



(RESEARCH ARTICLE)



Advantages and limitations of the endoscopic tympanotomy a prospective study

Najib Zouhair *, Anass Chaouki, Amine M'khatri, Youssef Oukessou, Sami Rouadi, Redalah elarabi Abada, Mohamed Roubal, Mohamed Mahtar

Department of Otorhinolaryngology, Hospital of 20 august, Casablanca, Morocco.

Publication history: 19 September 2020; revised on 22 October 2020; accepted on 26 October 2020

Article DOI: <https://doi.org/10.30574/ijrsra.2020.1.1.0016>

Abstract

Tympanoplasty is one of the most performed procedures in ENT. The aggressiveness of its microscopic approach has led otologists to adopt the endoscopic approach as a less invasive alternative. The purpose of this work is to appreciate the advantages and disadvantages of this surgical technique. We conducted a prospective descriptive cross-sectional study on 20 interventions within the ENT department of August the 20th 1953 Hospital of Casablanca from April 2019 to June 2019. The average age of operated patients was 36.3 years. Perforations were unilateral in (71%) of the cases with a predominance of the anterior (29%) and subtotal (36%) locations. The tympanoplasties were performed by 3 different senior otologic surgeons, and were left in (57%). The mean operating time was (59.5 min) and the mean anesthesia duration was 75.1 min. Intraoperative vision allowed us to fully visualize the margins of all perforations (100%) and anatomical structures of the middle ear in almost all interventions. The first procedures carried out were filled with difficulties whose management of intraoperative bleeding was the main one in (42.8%) of the cases. (57%) procedures were described as easy. No complication was detected intraoperatively or immediately postoperatively. Endoscopic tympanoplasty has several advantages, including: Minimally invasive approach to the middle ear; panoramic perioperative vision; Gain of operating time; decrease in the duration of anesthesia; Valuable educational tool; postoperative comfort; Decrease in hospital stay and early return to daily activities; Better aesthetic rendering; cost and transportability. However, we also note a number of disadvantages of endoscopic tympanoplasty, particularly: performing the procedure with one hand; difficulty passing through the EAC; 2D vision that alters the perception of depth; management of intraoperative bleeding; fogging; learning curve.

Keywords: Tympanoplasty; Endoscopy; Surgical Technique; Endoscopic surgery; Advantages; Disadvantages

1. Introduction

Tympanoplasty is one of the most performed procedures in ENT. Conventionally, it is carried out microscopically. This same technique has become in 50 years one of the most satisfying procedures in otologic surgery. But despite several improvements applied to the operating microscope [1], this traditional approach still presents some challenges. Exposure of all of the margins of the entire tympanic perforation is an important condition for the success of any tympanoplasty. When using a microscope, the unfavorable anatomy of the ear canal and / or anterior perforations make transcanal procedures technically difficult [2] and a post-auricular approach may be necessary to provide adequate access.

The endoscopic approach overcomes this limitation by offering a wide transcanal view encompassing all the elements involved in this surgery; that is, the ear canal, tympanic ring and tympanic membrane; without the need for a retroauricular incision or continuous repositioning of the microscope, even with an anterior overhang of the duct.

* Corresponding author: Najib Zouhair
Department of Otorhinolaryngology, Hospital of 20 august, Casablanca, Morocco.

In recent years, several studies have been and continue to be carried out on the evaluation of the results of endoscopic tympanoplasties and their comparisons with those obtained with microscopic tympanoplasties. However, very few studies evaluating the surgical technique itself have been performed.

The purpose of this work is to appreciate the advantages and disadvantages of this surgical technique.

2. Material and methods

We conducted a prospective descriptive cross-sectional study in the ENT department of August the 20th 1953 Hospital of Casablanca from April 2019 to June 2019. Including patients with tympanic membrane perforation excluding patients with chronic otitis media, external canal stenosis or exostosis. Variables studied was details of the operator's experience with endoscopic surgery were noted; Image qualities regarding visualization of anatomical structures, and vision during progression through the operative field were assessed; The technical difficulties encountered during the performance of the procedure were noted; Any intraoperative incidents were noted; The duration of the surgical procedure and the anesthesia as well as the duration of hospitalization have been specified. Those variables were collected using a questionnaire, the statistical analysis was performed using Excel. Patients' consent was taken.

3. Results and discussion

We have collected twenty patients. The average age of operated patients was 36.3 years. Perforations were unilateral in (71%) of the cases with a predominance of the anterior (29%) and subtotal (36%) locations.

The tympanoplasties were performed by 3 different senior otologic surgeons, and were left in (57%), all operators were experimented in tympanoplasty using microscope and in endonasal endoscopic surgery.

The mean operating time was (54.3 min) detailed in (figure 1) and the mean anesthesia duration was 71.5 min.

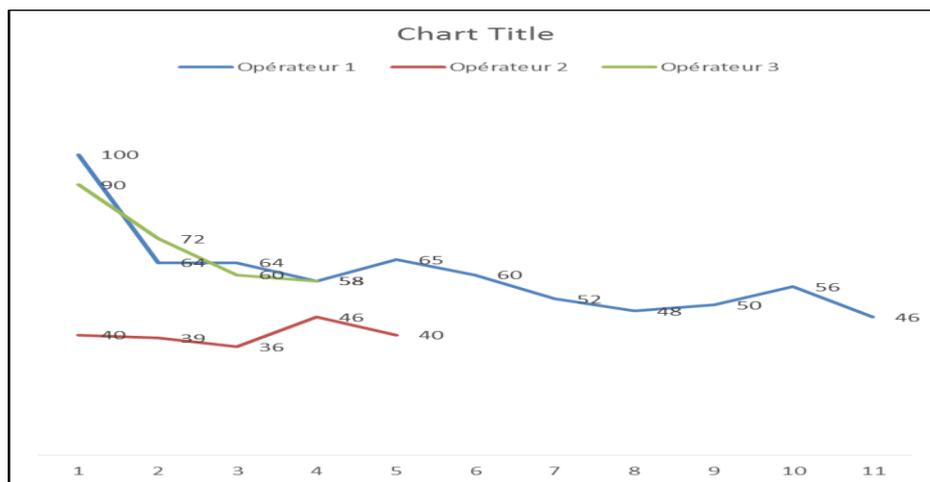


Figure 1 Curve showing the evolution of the operating time.

Intraoperative vision allowed us to fully visualize the margins of all perforations (100%) and anatomical structures of the middle ear in almost all interventions:

Image quality: during all procedures the image quality was qualified as satisfying. Some elements were reported as disturbing the image perception by the operator (table 1)

Table 1 Elements hindering the intraoperative vision.

	Number of times signaled
Operational seizure	07
Constitution of the bow	04
Vision in 2D	02

Visualization of the perforation margins: for all patients we were able to fully visualize perforation margins.

Anatomic structures visualized in per-operative, the endoscope allowed us to visualize clearly the structures represented in (table 2).

Table 2 Visualized anatomical structures.

Anatomical structures	Number of times visualized
Chorde du tympan	20/20
Promontory	20/20
Hypotympanum	20/20
Mestotympanum	
-Interior	15/20
- Posterior	20/20
- Superior	17/20

The first procedures carried out were filled with difficulties whose management of intraoperative bleeding was the main one in (42,8%) of the cases. (57%) procedures were described as easy. All difficulties found are showed in (table 3).

Table 3 Technical difficulties encountered when working with one hand

Difficulties encountered	Number of times
Management of pre-operation signing	07
Incision and elevation of the tympano-meat lamb	03
Progression of the endoscope the length of the external auditory conduit	01
Debridement of the perforation boards	00
Exploration of the middle ear and the ossicular chain	00
Position of the greffe	02

No complication was detected intraoperatively or immediately postoperatively.

4. Discussion

Endoscopic tympanoplasty has several advantages, including:

- Minimally invasive approach to the middle ear: endoscopic tympanoplasty is fully in line with the development of the concept of minimally invasive surgery [2];
- Panoramic perioperative vision: When performing endoscopic tympanoplasty; and unlike the binocular microscope; the endoscope makes it possible to assess the condition of the external auditory canal, its correct caliber and its correct length [3,4]. By progressing along the external auditory canal, the endoscope allows a panoramic view of the components of the middle ear and easily shows their relationships [5];
- Gain of operating time: The work of Choi et al. [6] showed that the mean operative time for microscopic and endoscopic tympanoplasty was 88.9 and 68.2 min, respectively, Dundar et al reported that during endoscopic tympanoplasties the duration of surgery was significantly shorter than during microscopic tympanoplasties in children [7];
- Decrease in the duration of anesthesia;
- Valuable educational tool: during an endoscopic tympanoplasty: the operating surgeon, ENT residents, interns, students and all operating staff, all share the same image: which allows a real-time explanation of the anatomical structures, their relationships between them, and the surgical steps of the procedure [8].;
- Postoperative comfort: The assessment of this pain is based on the Visual Analgesic Scale [9]. Choi et al [6] report that the mean pain was 0.8 on day 1 post-op for patients undergoing endoscopic surgery;
- Decrease in hospital stay and early return to daily activities;
- Better aesthetic rendering: by reducing the risk of wound infection, which lengthens the recovery time, the absence of atrial deformity and disturbances in atrial sensitivity [10], the absence of a visible scar after healing, or even The need for a bulky bandage [11] postoperatively makes the endoscopic approach a better choice for the patient to perform tympanoplasty.;
- Cost and transportability.

However, we also note a number of disadvantages of endoscopic tympanoplasty, particularly:

- Performing the procedure with one hand: This disadvantage is even more severe in the event of bleeding, especially when the technique is not yet perfected in the beginner, or during total perforations where working with two hands is particularly important. During endoscopic tympanoplasty, working with one hand is particularly difficult when raising the tympanomeatal flap [12] or when positioning the graft [13].
- Difficulty passing through the EAC: The diameter and size of the EAC are limiting factors for endoscopic tympanoplasty [14]. A narrow CAE is defined with a diameter of less than 4 mm in adults and 3.2 mm in children [15].
- Tow D vision that alters the perception of depth;
- Management of intraoperative bleeding;
- Fogging: This inconvenience can be overcome by immersing the endoscope in hot water before the start of surgery [16]. Fog builds up quickly after bleeding in the external ear canal or middle ear, necessitating frequent use of anti-fog fluids [17];
- Learning curve: Many surgeons already trained in microscopic tympanoplasty fear the transition to endoscopic tympanoplasty for fear of the results obtained during the learning period [18].

5. Conclusion

Knowledge of the risks inherent in this endoscopic approach, as well as compliance with certain recommendations, make it possible to minimize the adverse events of this technique. The endoscopic perspective redefines and reinvents surgical anatomy, allowing a better understanding of ear pathologies and therefore a better therapeutic approach. The use of endoscopy applied to otologic surgery has proven to be of interest, not only in tympanoplasties but also in surgery for cholesteatoma or tumors of the tympanic cavity

Compliance with ethical standards

Disclosure of conflict of interest

Authors declares there was no conflict of interest.

Statement of informed consent

No conflict of interest is exist.

References

- [1] Uluç K, Kujoth G, Başkaya M. Operating microscopes: past, present, and future. *Neurosurgical Focus*. 2009; 27(3):E4.
- [2] Pollak N. Endoscopic and minimally-invasive ear surgery: A path to better outcomes. *World Journal of Otorhinolaryngology - Head and Neck Surgery*. 2017; 3(3):129-135. <http://dx.doi.org/10.1016/j.wjorl.2017.08.001>
- [3] Marchioni D, Alicandri-Ciufelli M, Mattioli F, Nogueira J, Tarabichi M, Villari D et al. From external to internal auditory canal: surgical anatomy by an exclusive endoscopic approach. *European Archives of Oto-Rhino-Laryngology*. 2012; 270(4):1267-1275. DOI:10.1007/s00405-012-2137-x
- [4] Sürmelioglu Ö. Transcanal endoscopic tympanoplasty in the treatment of chronic otitis media. *The Turkish Journal of Ear Nose and Throat*. 2014; 24(6):330-333.
- [5] DOI: 10.5606/kbbhtsas.2014.93270 Karchier E, Niemczyk K, Orłowski A. Comparison of visualization of the middle ear by microscope and endoscopes of 30° and 45° through posterior tympanotomy. *Videosurgery and Other Miniinvasive Techniques*. 2014; 2:276-281. DOI: 10.5114/wiitm.2014.41618.
- [6] Choi N, Noh Y, Park W, Lee J, Yook S, Choi J et al. Comparison of Endoscopic Tympanoplasty to Microscopic Tympanoplasty. *Clinical and Experimental Otorhinolaryngology*. 2017; 10(1):44-49.
- [7] Dündar R, Kulduk E, Soy F, Aslan M, Hanci D, Muluk N et al. Endoscopic versus microscopic approach to type 1 tympanoplasty in children. *International Journal of Pediatric Otorhinolaryngology*. 2014; 78(7):1084-1089.
- [8] Ryan P, Wuesthoff C, Patel N. Getting started in endoscopic ear surgery. *Journal of Otology*. 2020; 15(1):6-16. <https://doi.org/10.1016/j.joto.2018.10.002>.
- [9] Sochala C, Vanooteghem J, Moises L, Mestdagh C, Dubois H, Chiche A et al. L'évaluation de l'analgésie postopératoire ciblée en chirurgie ambulatoire constitue un levier. *Annales Françaises d'Anesthésie et de Réanimation*. 2014; 33:A279-A280.
- [10] Tseng C, Lai M, Wu C, Yuan S, Ding Y. Comparison of the efficacy of endoscopic tympanoplasty and microscopic tympanoplasty: A systematic review and meta-analysis. *The Laryngoscope*. 2016; 127(8):1890-1896.
- [11] Smyth C. TWJ Fellowship – Toronto 2015: Endoscopic Ear Surgery [Internet]. *ENT & Audiology News*. 2020 [cited 19 October 2020]. Available from: <https://www.entandaudiologynews.com/features/ent-features/post/twj-fellowship-toronto-2015-endoscopic-ear-surgery>
- [12] Tseng C, Lai M, Wu C, Yuan S, Ding Y. Learning curve for endoscopic tympanoplasty: Initial experience of 221 procedures. *Journal of the Chinese Medical Association*. 2017; 80(8):508-514.
- [13] Swarup A, le Nobel G, Andrysek J, James A. The Current Limitations and Future Direction of Instrument Design for Totally Endoscopic Ear Surgery. *Otology & Neurotology*. 2018; 39(6):778-784.
- [14] Lou Z. The indication for endoscopic butterfly cartilage myringoplasty in children. *Auris Nasus Larynx*. 2017; 44(4):498-499. <http://dx.doi.org/10.1016/j.anl.2017.03.001>
- [15] Ito T, Kubota T, Watanabe T et al. Transcanal endoscopic ear surgery for pediatric population with a narrow external auditory canal. *Int J Pediatr Otorhinolaryngol* 2015;79:2265–2269
- [16] David D. Pothier. Introducing Endoscopic Ear Surgery into Practice. *Otolaryngol Clin North Am*. 2013 Apr; 46(2):245-55<http://dx.doi.org/10.1016/j.otc.2012.10.009>.

- [17] Nassif N, Berlucchi M, Redaelli De Zinis Lo. Tympanic membrane perforation in children: endoscopic type I tympanoplasty, a newly technique, is it worthwhile? *Int J Pediatr Otorhinolaryngol.* 2015; 79(11):1860-4. 10.1016/j.ijporl.2015.08.025
- [18] Se-Joon Oh, Eui-Kyung Goh, Hyun-Min Lee, Jae-Hoon Jung, Il Joon Moon, Jong-Woo Chung, Il-Woo Lee. Application of endoscopy in otology: Changes over the last 8 years in Korean Otological Society. *American Journal of Otolaryngology-Head and Neck Medicine and Surgery.* 2018 Mar 1; 39(2):212-9.