

Endoscopic middle ear surgery: First steps in a third level hospital

Fabian Alzate Amaya • Liliana Invencio Da Costa • Anselmo Padin Seara • Jose Eugenio Estrada Gromaz

RESUMO

Introdução: O uso da cirurgia endoscópica otológica (CEO) é uma tendência a nível mundial. Proporciona uma visão com mais amplitude, melhor ampliação e profundidade do campo cirúrgico. No entanto, permanecem algumas dúvidas, relativamente aos seus resultados no nosso quotidiano cirúrgico. O objetivo deste estudo é descrever os resultados obtidos em pacientes diagnosticados e tratados no nosso centro, com patologia cirúrgica otológica, que foram tratados inicialmente, exclusivamente, com uma abordagem endoscópica.

Material e métodos: estudo de coorte retrospectivo dos primeiros pacientes submetidos a cirurgia endoscópica otológica exclusiva, no período de janeiro de 2015 a março de 2018, na nossa instituição. Foi recolhida informação relacionada com as características epidemiológicas, tipo de intervenção, tempo de cirurgia, tipo de reconstrução, complicações e resultados audiométricos pré e pós-cirurgia.

Resultados: foram operados 48 pacientes, nos quais, se realizaram 23 miringoplastias (48%), 16 timpanoplastias (33%) e 9 estapedectomias (19%). O encerramento cirúrgico da perfuração foi alcançado em 17/23 miringoplastias (74%), com tempo médio de operação (OT) de 88 minutos e LTM prévio de 27,5 dB com melhoria a 19,5 dB. Nas timpanoplastias, o LTM anterior passou de 45,7 dB para 30,6dB e observou-se um OT de 106 minutos. Nas estapedectomias foi encontrada melhoria de 46,6 dB para 20 dB com tempo cirúrgico de 81 minutos. Não foram observadas complicações pós-operatórias importantes.

Conclusões: Cirurgia endoscópica otológica (CEO) é uma técnica reproduzível e confiável que mostra novos benefícios em comparação com as abordagens otológicas convencionais, assim como complicações similares. A CEO possui uma curta curva de aprendizagem que permite ser utilizada como elemento adicional em programas de ensino durante a residência de otorrinolaringologia e na nossa rotina cirúrgica diária.

Palavras chave: cirurgia endoscópica otológica; colesteatoma; miringoplastia; transcanal; otologia

Fabian Alzate Amaya

Complejo Hospitalario Universitario A Coruña

Liliana Invencio da Costa

Complejo Hospitalario Universitario A Coruña

Anselmo Padin Seara

Complejo Hospitalario Universitario A Coruña

Jose Eugenio Estrada Gromaz

Complejo Hospitalario Universitario A Coruña

Correspondência

Fabian Alzate Amaya

fabian.alzate.amaya@gmail.com

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ABSTRACT

Introduction: The use of endoscopic ear surgery (EES) is a worldwide tendency. It gives a wider vision, better magnification and depth on the surgical field. However, there are still some doubts related to its results in our daily surgical settings. The purpose of this study is to describe the results obtained in patients diagnosed with otologic surgical pathology who were treated through an exclusive endoscopic approach for the first time in our institution.

Methods: Retrospective cohort study of the first patients undergoing exclusive endoscopic ear surgery from January 2015 to March 2018 in our institution. Information related to epidemiological features, type of intervention, surgical operation room time, and type of reconstruction, complications, and comparing audiometry results before and after intervention were documented.

Results: We studied 48 patients were operated, in which a total of 23 myringoplasties (48%), 16 tympanoplasties (33%) and 9 stapedectomies (19%) were performed. An optimal surgical closure of the perforation was achieved in 17/23 myringoplasties (74%), with a mean operation time (OT) of 88 minutes PTA improved from 27.5 dB to 19 dB, after follow up. In tympanoplasties, pre PTA improved from 45 dB to 30 dB and OT was of 106 minutes. Stapedectomies showed an improvement from 46.6 dB to 20 dB with an OT of 81 minutes. No major postoperative complications were observed.

Conclusions: Endoscopic ear surgery (EES) is a reproducible and reliable technique showing new benefits compared to conventional otologic approaches and similar complications. EES has a short learning curve allowing it to be used as an additional element in training programs during the otolaryngology residency, and in our daily basis surgical routine.

Keywords: Otologic Surgical Procedures; Endoscopy; Audiometry; Learning Curve; Myringoplasty; Tympanoplasty.

INTRODUCTION

The application of endoscopy in otologic surgery, a novel approach in the 1990s done by Poe et al and adapted to the surgical field for the first time by Muazz Tarabichi, has been one of the turning points towards the future in this field^[1]. The use of a rigid endoscope provides a series of benefits; an endoscopic vision allows a wider vision of the tympanic frame, better magnification and an increased depth of the surgical field. These characteristics translate into a better access to the tympanic membrane and middle ear^[2].

The advent of new technologies, particularly using endoscopes with different angulations and diameters (2.8-4.0 mm), and high-resolution video systems,

allowed endoscopic ear surgery to consolidate, in a daily basis tendency and as a useful tool in the surgical practice at different hospital centers^[3]. Another advantage, besides the benefits in the surgical field, is decreasing the morbidity, during and after the intervention, and avoiding long-term sequelae of the retroauricular approaches: possible residual cholesteatomas, stenosis of the external auditory canal, among others^[4]. The purpose of this study is to describe patients diagnosed in our center with otologic surgical pathology who were treated through an endoscopic approach and evaluate the results in the short term.

MATERIALS AND METHODS

A retrospective cohort study of all patients undergoing ear surgery, exclusively by endoscopy, carried out from January 2015 to March 2018, in a third level hospital center.

Clinical records with incomplete information, without pre- and post-surgical audiometry or without postoperative follow-up were excluded. The information related to age, gender and basic demographics was collected. Outcomes were prioritized in primary (type of intervention, comparison of PTA pre-post surgery, type/material of reconstruction) and secondary (surgical operation room time, intraoperative complications such as bleeding, lesion of the chorda timpani or ossicular damage). Surgical time was determined using the measurement of time between the end of the anesthetic induction and the end of the procedure. Preoperative audiometric profile, calculated as the average of the PTA and air-bone gap (ABG), was done pre and postsurgery. A follow-up was performed during the first week after surgery and a second one six months later, performing a new audiometry and a new calculation of the PTA as the usual follow up protocol for every otologic surgery of this type in our institution.

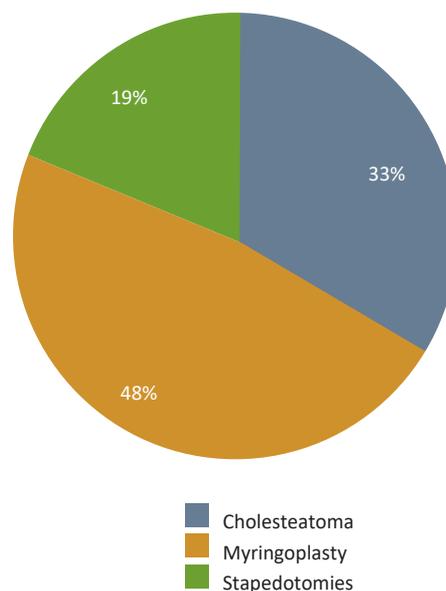
Data analysis of made through SPSS version v23 and Microsoft Excel 2010, using nonparametric tests and considering as statistically significant results with $p < 0.05$.

RESULTS

In the studied period, 48 patients underwent otologic surgery under endoscopic vision (Figure 1) done by the same surgeon using a HOPKINS® Straight Forward Telescope 0°, enlarged view, diameter 3 mm, length 14 cm. Twenty-four patients were male, constituting 50% of the sample size. The average age was 36 years. We had surgery on twenty-five left side ears (52%) and twenty-three from the contralateral side (48%). We performed 23 myringoplasties (48%), 16 cholesteatoma surgeries (33%) and 9 stapedectomies (19%).

FIGURE 1

Classification of the surgeries performed using transcanal endoscopic approach



Outcomes Myringoplasty (Tympanoplasty type I)

The majority of patients underwent myringoplasty for the first time (87%), with a history of previous surgery in only 3 cases (13%). Thirteen patients were male (56%) and ten female (44%). Considering ear laterality, the left ear was operated in 65% of the cases ($n = 15$) and right ear in 35% ($n = 8$). None of the cases required re-conversion to a retroauricular or endoaural approach. Analyzing tympanic membrane's perforations, the involvement of the anterior quadrants was observed in fourteen cases (61%). Isolated perforations of the anterior-superior quadrant occurred only in one case. The remaining cases were observed at the posterior quadrants (39%) seeing isolated involvement of the postero-superior quadrant in one case and the postero-inferior quadrant in another.

In regards to reconstruction of the tympanic membrane, all procedures were done using an underlay technique, using a combination of cartilage and perichondrium from the tragus was used in eleven cases (48%), "cartilage-only" in nine cases (39%) and abdominal fatty tissue in three cases (13%) (Figure 2).

The OT obtained was 88 minutes ranging between 50 and 120 minutes.

Preoperative audiometric profile results showed an improvement from 28 dB to a 19 dB in the first parameter; in regards to ABG it was from 30 to 20 dB (Figure 3).

A successful surgical closure of the tympanic membrane perforation was obtained in seventeen cases (74%) and re-perforation in six cases (26%).

FIGURE 2
Grafts utilized in endoscopic myringoplasty surgery

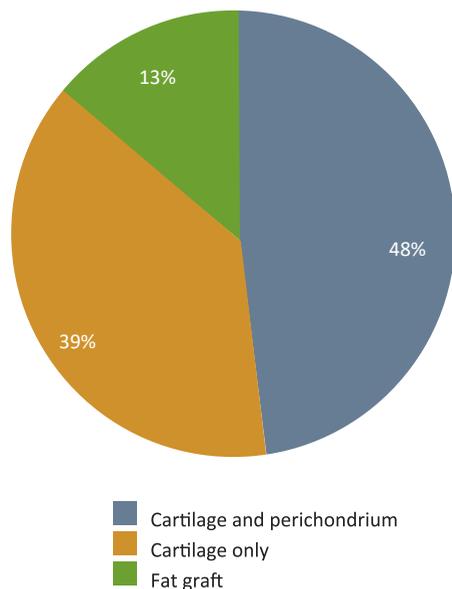
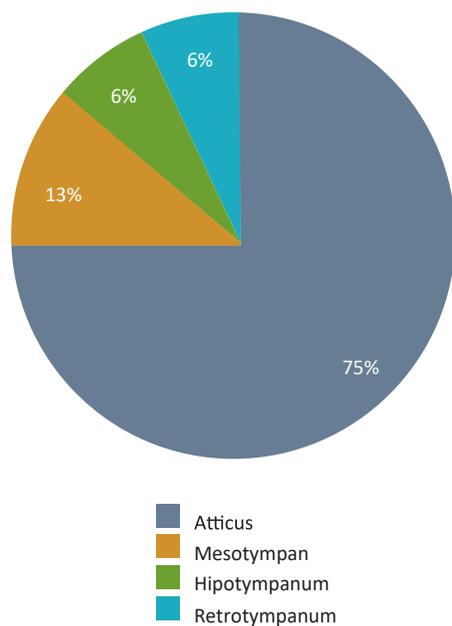


FIGURE 3
Pure tone average comparisons before and after endoscopic myringoplasty surgery.

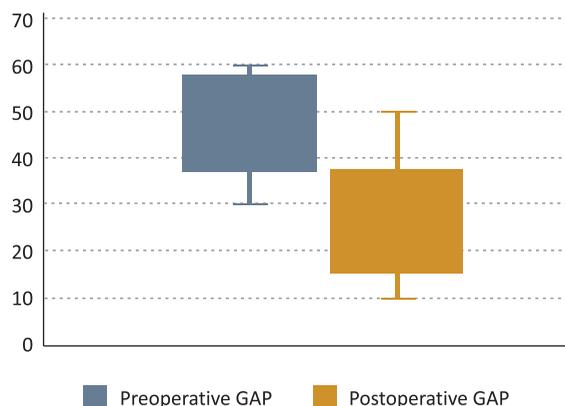


Outcomes Stapedotomy

A total of 9 stapedotomies were performed, 77% were female (n = 7); There was no previous otologic surgery in any patient. Involvement of the left ear was the most frequent, in 5 cases (56%). The platinotomy was made in the posterior one third of the footplate using an electric drill and the prosthesis used was a titanium softclip over the long process of the incus in all of the cases. Surgical time ranged between 60 and 120 minutes, with a mean OT of 81 minutes. The mean preoperative PTA was 43 dB, with a postoperative PTA score of 30 dB.

The preoperative GAP also presented an improvement respecting to its pre-surgical value, from 46.6 dB to 20 dB (Figure 4).

FIGURE 4
Air bone gap changes before and after endoscopic staples surgery



Outcomes of cholesteatoma surgery

A total of 16 interventions were performed in exclusively first-time surgery patients, with a prevalence of the male gender (56%). All cases were assessed using CT scans, choosing specifically cholesteatomas localized solely in the middle ear cavity. Twelve of the cases of the cases were located in the epitympanum (75%), followed by the mesotympanum (12.5%), and two cases, one in hipotympanum and retrotympanum.

Partial prosthetic replacement (PORP) was required in 8 cases and total replacement of the ossicular chain (TORP) in the remaining cases. In all cases we used fascia from the temporal muscle for the completion of the reconstruction. The surgical time ranged between 65 and 120 minutes, with a mean OT of 106 minutes. Pre-surgical PTA was 46 dB, improving to 30 dB postoperatively. ABG preoperatively decreased from 39 dB to 29 dB.

Of the 16 interventions performed, a total of 2 cases required a revision surgery based on recurrence of the pathology (12%).

Complications:

In the 48 patients that underwent surgery, laceration of the external auditory canal was observed in two cases, presenting self-limiting bleeding. Injury of the chorda tympani happened in only one case. The patients were discharged with antibiotic treatment exclusively in cases of cholesteatomatous surgery.

DISCUSSION

In the last two decades, middle ear surgery under an endoscopic approach, has been established as an "emerging trend" in the otologic surgical pathology, including in its repertoire: myringoplasties,

ossiculoplasties, stapedotomies and surgery for cholesteatoma of the ear. In this way, endoscopic view has become an alternative approach and as well a "cooperative" tool for traditional microscopic surgery^[5]. This technique applies the concept of minimally invasive surgery, obtaining the implicit benefits of its high-quality definition, based on using incisions with less aesthetic repercussion, shorter hospital stay, minor intracranial complications (by not addressing the mastoid avoiding the involvement of the dura mater) and greater control of the postoperative pain, and better cosmetic results^[6]. In turn, the use of 0°, 30° and 45° endoscopes with a diameter of 2-7-3.0 mm and 14 mm of length allows an optimal visualization of the surgical field. This translates into a better accessibility to the entire tympanic framework and to structures that are difficult to control, under microscopic vision, such as the tympanic sinus, the supratubal recess, the facial recess, or the anterior epitympanic recess. In the presence of residual cholesteatomas, previously treated under microscopic visualization, located in the retro or epitympanic area, this approach provides a more effective access and more promising results^[7].

Myringoplasty outcomes: In regards to tympanic perforations, many elements tend to affect its rate of success: type of graft, condition of the mucosa in the tympanic cavity, contact with the ossicular chain, etc. However, the position of the graft plays a fundamental role in its evolution^[8]. The correct approximation of the graft towards the margins of the perforation, avoiding its medialization or lateralization, allows obtaining greater probabilities of success. For obtaining this result, it is essential to achieve a correct image of the defect. In the cases performed endoscopically in our center, being able to observe the tympanic annulus entirety, allowed us to correctly calculate the size of the defect and obtain the most appropriate graft. The most used material for reconstruction was the cartilage with perichondrium in a single piece, adjusting it directly to the defect, without needing to use a grafting palisade technique, like the one used in others approaches^[9].

The surgical success, based on the closing of the perforation, achieved after 6 months of follow-up (92%) is similar to the one achieved in the studies done by Migiroy and Mohindra et al^[9]. Audiometric results of myringoplasty in our study had a general improvement in the PTA postoperative results with a mean of -15.1 dB being similar to Dundar et al^[10].

Stapedotomy outcomes: The endoscopic stapedotomies performed in our study obtained a decrease in bone / air GAP of -15 db. When compared with studies such as that of Cohen et al^[13], comparable results were obtained, with a decrease of -10.73 db. However, our sample, as in that of Cohen et al, has a bias produced by the low sample size and the particular selection of cases, none

had been previously operated and the access conditions through the auditory canal were excellent^[13].

Cholesteatoma surgery outcome: several studies have shown a decrease in postsurgical recurrence of cholesteatoma pathology with the use of an endoscopic approach, since this allow us to reach areas with difficult access under microscopic vision, where recurrences are observed up to 71% of cases^[11]. The results of recurrences rate, obtained with the introduction of this technique have reached results around 18%, as reported by Good and Isaacson^[12], being which are similar to those obtained in our center (12%). However, according to the sample and the learning curve in the different work groups, recurrences of 50% have been found, but none of them is superior to traditional microscopic surgery^[12]. It is important, as in any other procedure, to identify the limitations and contraindications of implementing a specific surgical technique. This type of approach should not be considered, in narrow external auditory canals, either due to congenital or secondary causes, to cholesteatomas located at the mastoid, dehiscence of the lateral semicircular canal or in tegmen tympani^[13]. This technique also presents the usual limitation of all new surgical approaches, since it forces to switch from using two hands to exclusively one (using the other hand to control the endoscope). The learning curve in endoscopic sinus surgery helps in the adaptation to this technique, that's why it should be incorporated in all resident formation programs in order to expand and familiarized its use.^[14] In our experience, the lowest learning curve obtained was in myringoplasties and stapedotomies with an average time of 88 and 81 minutes respectively; followed by 106 minutes in cholesteatoma surgery.

Other limitations that were frequently mentioned in the literature were the loss of stereoscopic vision when changing from a three-dimensional vision to a two-dimensional view of the screen. This aspect constitutes a problem in surgeons with less experience because they can present more difficulties, specifically during the elevation of the tympanomeatal flap causing lacerations in the external auditory canal during the introduction of instruments^[15].

All the patients were operated by the same surgeon, which allowed us to obtain a more precise result on the learning curve. No significant complications were observed in any of the procedures required changing to a different surgical approach.

Conflito de Interesses

Os autores declaram que não têm qualquer conflito de interesse relativo a este artigo.

Confidencialidade dos dados

Os autores declaram que seguiram os protocolos do seu trabalho na publicação dos dados de pacientes.

Proteção de pessoas e animais

Os autores declaram que os procedimentos seguidos estão de acordo com os regulamentos estabelecidos pelos diretores da Comissão para Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

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Este trabalho não recebeu qualquer contribuição, financiamento ou bolsa de estudos.

CONCLUSION

Endoscopic ear surgery is a reproducible and reliable technique with reasonable good results as well as limited and assumedly preventable complications with complications similar to or perhaps lowers conventional otologic approaches. It has a short learning curve, being a useful additional tool, both in the teaching field, as a training program during the otolaryngology residency, or in the usual surgical daily basis practice.

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