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Endoscopic Otologic Surgery in Otosclerosis: A Retrospective Study at Avicenne Military Hospital, Marrakech

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Abstract

Objective: To evaluate the effectiveness, functional outcomes, and surgical advantages of **endoscopic stapes surgery** in patients with otosclerosis, based on a three-year experience at the Otolaryngology Department of Avicenne Military Hospital in Marrakech.

Materials and Methods: We conducted a retrospective study of patients operated on for otosclerosis between January 2020 and January 2023. All surgeries were performed using a **transcanal endoscopic approach**, involving a fully calibrated **small-fenestra platinectomy** and titanium prosthesis insertion, without the use of a surgical microscope. Patients were assessed pre- and postoperatively with audiometry (pure-tone average, air–bone gap), tympanometry, and postoperative functional evaluation.

Results: A total of 36 patients were included (28 women, 8 men; mean age: 38.5 years). Unilateral stapedotomy was performed in all cases, and no conversion to microscopic surgery was required. The mean preoperative air–bone gap (ABG) was 33 dB. At 3 months postoperative follow-up, **closure of the ABG to <10 dB was achieved in 83%**, with a mean postoperative ABG of 8.2 dB. No severe complications occurred; minor transient vertigo was reported in 14% of patients, and temporary taste disturbance (chorda tympani stretch) in 11%. No persistent tympanic perforations or sensorineural hearing losses were observed.

Conclusion: Endoscopic stapes surgery represents an efficient, safe, and minimally invasive alternative to traditional microscopic stapes surgery. Its advantages include wide-angle visualization, improved exposure of the oval window niche, and enhanced identification of anatomical variations. Based on our experience, endoscopic surgery offers excellent hearing outcomes and low complication rates, making it a valuable technique in modern otologic practice.

Keywords: Otosclerosis; Endoscopic stapes surgery; Stapedotomy; Platinectomy; Hearing outcomes; Otology

1. Introduction

Otosclerosis is a primary osteodystrophy of the otic capsule leading to fixation of the stapes footplate and resulting in progressive conductive hearing loss. [1]. It predominantly affects young adults, especially women, and constitutes one of the most frequent indications for middle ear surgery. The standard treatment remains stapes surgery, traditionally performed with a surgical microscope. [2].

In recent decades, the introduction of rigid endoscopes in otologic surgery has revolutionized surgical visualization. Initially limited to chronic ear surgery, endoscopic ear surgery (EES) has expanded to include stapes surgery, offering panoramic visualization and superior exposure of the middle ear, even in anatomically narrow ear canals. [3].

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Endoscopic stapes surgery is increasingly adopted worldwide, but remains less common in the Maghreb region. The purpose of this study is to report the results of our initial experience with fully endoscopic stapes surgery, analyze functional outcomes, evaluate the feasibility of the technique, and compare our results with international standards.

2. Material and methods

2.1. Study Design

We conducted a retrospective descriptive and analytical study in the ENT-Head and Neck Surgery Department of Avicenne Military Hospital, Marrakech.

2.2. Study Period

January 2020 to January 2023.

2.3. Inclusion Criteria

- Patients aged ≥ 18 years.
- Clinical and audiometric diagnosis of otosclerosis.
- Conductive or mixed hearing loss due to footplate fixation.
- Patients who underwent **endoscopic stapedotomy**.

2.4. Exclusion Criteria

- Revision stapes surgery.
- Sensorineural otosclerosis without footplate fixation.
- Non-otosclerotic causes of conductive hearing loss.

2.5. Clinical Evaluation

All patients underwent:

- Otoscopic examination
- Tuning fork tests
- Audiometric assessment (air-bone gap, pure-tone average, speech discrimination)
- Tympanometry (Type As in 70% of cases; Type A flat in 30%)

2.6. Imaging

CT scans were performed selectively:

- Suspected facial nerve dehiscence
- Narrow oval window niche
- Differential diagnosis (e.g., congenital ossicular malformations)

2.7. Surgical Technique

All surgeries were performed by the same senior surgeon, exclusively using:

- 0° and 30° rigid endoscopes (3 mm diameter, 14 cm length)
- Transcanal approach
- Tympano-meatal flap elevation
- Complete exposure of the oval window niche
- Small fenestra stapedotomy (0.6 mm microdrill)
- Titanium piston prosthesis insertion (0.4 mm diameter)
- Fat seal or gelfoam around the fenestra
- No microscopic assistance
- No external incisions

2.8. Postoperative Evaluation

Follow-up was conducted at:

- 1 week
- 1 month
- 3 months
- 6 months

Assessment included:

- Otoscope examination
- Audiometry (ABG, PTA, bone conduction stability)
- Evaluation of vertigo, taste disturbance, tinnitus

2.9. Data Analysis

Data were entered into SPSS 21 and analyzed using descriptive statistics.

3. RESULTS

3.1. Patient Characteristics

Total patients: **36**

- Female: 28 (77.8%)
- Male: 8 (22.2%) Mean age: 38.5 years (range 22–58)

Bilateral otosclerosis was suspected in 14 patients, but only one ear per patient was operated during this study period.

3.2. Symptoms at Presentation

- Progressive hearing loss: **100%**
- Tinnitus: **68%**
- Occasional vertigo: **25%**
- Bilateral symptoms: **39%**

3.3. Audiometric Findings

Mean preoperative ABG: **33 dB**

Mean postoperative ABG:

- 1 month: 12 dB
- 3 months: **8.2 dB**
- 6 months: 7.5 dB

ABG closure to <10 dB: 83%

ABG closure to <20 dB: 97%

Bone conduction remained stable in all cases.

3.4. Intraoperative Findings

Visualization of the oval window niche was excellent in all cases.

Prominent anatomical observations:

- Overhanging facial nerve: 6 cases (16%)

- Narrow oval window niche: 9 cases (25%)
- Thick footplate: 4 cases (11%)
- Floating footplate: 1 case (2.7%)

No conversion to microscopic surgery was required.

3.5. Complications

- Transient vertigo: 14%
- Transient dysgeusia (chorda tympani stretch): 11%
- Tympanic membrane perforation: 0%
- Immediate sensorineural hearing loss: 0%
- Facial nerve paralysis: 0%

3.6. Hospital Stay

- 85% of patients were discharged on the same day.
- No postoperative readmissions.

4. Discussion

4.1. Advantages of Endoscopic Stapes Surgery

Endoscopic ear surgery offers several significant advantages: [4,5].

4.2. Wide-Angle Visualization

The panoramic field allows excellent exposure of:

- The oval window
- Facial nerve segments
- Pyramidal eminence
- Incudostapedial joint

Even in narrow or tortuous ear canals, exposure remains superior to microscopy.

4.3. Superior Identification of Anatomical Variations

In our study:

- 16% had an overhanging facial nerve
- 25% had a narrow oval niche

In microscopy, these cases often require canalplasty; endoscopy avoids this.

4.4. Minimally Invasive Technique

No canalplasty or external incision was needed.

4.5. Learning Curve and Safety

The surgeon must operate with one hand holding the endoscope and one hand working. However, with experience:

- Complication rates decrease significantly
- Precision of prosthesis placement improves

4.6. Comparison With the Literature

International data show excellent outcomes with endoscopic stapes surgery: [2,3,6].

Table 1 Post-operative results according to the authors

Study	Mean ABG Closure	Complications
Daneshi (2011)	10 dB	Low
Marchioni (2016)	8-12 dB	Very low
Tseng (2018)	9 dB	<5% dysgeusia

Our results (**mean postoperative ABG 8.2 dB**) are comparable to the best endoscopic series.

4.7. Complication Analysis

No major complications occurred. The most common issues: [7].

- Vertigo
- Taste disturbance

These were mild and resolved spontaneously. [8,9].

4.8. Limitations

- Retrospective design
- Limited sample size
- No comparison arm with microscopy
- Short-term follow-up (6-12 months)

4.9. Strengths

- First Moroccan series exclusively using endoscopic stapes surgery
- Standardized surgical technique
- Uniform follow-up
- Excellent functional outcomes

5. Conclusion

Endoscopic stapes surgery is a safe, effective, and minimally invasive alternative to traditional microscopic surgery for otosclerosis. It provides superior visualization, reduces the need for canalplasty, and yields excellent auditory outcomes with minimal complications.

Our results confirm that endoscopic stapes surgery can be successfully implemented in a military tertiary center, offering significant benefits to patients and expanding the role of endoscopy in modern otologic surgery.

Future prospective studies comparing endoscopic and microscopic techniques in our population may further validate this approach.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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