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Hearing Preservation in Surgery for Vestibular Schwannoma

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Pandemic Update
May 2020



Related Publications

Karush JM, Telian SA, Graham MD, Kemink JL. Anatomic basis for labyrinthine preservation during posterior fossa acoustic tumor surgery. *Laryngoscope* 1986; 96:1004-1005.

Telian SA, Kemink JL, Kileny PR. Hearing recovery following suboccipital excision of acoustic neuroma. *Arch Otolaryngol Head Neck Surg* 1988; 114:95-97.

Kemink JL, LaRoque MJ, Kileny PR, Telian SA, Hoff JT. Hearing preservation following suboccipital removal of acoustic neuromas. *Laryngoscope* 1990; 100:597-602.

Telian SA. Management of the small acoustic neuroma: A decision analysis. *Am J Otol* 1994; 15:358-365.

Tucci DL, Telian SA, Kileny PR, Hoff JT, Kemink JL. Stability of hearing preservation following acoustic neuroma surgery. *Am J Otol* 1994; 15:183-188.

Isaacson B, Telian SA, El-Kashlan HK. Facial nerve outcomes in middle cranial fossa versus translabrythine approaches. *Otolaryngol Head Neck Surg* 2005; 133:905-910.


Arts HA, Telian SA, El-Kashlan HK, Thompson BG. Hearing preservation and facial nerve outcomes in vestibular schwannoma surgery: Results using the middle cranial fossa approach. *Otology & Neurotology* 2006; 27:234-241.

Wang AC, Chen SB, Then KD, Arts HA, Telian SA, El-Kashlan HK, Thompson BG. Durability of hearing preservation after microsurgical treatment of vestibular schwannoma using the middle cranial fossa approach. *J Neurosurg* 2013; 119:131-138.

Ahmed S, Arts HA, El-Kashlan HK, Bauras GJ, Thompson BG, Telian SA. Immediate and long-term hearing outcomes with the middle cranial fossa approach for vestibular schwannoma resection. *Otology & Neurotology* 2018; Jan/39(1):92-98.

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LARGE ACOUSTIC NEUROMA



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SMALL ACOUSTIC NEUROMA



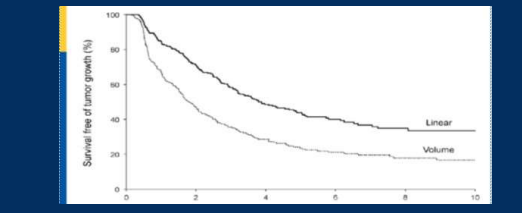
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WHAT ARE OPTIONS FOR TREATING A SMALL VESTIBULAR SCHWANNOMA?

- OBSERVATION
- STEREOTACTIC RADIATION
 - NOW OR LATER
- SURGERY
 - TRANSLAB OPERATION; NOW OR LATER
 - HEARING PRESERVATION?
 - MCF
 - RETROSIGMOID

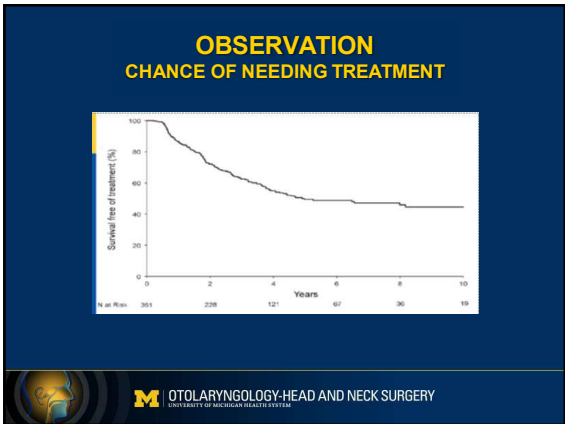
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OBSERVATION CHANCE OF GROWTH



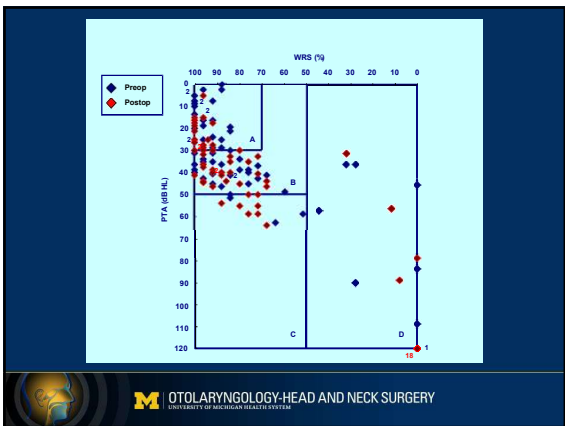
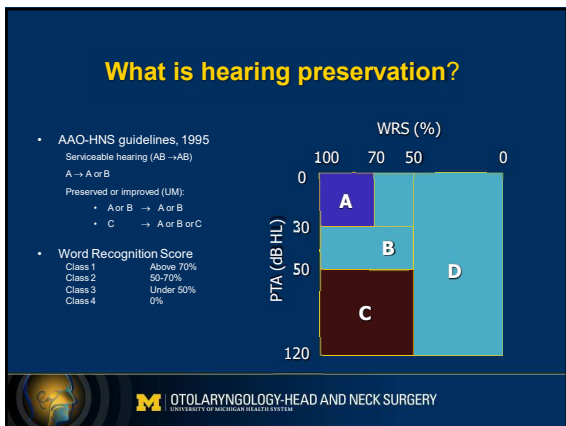
Time (Years)	Linear (%)	Volume (%)
0	100	100
2	~85	~75
4	~70	~60
6	~60	~50
8	~50	~45
10	~45	~40

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- ### WHAT ARE THE BENEFITS OF BINAURAL HEARING OVER UNILATERAL DEAFNESS?
- BILATERAL SOUND AWARENESS
 - ENVIRONMENTAL AWARENESS WITH PHONE USE
 - SOUND LOCALIZATION
 - SPEECH PERCEPTION IN BACKGROUND NOISE
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- ### HEARING PRESERVATION SURGERY
- SURGICAL CONSIDERATIONS
 - PRESERVATION OF AUDITORY NERVE
 - NO SERIOUS VIOLATION OF OTIC CAPSULE
 - PRESERVATION OF COCHLEAR BLOOD SUPPLY
 - INTRAOPERATIVE MONITORING
 - FACIAL NERVE
 - ABR or DIRECT COCHLEAR NERVE RECORDING
 - PATIENT SELECTION
 - IDEAL TUMOR SIZE < 1.5 CM
 - IDEAL HEARING BETTER THAN 30dB / 70%
 - NOT DEEPLY IMPACTED INTO FUNDUS OF IAC
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- ### SURGICAL APPROACHES
- | | |
|-------------------------------|------------------------|
| TRANSLABYRINTHINE | |
| Safety/Extradural Drilling | Complete Deafness |
| Better Facial Nerve Results? | |
| RETROSIGMOID | |
| Possible Hearing Preservation | Poor IAC Access |
| Similar Facial Nerve Outcomes | Intradural Drilling |
| MIDDLE FOSSA | |
| Better IAC Exposure? | Technically Demanding |
| Better Hearing Results? | More Facial Paralysis? |
| Extradural Drilling | |
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Otology & Neurology 2006; 27:234-241
 Hearing Preservation and Facial Nerve Outcomes in Vestibular Schwannoma Surgery: Results Using the Middle Cranial Fossa Approach

75 MCF TUMOR CASES 1999-2005

- 71 TUMORS OPERATED FOR HEARING PRESERVATION
 - INCLUDED 3 NF-2 CASES & 2 ONLY HEARING EARS
- 2 SMALL TUMORS WITH NO RESIDUAL HEARING
 - JUGULAR BULB OBSTRUCTING TRANS LAB APPROACH
- 2 CASES EXCLUDED
 - 1 WITH NO POSTOP DATA AVAILABLE
 - 1 TEEN WITH HETEROTOPIC BRAIN IN DISTAL IAC




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TUMOR SIZE
MIDDLE FOSSA APPROACH

MEAN TUMOR SIZE = 9 mm (3 to 18 mm)


- 5 mm or less 20 (27%)
- 6 to 10 mm 32 (44%)
- 11 to 15 mm 15 (21%)
- > 15mm 6 (8%)



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HEARING RESULTS
MIDDLE FOSSA APPROACH


- PREOPERATIVE CLASS A (N=34)
 - A: 21 (62%)
 - B: 6 (18%) 80% PRESERVED
 - D: 7 (20%)
- PREOPERATIVE CLASS B (N=28)
 - A: 0
 - B: 18 (64%)
 - C: 3 (11%) 75% PRESERVED
 - D: 7 (25%)
- PREOPERATIVE CLASS C (N=3)
 - C: 2
 - D: 1 67% PRESERVED



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HEARING RESULTS
TUMORS LARGER THAN 15 mm


- 5 of 8 (62.5%) PRESERVED - CLASS A OR B
- PREOPERATIVE CLASS A (N=3)
 - A: 2
 - B: 1
- PREOPERATIVE CLASS B (N=5)
 - B: 2
 - C: 1
 - D: 2



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MIDDLE FOSSA vs. RETROSIGMOID
COMPARATIVE RESULTS in 2006

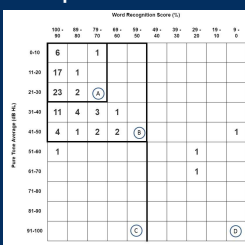
	MIDDLE FOSSA	RETROSIGMOID
HEARING (CLASS A PREOP & TUMORS <15mm)		
PRESERVED	80%	53%
DEAF	20%	47%
FACIAL NERVE		
CLASS I	85%	82%
CLASS II	11%	15%
CSF LEAK	8%	12%



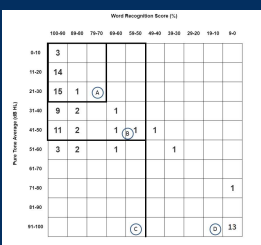
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2006 DATA n=71
ON MODERN SCATTERGRAMS

Preop

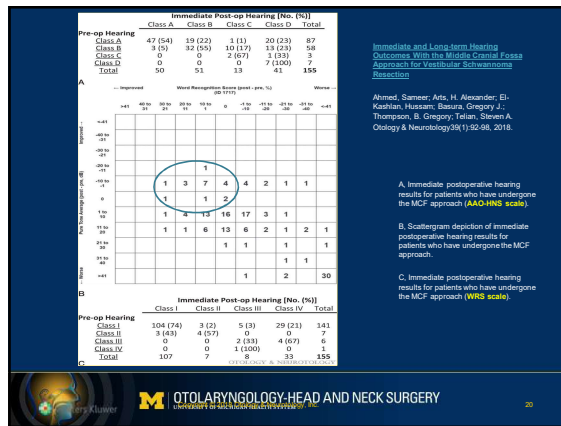
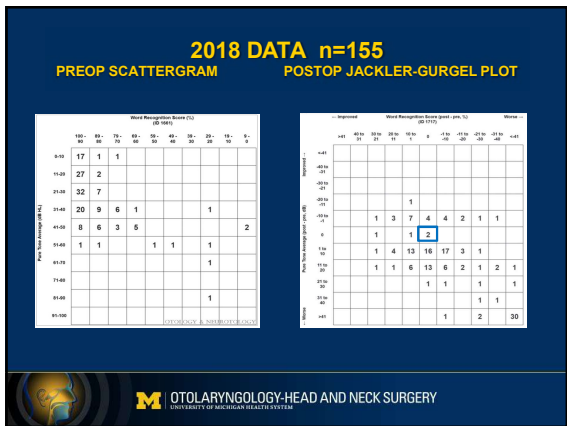


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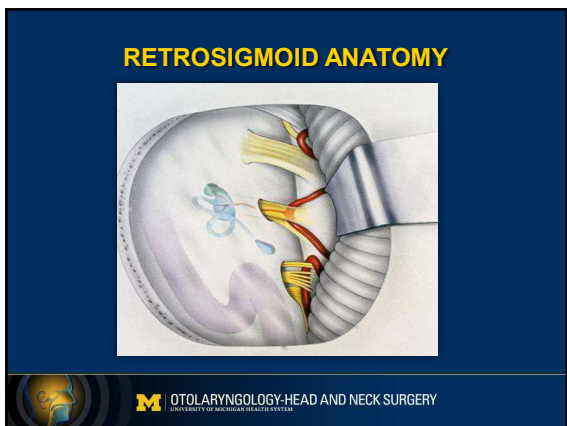
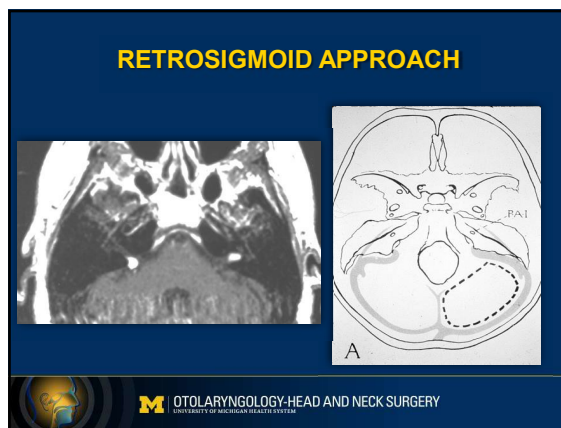
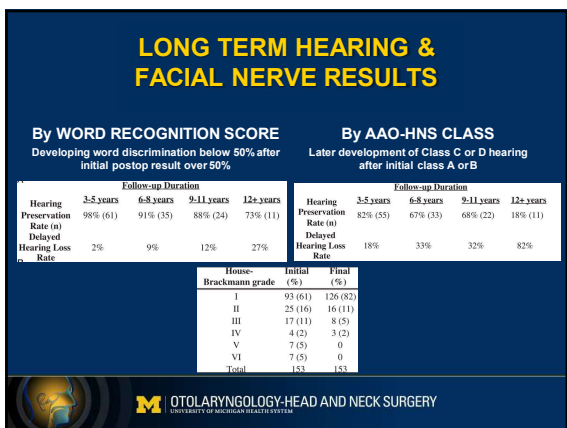
Immediate and Long-term Hearing Outcomes with the Bridget Craniotomy Approach for Vestibular Schwannoma Resection

Ahmed, Sameer; Arts, H. Alexander; El-Kashlan, Hussam; Basura, Gregory J.; Thompson, B. Gregory; Fekri, Steven A. *Otolaryngology* 36(1):50-58, 2018.

A. Immediate postoperative hearing results for patients who have undergone the MCF approach (**AAO-HNS scale**).

B. Scattergram depiction of immediate postoperative hearing results for patients who have undergone the MCF approach.

C. Immediate postoperative hearing results for patients who have undergone the MCF approach (**WRS scale**).



Laryngoscope 1986

Anatomic Basis for Labyrinthine Preservation During Posterior Fossa Acoustic Tumor Surgery

Labels in diagram: Superior Semicircular Canal, Vestibular Aqueduct, Singular Canal, Bill's Bar, Transverse Crest, Posterior Semicircular Canal, Foveate Impression for Endolymphatic Sac, Ampulla of Posterior Semicircular Canal, Cochlear Aqueduct, Posterior Lip of Forus Acousticus.

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POSTERIOR SEMICIRCULAR CANAL TO PETROUS FACE

Labels in diagram: Non-Ampullated End, Ampullated End, 15, 30.

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VESTIBULAR AQUEDUCT

Labels in diagram: GENU OF VESTIBULAR AQUEDUCT, SSC, COMMON CRUS, PSC, ENDOLYMPHATIC SAC, HORIZONTAL PORTION OF VESTIBULAR AQUEDUCT, ELLIPTICAL RECESS OF VESTIBULE, VERTICAL PORTION OF VESTIBULAR AQUEDUCT.

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RETROSIGMOID DISSECTION OF THE INTERNAL CANAL

ANATOMIC POSITION

SURGICAL POSITION

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MIDDLE FOSSA OSTEOLOGY

SURFACE ANATOMY

BELOW THE SURFACE!

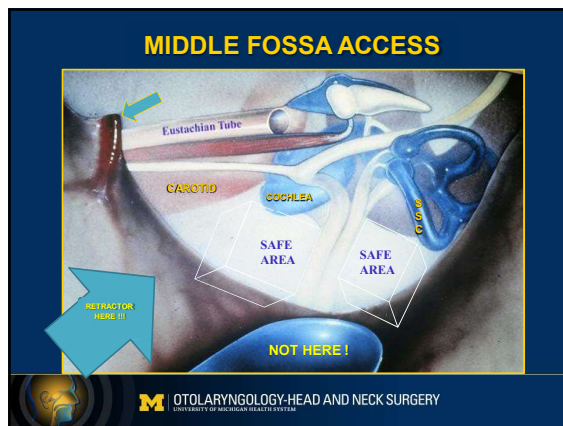
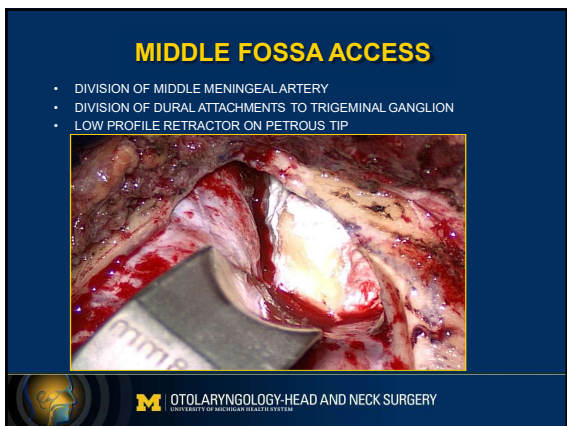
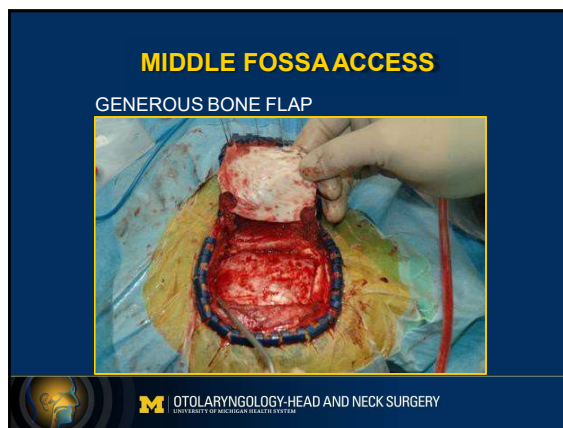
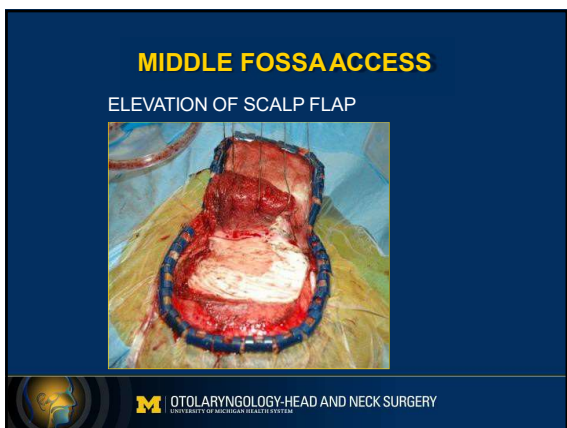
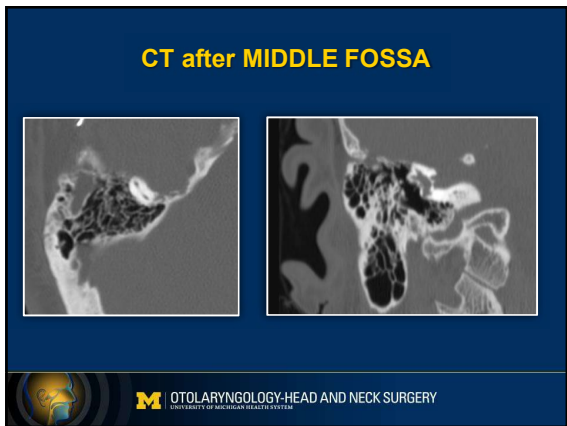
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MIDDLE FOSSA DISSECTION OF THE INTERNAL CANAL

ANATOMIC POSITION

SURGICAL POSITION

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MIDDLE FOSSA ACCESS

- LATERAL BONE REMOVAL AROUND IAC TO BILL'S BAR
- BLIND LATERAL DISSECTION IS STILL OFTEN REQUIRED
14-34% obscured by transverse crest or tethered facial nerve (Driscoll & Jackler - AJO 2000)

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MIDDLE FOSSA ACCESS INTRACANALICULAR LESION

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MIDDLE FOSSA ACCESS AFTER RESECTION OF LESION

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PROFOUND HEARING LOSS IN BETTER EAR

- Left MCF for smaller tumor; lost hearing at end of case
- Cochlear implant in left ear without benefit
- Implanted right ear after larger tumor was documented to be stable and the reluctance of patient was overcome

One year cochlear implant hearing results

Soundfield detection	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Right CI	20	20	15	15	20

Speech recognition in sound field at 60 dB SPL	AXILLO, ONHE	CNC	AXILLO, +10 SNR
Right CI	120/149 = 80%	10/25 = 76%	104/135 = 77%

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SUMMARY

- Management of every vestibular schwannoma is individualized and determined by lengthy conversations with the patient.
- Surgery is playing a decreasing role in the management of smaller tumors, but appears to offer excellent long term hearing preservation rates in a high percentage of patients who present with good hearing.
- The middle fossa approach seems to offer the best prognosis for success, with a satisfactory complication rate, when hearing preservation is a primary goal for the younger patient.
- This operation plays a critical role in the treatment of NF-2 tumors.
- Young neurotologists must learn this operation and team up with motivated neurosurgeons in order to keep it available when needed.

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