYNGOGLOSSOPLASTY (Djupesland & Coll., 1992)
- MIDLINE GLOSSECTOMY AND EPIGLOTTIDECTOMY (Michelson & Rosenthal, 1997)
- RADIOFREQUENCY VOLUME REDUCTION OF THE TONGUE (Powell & Coll., 1997)
- TONGUE BASE REDUCTION WITH HYOEPIGLOTTIDECTOMY - TBRHE (Chabolle & Coll., 1999)
- COBLATION CHANNELING IN BASE OF TONGUE (Senders, 2003)
- RADIOFREQUENCY TONGUE REDUCTION THROUGH A CERVICAL APPROACH (Blumen & Coll., 2006)
- ENDOSCOPICALLY ASSISTED COBLATION LINGUAL TONSILLECTOMY / MIDLINE POSTERIOR GLOSSECTOMY (Tucker Woodson, 2007)
- TONGUE BASE REDUCTION WITH THYRO-HYODOPEXY – TBRTHP (Vicini & Coll., 2008)
- SUBMUCOSAL MINIMALLY INVASIVE LINGUAL EXCISION-SMILE (Friedman & Coll., 2008)
**Tab. II - Supraglottic Surgical Techniques described in Literature for OSAHS treatment in adults**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser Epiglottectomy</td>
<td>(Zeitels 1990)</td>
</tr>
<tr>
<td>Laser Epiglottectomy</td>
<td>(Woo 1992)</td>
</tr>
<tr>
<td>Laser Partial Epiglottidectomy</td>
<td>(Catalfumo 1998)</td>
</tr>
<tr>
<td>Laser Partial Epiglottidectomy</td>
<td>(Verse 1999)</td>
</tr>
<tr>
<td>Laser Partial Epiglotidectomy</td>
<td>(Golz 2000)</td>
</tr>
<tr>
<td>Diathermy Epiglottectomy</td>
<td>(Oluwasanmi 2001)</td>
</tr>
</tbody>
</table>

**Forlì’s setting according to Weinstein**

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ITALY
TORS by Intuitive Da Vinci®

Master Consolle
View Port – 3D Googles

Joystics
Slave Kart

Surgical Arm
Surgical Instruments

Video Tower
Basic Operative Instrument Set

- (n°1) 5mm “snake” grasp forcep – x20 (€ 8000)
- (n°1) 5mm “snake” Bowie (straight or hook) – x20 (€ 8000)
- (n°1) additional 5mm (“teethed” forcep) – x20 (€ 8000)
- (n°2) atraumatic suction tubes - xn
- (n°1) clips applicator - xn (€ 250)
- (n°1) plastic suction tube - x1
- (n°1) disposable suction Bowie

About € 3.000-3.500 / procedure
Optics, Arms, Suction & Clips

Mouthgags & Basic Instruments
Setting

Oropharynx Mouthgag, Cheek Retractors, Blade & Nose Suctions
Surgical Arms in place

1° Surgeon
2nd Surgeon & Scrub Nurse: assistance

2nd Surgeon & Scrub Nurse: suctioning
Forlì’s SDB TORS Experience up to April 2009

- 12 cases treated
- 8 medium to severe OSAHS
- 6 primary cases
- 2 secondary in failed UPPP/nose

- Ø conversion to open surgery
- Ø emergency revision surgery

Setting & Surgery Times
NG-feeding, Trch, Hospital Times along the first cases

Pain Visual Analogue Profile

TORS mean

<table>
<thead>
<tr>
<th>day</th>
<th>TORS mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2.6</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>2.2</td>
</tr>
</tbody>
</table>
**QoL SF36 evaluation**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
</tr>
<tr>
<td>AHI</td>
<td>46.1</td>
<td>9.7</td>
<td>27.0</td>
</tr>
<tr>
<td>Lowest Sat O₂</td>
<td>70.2</td>
<td>83.0</td>
<td>52.0</td>
</tr>
<tr>
<td>ESS</td>
<td>11.3</td>
<td>7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>BMI</td>
<td>27.2</td>
<td>26.8</td>
<td>25.4</td>
</tr>
<tr>
<td>Subjective Satisfaction %</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**ARDSVARS**

**pre** 78 69 81 58 55 69 66 70
**post** 95 94 10 76 75 91 92 78
**normal** 84 78 74 65 62 77 76 67

*AHI = Apnoea-hypopnoea Index; ESS = Epworth Sleepiness Scale; BMI = Body Mass Index*

*Tab. V - CARDIO-RESPIRATORY AND NEURO-PSYCHOLOGICAL OUTCOMES*
TORS vs Other Techniques

- TORS vs Open Surgery
- TORS vs Micro-Laryngoscopic Surgery

ADVANTAGES vs OPEN:

- Scarless procedure
- Low pain procedure
- Strong impact on QOL
### TBRHE vs TBRTHP vs TORS overall comparison

<table>
<thead>
<tr>
<th>Operations</th>
<th>Follow-up Mean (Months)</th>
<th>AHI Pre Mean</th>
<th>AHI Post Mean</th>
<th>Nadir Pre Mean</th>
<th>Nadir Post Mean</th>
<th>ESS Pre Mean</th>
<th>ESS Post Mean</th>
<th>BMI Pre &amp; Post Mean</th>
<th>Satisfaction % Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 TBRHE 5/5 + UP3</td>
<td>14.4</td>
<td>64.8</td>
<td>31.8</td>
<td>59</td>
<td>66.4</td>
<td>14.6</td>
<td>8.0</td>
<td>Pre 36.7 Post 33.9</td>
<td>73.0</td>
</tr>
<tr>
<td>7 TBRTHP 1/7 +UP3</td>
<td>5.0</td>
<td>54.6</td>
<td>13.1</td>
<td>63.7</td>
<td>82.0</td>
<td>11.6</td>
<td>6.0</td>
<td>Pre 29.1 Post 27.3</td>
<td>89.3</td>
</tr>
<tr>
<td>4 TORS</td>
<td>4.0</td>
<td>46.1</td>
<td>9.7</td>
<td>70.2</td>
<td>83.00</td>
<td>11.3</td>
<td>7.0</td>
<td>Pre 26.00 Post 25.7</td>
<td>100%</td>
</tr>
</tbody>
</table>

### TORS advantages vs MLS (laser) - 1

- Digitally enhanced “true” 3D view (dual endoscopical system)
- Angulated view (30°) working around the corner
- “Intuitive” image & joystics movement
- Bimanual
- Endo-Wrist (6° freedom)
- Endolaryngeal suturing made possible
TORS advantages vs MLS (laser) - 2

- Amplitude scaling according surgical requirement
- Tremor Filtering
- More rapid learning curve
- More rapid surgical procedures (vs CO2)

TORS Applications in SDB Surgery

- UP3 + Tonsillectomy (narrow opening)
- **Lingual Tonsillectomy**
- **Tongue Base Resection**
- **Epiglottectomy / Epiglottoplasty**
- Posterior Cordotomy
TORS Limits & Solutions

- Lack of reliable Force Feedback
- No automatic-tool changer
- Cost
- Lack of evidence-based clinical data
- No suction device
- Not dedicated tools
- 2nd surgeon palpation
- Extra-robotic instruments
- Machine Sharing
- Ongoing studies
- External suction & bleeding prevention
- Brain squeezing ...

TORS problems in SDB Surgery

- Poor knowledge of trans-oral neck anatomy in extended lateral dissection for TORS Base of the Tongue resection;
- High risk of neural and vascular structures injury
- Neurovascular Damage is not justified in a completely functional surgery compared to the oncological surgery of the same district (tumour infiltration resection may require a more acceptable sacrifice of important anatomical structures along with the following sequela:...)
Possible solution: **TORS**
anatomic dissection

Human Endo Anatomy Vienna Lab
“TORS” setting
TORS problems in SDB Surgery (III)

- BOT & Epiglottis OSAHS patients are more commonly severe OSAHS patients
- Post Op course may be affected by respiratory complications related to severity of OSAHS
- The additional risk of bleeding of all the BOT procedures may increase the respiratory postoperative risk

Possible Solution: **Routine Tracheotomy ( < than 2 days)**

- Routine Trch may allow a better surgical field exposition (no tube)
- Ventilation may be assisted in a very safe way
- In case of early bleeding surgical management is far easier
- Morbidity of a planned Trch is reasonable low
- Psychological and economical impact must be put into account
TORS in SDB Surgery Routine

New Procedure Selection Rules

PHASE II
Our philosophy after TORS available

SLEEP ENDOSCOPY

Epiglottis, BOT pathology

TORS

MMA not possible

External appr. Not accepted

TBRHE/ TBRTHPx
Thank you so much for your attention!