Endoscopic transcanal myringoplasty: Is learning curve a myth?

Amit Sainia, Munish Sarocha, Gaveshna Gargib

a Dept of Otolaryngology, Dr Rajender Prasad Govt Medical College, Tanda, Kangra, Himachal Pradesh, India
b Dept of Medicine, Dr Rajender Prasad Govt Medical College, Tanda, Kangra, Himachal Pradesh, India

ARTICLE INFO

Article history:
Received 26 March 2018
Received in revised form 31 May 2018
Accepted 14 May 2018

Keywords:
Endoscopic transcanal
Myringoplasty
Learning curve
Beginner

ABSTRACT

Objective: To investigate the feasibility of transcanal endoscopic myringoplasty in the hand of young beginner surgeons who had just completed the residency programme.

Methods: In a three year period (August 2012 to August 2015), 44 ears in 42 patients were operated upon by a beginner surgeon through the transcanal endoscopic approach in a subdistrict level hospital located in the north western ranges of the Himalayan region.

Results: Of the 42 patient, 19 were male and 23 female. The mean age was 26.23 years (range: 15–47 years). In 40 ears, complete perforation closure was achieved at six months (success rate: 90.9%). The mean air conduction PTA preoperatively was 40.84 dB HL and improved to 28.06 dB HL postoperatively (p < .001). The mean AB gap preoperatively was 22.40 dB, which improved to 9.1 dB postoperatively (p < .001).

Conclusion: Endoscopic transcanal myringoplasty is safe and reliable even in young beginners’ hands. Surgeons can consider endoscopic approach early in their careers without the fear of learning curve. The cost of endoscopic equipment is about one tenth as compared to open approach under a operating microscope, and an added advantage.

© 2018 PLA General Hospital Department of Otolaryngology Head and Neck Surgery. Production and hosting by Elsevier (Singapore) Pte Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Myringoplasty is the most commonly done otology procedure worldwide. It is probably the first surgery performed by young otology surgeons in their careers. Ear surgeries were conventionally performed using an operating microscope. Endoscopes have revolutionized the specialty of Otolaryngology. Now complex surgical procedures are being performed with considerable ease with the help of endoscopes, causing less morbidity to patients. In the field of otology, endoscopes are also fast replacing the operating microscope as the instrument of first choice for performing various surgeries.

Middle ear endoscopy was first introduced by Mer et al., in 1967, but endoscopes were mainly used for diagnostic purposes and to take photographs rather than to perform surgical procedures (El-Guindy, 1992). In the last decade or so, middle ear surgeries, which were traditionally performed under the microscope, are now being increasingly done endoscopically. There is ample information in the literature indicating that endoscopic approach requires considerable experience and the learning curve is quite long (Smith et al., 2010). In the present study we explored the feasibility of using an endoscope in myringoplasty by a young beginner surgeon to see if the present teaching is a reality or a myth.

2. Methods

The present study was conducted in a subdistrict level hospital located in the north western ranges of the Himalayan region between August 2012 and August 2015. The inclusion criteria for enrolling the patients in study were:

1. Presence of a central tympanic membrane perforation
2. Dry ear in the previous 3 months
3. Absence of cholesteatoma
4. ≤ 25 dB air-bone gap on the preoperative audiogram
5. Age between 15 and 50 years.

A total of 42 patients who fulfilled the inclusion criteria were included in the study and underwent transcanal endoscopic
myringoplasty. Two patients received bilateral procedures in the same sitting, taking total number of operated ears to 44. All the surgeries were performed by a young surgeon who had just completed his residency. We used only a 0° rigid endoscope with an outer diameter of 4 mm (Pioneer make) and length of 18 cm. The Pioneer Cam 1 camera was used for the video system. All the surgeries were performed under local anaesthesia without sedation. Pre- and postoperative pure tone audiometry was performed. The air bone gap of each patient was calculated at the frequencies of 500 Hz, 1000 Hz and 2000 Hz both pre- and postoperatively.

3. Surgical procedure

All the surgeries were performed by holding the endoscope attachment in the left hand and surgical instruments in the right hand. Topical anaesthesia was administered with 2% lidocaine and 1:200,000 epinephrine injections into the posterior, inferior, superior and anterior walls of the external auditory canal. The temporalis fascia graft was harvested above the hairline via a supra auricular incision. It was then spread and dried. The perforation was visualized using the endoscope (Fig. 1).

The margins of the perforation were freshened using a fine pick (Fig. 2) and circumferentially epidermis was removed and local bleeding was promoted. The under surface of the perforation was also freshened using a circular knife. Tympanomeatal flap was elevated in every case from 12 to 6 O’clock position about 4–6 mm lateral to the tympanic annulus (Fig. 3). The middle ear was inspected and the state of the Ossicles, incudostapedial joint and round window was noted. The round window reflex was visualized and continuity of the ossicular chain was confirmed. Middle ear was packed with gelfoam. The graft was placed by an underlay technique beneath the tympanomeatal flap over the bed of gelfoam and was tucked all around. Medicated gelfoam was placed over the graft to stabilize it. Medicated wick was kept in the external auditory canal. Simple dressing completed the procedure. No patient required the traditional bulky mastoid dressing. All the patients were kept overnight, given injectable antibiotics and were discharged next day on oral antibiotics for one week and called for regular follow up.

4. Statistical analysis

Statistical analysis was performed using the SPSS (version 16) software. The results are expressed as mean (±SD). The study data were compared using paired t-test. A p value < .05 was considered significant.

5. Results

A total of 44 ears were operated upon. Two patients with bilateral procedures. The mean age of patients was 26.23 (±9.44) years, ranging from 15 to 47 years. Nineteen patients were male and twenty three were female. Twenty two right and the same number of left ears were operated upon. No patient in the present study had history of previous ear surgery. None of the patients had diabetes mellitus. The etiology of perforation was chronic suppurative otitis media in 40 patients (95.23%) and trauma in 2 patients (4.76%). Subtotal perforation was present in 15 ears (34.09%), anterior quadrant perforation in 10 ears (22.72%) and posterior quadrant perforation in 19 ears (43.18%). Tympanosclerosis was encountered in 15 ears (34.09%) during surgery.

All the patients were followed up for a period of six months.
Tympanic membrane was examined endoscopically at two weeks, four weeks, three months and six months. Postoperative PTA was done at three months after surgery.

5.1. Perforation closure

Of the total 44 ears operated, 40 showed complete perforation closure at six months. The success rate of perforation closure was 90.9%. In four patients, perforation reoccurred. No superficial iatrogenic cholesteatoma or ossicular chain related complication was found on follow up.

5.2. Hearing results

The mean air conduction PTA preoperatively was 40.84 (±3.35) dB HL, ranging from 34 to 46 dB HL. Post operatively the mean air conduction PTA improved to 28.06 (±2.1) dB HL, ranging from 24 to 33 dB HL. This difference was statistically significant (p < .001) (Table 1).

The mean bone conduction PTA was 18.43 (±2.20) dB HL preoperatively and 18.95 (±1.99) dB HL post operatively. This difference was statistically insignificant (p = 0.24).

The mean preoperative air bone gap (ABG) was 22.40 (±2.55) dB. ABG improved in 40 patients, yielding a mean postoperative ABG of 9.1 (±1.71) dB. The difference was statistically significant (p < .001) (Fig. 4).

6. Discussion

Surgical procedures are transforming into minimally invasive techniques at a rapid rate. Otology is no exception to this phenomenon. Transcanal endoscopic myringoplasty is a big leap forward in this direction. The main advantage of the conventional post auricular microscopic approach is bimanual handling and three dimensional image perception. The microscope allows a broad and excellent image quality, with a direct and stereoscopic visualization (Lade et al., 2014). However, there are inherent limitations to the equipment such as: decrease of brightness proportional to magnification; limitation of the surgical field-of-view especially in narrow spaces such as the external auditory canal and the middle ear; the field of view has to be changed frequently for which either patient’s head or microscope has to be moved at short intervals. Endoscopes, in turn, provide in-depth images in narrow recesses, while maintaining brightness and allowing different visualization angles (Karchier et al., 2014).

Endoscopic ear surgery is a one hand technique. The surgeon holds the endoscope in one hand (most commonly left hand) and operates with the other hand. During the elevation of tympanomental flap there is brisk bleeding which is difficult to control and consumes lot of surgical time. The images transmitted in the endoscopic system are two dimensional and the surgeon does not appreciate depth perception while performing the procedure (Mohindra and Panda, 2010). Another disadvantage of the endoscopic approach is that it can cause hematomas in external auditory canal due to constant contact. However the wide field of view provided by the endoscope allows observation of the entire circumference of the perforation, 360° freshening of the perforation margins and meticulous tucking of the graft all around.

Gracia et al. performed transcanal endoscopic myringoplasty in 22 patients. They used tragal cartilage with perichondrium as graft materials. The success rate of perforation closure in their study was about 86.4% and statistically significant improvement in pure tone average thresholds after surgery was also observed (de Borborema Garcia et al., 2016). In the present study the graft survival rate was 90.9% which is slightly better than that of Gracia et al.

Yadav et al. reported graft survival of 80% at eighth postoperative week. They also emphasized that endoscopic examination of the tympanum allowed one to repair the perforation without any possibility of an iatrogenic cholesteatoma, in contrast to conventional myringoplasty (Yadav et al., 2009).
Raj et al. in their study on 40 patients compared results of endoscopic approach with that of microscopic approach. In the endoscope group the rate of graft survival was 90%, which is comparable to present study. Whereas in the microscope group the rate of graft survival was 85%. There was no significant difference in the AB gap in either group (Raj and Meher, 2001).

It is quite clear that endoscopic transcanal approach is fast becoming the procedure of choice for myringoplasty. The present study highlights that endoscopic approach can even be utilised by new otology surgeons who are starting their careers, just after completing residency programme. The cost of endoscopic equipment is almost one tenth of that of an operating microscope.

7. Conclusion

The present study of 44 endoscopic transcanal myringoplasties was done to assess the usefulness of endoscope in new hands. It is obvious from the present study that the endoscope is safe and reliable even in inexperienced hands and is fast replacing the microscope as the instrument of first choice for basic otology surgeries by young surgeons. The endoscope offers wide panoramic view, can be easily negotiated through the external auditory canal and offers complete examination of graft tucking. The cost of an endoscope is also less as compared to an operating microscope. One hand operation and two dimensional view are the disadvantages of the endoscopic transcanal approach. This study strongly recommends the use of endoscopes in new hands.

Funding

There are no funding source for this study.

Conflicts of interest

Authors declare that there are no conflict of interest.

Informed consent

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

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.joto.2018.05.002.

References

de Borborema Garcia, Leandro, Figner Moussalem, Guilherme, Santos Cruz de Andrade, José, et al., 2016. Transcanal endoscopic myringoplasty: a case series in a university center. Braz J Otorhinolaryngol 82 (3), 321–325.

El-Guindy, A., 1992. Endoscopic transcanal myringoplasty. J. Laryngol. Otol. 106, 493–495.

Karchier, E.B., Niemczyk, K., Orlowski, A., 2014. Comparison of visualization of the middle ear by microscope and endoscopes of 30- and 45- through posterior tympanotomy. Videosurg MininvasiveTech 9, 276–281.

Lade, H., Choudhary, S.R., Vashishth, A., 2014. Endoscopic vs microscopic myringoplasty: a different perspective. Eur. Arch. Oto-Rhino-Laryngol. 271, 1897–1902.

Mohindra, S., Panda, N.K., 2010. Ear surgery without microscope: is it possible. Indian J. Otolaryngol. Head Neck Surg. 62, 138–141.

Raj, A., Meher, R., 2001 Jan. Endoscopic transcanal myringoplasty: a study. Indian J. Otolaryngol. Head Neck Surg. 53 (1), 47–49.

Smith, S., Erablì, C., Woon, K., Sama, A., Dow, G., Robertson, I., 2010. Light at the end of the tunnel: the learning curve associated with endoscopic transsphenoidal skull base surgery. Skull Base 20, 69–74.

Yadav, S.P., Aggarwal, N., Julaha, M., Goel, A., 2009. Endoscope-assisted myringoplasty. Singap. Med. J. 50 (5), 510.