ENDOSCOPIC TRANSNASAL TRANSSPHENOIDAL APPROACH: Technique and Indications

Luigi M. Cavallo

DEPARTMENT OF NEUROLOGICAL SCIENCES
DIVISION OF NEUROSURGERY
(Chief: Prof. Enrico de Divitiis)
UNIVERSITA’ DEGLI STUDI DI NAPOLI FEDERICO II
NAPLES, ITALY
First employ of an endoscope in pituitary surgery was made by:

Gerard Guiot (1963)

First **endoscopic** removals of hypophyseal tumors were made by the ENTs...

<table>
<thead>
<tr>
<th>Year</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>Jankovski</td>
</tr>
<tr>
<td>1993</td>
<td>Shikani and Kelly</td>
</tr>
<tr>
<td>1994</td>
<td>Gamea et al.</td>
</tr>
<tr>
<td>1995</td>
<td>Sethi and Pillay</td>
</tr>
</tbody>
</table>
...then neurosurgeons mastered the technique introducing a “pure” endoscopic endonasal transsphenoidal approach

1993 Jho and Carrau
1997 de Divitiis and Cappabianca
1998 Frank and Pasquini
1998 Castelnuovo and Locatelli
The Endoscopic Endonasal Transsphenoidal Approach

endoscopic endonasal transsphenoidal approach

endoscopic → know the endoscope

endonasal → know the path
Endoscopes

- rigid endoscopes
- absence of working channel
- 18 – 30 cm in length
- 4 mm in diameter (2.7 mm in selected cases)
Endoscopes
The endoscope

Advantages

- Wider and orientable view of the surgical field
- closer look “inside” the anatomy
- view in hidden corners
- angled view using angled lenses
The endoscope

Disadvantages

- difficult handling of instruments (hand-eye coordination)
- “barrel-type” spatial distortion
- 2-D vision
- it is part of a clock-gear mechanism
• hand-eye coordination
• barrel-type distortion
• bidimensional VS tridimensional view
• clock gear mechanism
• The correct function of each component must be always checked before surgery.

• Two complete sets of each endoscopic component should be available for every operation.
Use the best components for the endoscopic equipment

The result of an endoscopic procedure depends also upon the quality of the endoscopic equipment.

Mono-CCD
Alogen light source

3-CCD
Xenon light source
The path

Be confident with the endoscopic view of the anatomic structures involved
The nostril

Sph. ostium

Sph-ethm. recess

Choana
The sphenoid sinus

Panoramic view inside the sphenoid sinus
The sella

The pituitary gland and the chiasm
Areas around the sella
Standard Endoscopic Approach
Basic concepts for Standard endoscopic approach

- One nostril procedure
- Lateralization of the middle turbinate
- Anterior sphenoidotomy
- Endoscope holder
Surgical steps

a) Nasal

b) Sphenoidal

c) Sellar
• No three pins head fixation
• Head elevated and tilted 10 degrees
Fluoroscopy

Neuronavigator

selected cases
Nasal step

1.5 – 2 cm

ST
SER
MT
Co
NS
Nasal step
Sphenoidal step
Spheno-palatine artery!
Sphenoidal step

Posterior wall of the sphenoid sinus
Sellar step

Tools
Sellar Step

Sellar floor fenestration
Sellar Step

Dura opening
Lesion removal
Sellar Step

Intrasellar exploration
Sellar Repair

Indications

Accurate packing with closure
- CSF leak
- Injury of the carotid artery
- Huge macroadenoma

Simple packing
- Prolapse of the cistern
- Bleeding from the cavernous sinus
- Microadenoma
- Intrasellar macroadenoma
- Intra-suprasellar macroadenoma incompletely removed

No packing/closure
Absence of autologous materials for sellar reconstruction

Need for synthetic and/or eterologous materials
Sellar packing

Eterologous Dural Substitutes

✓ Collagen fleece + fibrin glue

- DM
- SC

* DM

** DM
Sellar packing

Eterologous Dural Substitutes

✓ Collagen-only foil

DM

* 

**

DM
Sellar closure

**Synthetic substitutes**

**Pros**
- Availability
- Sterile
- Promote neodura

**Cons**
- Biocompatibility?
- Watertightness?
- Costs

- Pure titanium
  - Kelly et al (2001)

- Vicryl

- MacroSorb
  - Kaptain et al (2001)

- Polyester-silicone
  - Cappabianca et al (2001)
Sellar closure

Poly-L-lactic acid (PLLA)

• absorbable co-polymer
• synthesized from all-natural ingredients
  (82% L-Lactic acid and 18% glycolic acid)

plates, sheers, mesches, schews

Extra-dural closure
At the end of the procedure

MT repositioning

No packing
Variation of the Endoscopic Endonasal Approach
Variations of the Standard Procedure

Hemisphenoidotomoy
Variations of the Standard Procedure

Extended removal of the nasal septum

[Image: Microscopic view of nasal tissue with annotations PS, DM, SF]

[Diagram: Illustration of nasal anatomy with vasculature and nasal structures]
Variations of the Standard Procedure

Two nostril procedure
Endoscopic endonasal
Indications

The same as for microscopic pituitary surgery
Transsphenoidal approaches

(micro-endo)

**Absolute indications**

- Microadenomas
- Adenomas with downward development
- Elevated surgical risk of the transcranial route
  - in the elderly
  - in long standing compression of the chiasm, not able to tolerate additional trauma
  - in case of acute endosellar hypertension
  - in most cases of pituitary apoplexy
  - in pan-invasive not radically removable adenomas
Transsphenoidal approaches

(micro-endo)

Indications

• more than 95% of the sellar lesions
• almost all PITUITARY ADENOMAS (96%)

…also huge pituitary adenomas?
(endo)
Transsphenoidal approaches (micro-endo)

INDICATIONS

CRANIOPHARYNGIOMAS
- enlargement of the pituitary fossa
- preferably cystic
- extraarachnoid-infradiaphragmatic

CLIVUS CHORDOMAS
- upper clivus
- extended in the sphenoid sinus

SELLAR CYSTS

RATHKE’S CLEFT CYSTS

CSF LEAKS
Widening of the endoscopic approaches
Extended endoscopic transsphenoidal approaches
Extended transsphenoidal approaches

Planum Sphenoidale
- craniopharyngiomas
- Rathke’s cleft cysts
- tuberculum sellae meningiomas
- anterior cranial base CSF leaks
Basic concepts for extended approaches:

- Two nostril approach
- Free-hand endoscope
- Middle turbinectomy (uni or bilateral)
- Removal of the posterior portion of the nasal septum
- Wide sphenoidotony
• Two nostril approach
• Free-hand endoscope
• Middle turbinectomy
• Removal of the posterior portion of the nasal septum
• Wide sphenoidotomy
Needed tools

- Neuronavigator
- Microdrill
- Endonasal bipolar forceps
- Endonasal microinstruments
- Microdoppler probe
- Ultrasonic aspirator
Clinical cases
R. A., 58 ys, Macroadenoma
R. A., 54 yrs, Macroadenoma
A. I., female, 58 ys, Suprasellar meningioma
A. A., ♂️, 57 ys, meningo-encephalocele
S. F., ♂, 29 ys, Clivus chordoma
Advantages of the extended approaches

- Midline approach
- Direct approach to the lesion
- Extraarachnoid approach
- No brain retraction
- Minimally invasiveness
Limits of the extended approaches

- Adequate skill in pituitary endoscopy
- Longer operative times
- Narrower surgical field
- Bleeding control
- Repair of dural and bony defect
- Risk of post-op CSF leak or meningitis
Extended transsphenoidal approaches

- Weiss, Williams & Wilkins 1987
- Mason et al., J Neurosurg 1997
- Kouri et al., J Neurosurg 2000
- Kim et al., Minim Invas Neurosurg 2000
- Kaptain et al. (Laws group), Neurosurgery 2001
- Kitano et al., J Neurosurg 2001
- Jho, Minim Invas Neurosurg 2001
- Jane et al. (Laws group), Neurosurgery 2002
- de Divitiis and Cappabianca, Springer 2003
- Cook et al. (D. Kelly group), Neurosurgery 2004
- Couldwell et al., Neurosurgery 2004
- Dusick et al. (D. Kelly group), J Neurosurg 2005
Department of Neurological Sciences, Division of Neurosurgery
All the colleagues of the staff

Department of Molecular and Clinical Endocrinology and Oncology
A. Colao, G. Lombardi

Department of Anaesthesiology
T. Cafiero, G. Gargiulo

Department of Neurological Sciences, Division of Neuroradiology
F. Briganti, F. Caranci, R. Elefante

Department of Ophthalmology
G. Bonavolonta, G. Cennamo, G. Ferrara

Department of Pathology
M.L. Del Basso De Caro

Department of Pharmacology
L. Annunziato

Department of Biology and Cellular and Molecular Pathology
A. Fusco, M. Fedele

Department of Otolaryngology, Insubria University of Varese, Italy
P. Castelnuovo

Department of Anatomy, University of Wien, Austria
M. Tschabitscher

UCLA Neurosurgery
D.F. Kelly
Thank you