ORIGINAL ARTICLE

# LASER MYRINGOTOMY VERSUS VENTILATION TUBES IN OTITIS MEDIA WITH EFFUSION

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**Background:** Otitis media with effusion (OME) is a leading cause of difficulty in hearing in paediatric population. Otitis media with effusion must be detected and managed early to prevent conductive hearing loss in children. It was aimed to compare results of laser myringotomy and ventilation tube insertion, in terms of hearing improvement and recurrence of Middle ear effusion (MEE). **Methods:** This randomized controlled trial was conducted from February 2012 to January 2015. Children of 4–12 years of age with decreased hearing due to OME were included in the study. These children were investigated with pure tone audiometry (PTA) and tympanometry to confirm conductive hearing loss. Patients were put in 2 groups, group one comprised of patients treated with laser myringotomy and group 2, treated with ventilation tube insertion. The objective was to evaluate and compare results of the two procedures in terms of resolution of middle ear effusion (MEE) and improvement of hearing. The two procedures were also compared in terms of complications like otorrhea, persistence of perforation, hypertrophic scar and thinning of tympanic membrane (TM). **Results:** Middle ear effusion cleared in 35 out of 68 ears with laser myringotomy (LM) as compared to 52 out of 62 ears with ventilation tubes (VT). The myringotomy was still patent in 21 ears treated with LM while tube was in site in 50 years with VT after 3 months. The hearing level improved with LM by 10–15 dB after first 3 months. **Conclusion:** The aim in Otitis media with effusion is ventilation of tympanic cavity. Laser myringotomy can be substitute to ventilation tube insertion (VT). But it remains patent for shorter time and less effective than VT. The ears with refractory or recurrent MEE should have VT insertion.

**Keywords:** Otitis media with effusion; Middle ear effusion; Laser myringotomy; Ventilation tubes; Tympanometry

**J Ayub Med Coll Abbottabad 2016;28(4):773–5**

## INTRODUCTION

Middle ear effusion (MEE) is the leading cause of conductive hearing loss in the children.[1] Most cases of MEE resolve spontaneously. Medical treatment is less effective.[2] Laser myringotomy without tube has been attempted as an alternative procedure in otitis media with effusion (OME) as incisional myringotomy is not much effective.[3] Ventilation tubes are highly effective in refractory otitis media with effusion but incidence of complications is high.[4] Laser myringotomy has the advantage of patency for longer duration than incisional myringotomy.[3] laser myringotomy achieves the aim of middle ear ventilation.[5] LM has the disadvantage of shorter patency than VT.[3,5] We followed results of LM and ventilation tubes in terms of hearing improvement and resolution of MEE for 6 months. The objective was whether we can resolve persistent or recurrent OME using LM and we can avoid complications of persistent perforation and atrophic scar with VT.

## MATERIAL AND METHODS

The study was conducted from February 2012 to January 2015. This was a randomized controlled trial. Ninety-four Child patient of 4 to 12 years who fulfil the study criteria were included. The patients were collected from ENT OPD of DHQ hospital Haripur and Ayub hospital Abbottabad. All patients with OME were not included. Only those patients having decreased hearing due to persistent MEE for 6 months or more with three conservative treatments were included. They were either treated with adenoidectomy or with incisional myringotomy with recurrence of MEE. These patients were having hearing difficulty with hearing level more than 30 dB and type B tympanogram. Twelve patients did not participate in the study and were dropped. Finally, eighty-two children were included in the study. Every patient with MEE was evaluated with pure tone audiometry to determine hearing level. Tympanometry was carried out to determine middle ear pressure and to confirm middle ear fluid. These patients were randomly allocated to either of the 2 groups. Group 1 comprised of 42 Patients with 68 affected ears treated with LM and group 2 comprised of 40 patients with 68 ears having MEE treated with VT. Myringotomy was performed under operating microscope. Diode laser of 980-nm wavelength with a fibre-optic delivery system was used to perform the myringotomy in group 1. The myringotomy opening (MO) was made in anteroinferior quadrant of tympanic membrane with 0.6 mm bare diode fibre projecting 3 mm from

the hand piece edge. The laser energy was delivered by 5 shots in a circular manner with power of 5 W in 0.5 s single-pulse mode. The size of MO varied from 2 to 2.5 mm. IM was created with a myringotomy lancet with insertion of VT under the operating microscope in group 2. Middle ear effusion was aspirated using a no. 5 French Frazier-tipped suction in both groups. Saline drops were used to reduce the heat of laser. The patients were evaluated weekly for 8 weeks for otorrhea and presence MEE. The ears were compared in both groups at 1 month and 6 months for recurrence of MEE and hearing level with pure tone audiogram and tympanogram.

## RESULTS

A total of 136 ears out of 164 ears in 82 patients were selected. The 136 ears with MEE were divided in 2 groups. Group 1 had 68 ears with OME were treated with laser myringotomy (LM). Group 2 had 68 ears with OME were treated with ventilation tube (VT) insertion. In LM group, 61 (89.7%) out of 68 ears had clearance of MEE at first follow up after 30 days while 7 (11.3%) ears had effusion present in middle ear. Myringotomy opening was patent in 36 (53%) ears after 30 days. In group 2, 58 (85.2%) showed no MEE while 10 (14.8%) had recurrence of MEE after 30 days. The VT was found in place in 62 (91%) ears and only 6 (9%) were extruded after 30 days. These patients with clearance of MEE, had improvement of hearing by 10–12 dB and had type A curve on tympanometry.

After 6 months, in group 1 treated with LM 35 (51.5%) ears were free of MEE and 33 (48.5%) had recurrence of MEE. All myringotomy holes got closed and 01 ear had persistent perforation. In group 2, 57 (83.8%) ears were clear of MEE and 11(16.2%) ears had recurrence of effusion. VT was found present at its site in 15 (22%) ears. In group 1, 36 (53%) ears had no hearing problems while in group 2, 54 (79.5%) ears had good hearing. The ears having persistent or recurrent effusion had hearing level of 25–30 dB and type B tympanogram. LM and VT were equally effective in relieving MEE and improving hearing but recurrence was much higher with LM.

Intraoperative bleeding occurred in no ear operated with LM in group 1 as against 9 (13%) ears treated with insertion of VT. Two ears (3%) in LM group and 5 (7.3%) ears in VT group developed ear discharge. Immediate complications were twice more common with VT than LM. One ear (1.5%) in LM, group 1and 2 ears (3.0%) went on to have persistent perforation in VT group 2. In group 1, 4 (6.5%) ears developed retraction of TM as against 11 ears (16%) in group 2. Two ears (3%) had hypertrophic scar due to delayed healing having ear discharge in VT group 2 while none had prominent scar LM group 1. Twelve (8%) ears had thinning and retraction before LM and in 6 (4%) ears, it got resolved after treatment.

**Table-1: Results: comparison of LM and VT after 30 days**

| Follow up | LM% (68) | VT% (68) |
|---|---|---|
| Patency of hole in TM | 53 (36) | 91 (62) |
| MEE clearance | 89.7(61) | 85.2 (58) |
| MEE recurrence | 11.3 (7) | 14.8 (10) |
| Hearing improvement | 89.7 (61) | 91 (62) |

**Table-2: Results: comparison of LM and VT after 6 months**

| Follow up | LM% (68) | VT% (68) |
|---|---|---|
| Patency of hole in TM | 1.4 (1) | 22 (15) |
| MEE clearance | 51.5 (35) | 83.8 (57) |
| MEE recurrence | 48.5 (33) | 16 (11) |
| Hearing improvement | 53 (36) | 79.5 (54) |

**Table-3: Complications: LM versus VT**

| Complications | LM (68%) | VT (68%) |
|---|---|---|
| Bleeding | 00 (0) | 9 (13) |
| Otorrhea | 2 (3) | 5 (7.3) |
| Persistent hole | 1 (1.5) | 2 (3) |
| Atrophic scar | 4 (6.5) | 11 (16) |

## DISCUSSION

Otitis media with effusion (OME) is the leading cause of hearing loss in the children and 20% of children more than 2 year develop MEE that persists for more than 3 months.[1,6] OME may have negative effects on development of cognitive and learning skills and surgical treatment should help in reversing hearing loss.[7] The objective of our study was to achieve middle ear ventilation with laser myringotomy and whether LM is an alternative to VT. Our study showed that LM were patent for shorter time (4 weeks) compared to VT (4 months), similar results are shown in other studies conducted with the same objectives.[8,9] The advantages of diode laser over CO2 laser are that it is of small size and easily handled. It takes short time and by the use of contact modality the surgeon has more control on the place and power of the energy on the TM to avoid injury to surrounding structures.[8,10] The LM can also be an office based procedure under local anaesthesia where general anaesthesia is concern.[11]

Adenoidectomy and myringotomy is an effective procedure for refractory OME in children but most of the children have recurrence of MEE.[2] Our study showed that LM provide longer patency of MO helping in resolution of MEE.[7,12] Diode laser MO remains patent for an average of 3–4 weeks as against 4–6 months in VT.[8] Our study in agreement with other studies state that LM provides middle ear ventilation for not long enough time to clear glue ear in chronic OME.[8,13] We created MO in anterior and inferior quadrant of TM which healed without any visible damage as suggested by other studies.[8,14,15] We found that LM can improve hearing for several weeks as compared with IM but it does not obviate insertion of VT in recurrent and resis-

tant cases of OME needing longer duration of ventilation.[5,13] It is a useful alternative in surgical management of OME.[9,14] Other studies show as we do that LM is less effective than VT in the treatment of OME.[3,4 12] In our study, improvement of hearing was immediate and was recorded by 10–12 dB in 90% of ears treated with LM but this improvement dropped to 53% of ears after 6 months. similar results are shown in other studies conducted with the same objectives.[8,13] In group 2 treated with VT, 90% of success dropped to 79% at 6 months.[3,4]

Laser myringotomy provides blood less and clear surgical field. We found that intraoperative bleeding and ear discharge were common two times with VT than with LM.[5] At 6 months of follow, incidence of atrophic scar, thinning of TM, retraction of TM and persistent perforation were twice more common with VT than LM.[8,14,16] The recurrence of OME was comparatively high (48%) with LM than VT (16%).[3,11,15] We operated for LM under general anaesthesia but it can be operated with local anaesthesia to avoid risks of anaesthesia.[17]

## CONCLUSION

Laser myringotomy is a new modality to achieve the objective to ventilate the middle ear. It is much effective than myringotomy alone and competes with ventilation tube insertion. But as its patency is much shorter than tube insertion, it is less effective in clearance of mucoid effusion in long standing and recurrent OME. VT is still the choice in refractory and resistant cases where adenoidectomy and or incisional myringotomy are unable to resolve or prevent the recurrence.

## ACKNOWLEDGMENT

Special appreciation is expressed to Miss. Paghunda Gul for help in analysis of data and Mr. Abdal Khan for his help in typing the script.

## AUTHORS' CONTRIBUTION

All authors contributed equally in the preparation of manuscript.

## REFERENCES

1. Rosenfeld R. What to expect from medical treatment of otitis media. Paediatr Infect Dis J 1995;14(9):731–7.
2. Yousaf M, Inayatullah, Khan F. Medical versus surgical management of otitis media with effusion in children. J Ayub Med Coll Abbottabad 2012;24(1):83–5.
3. Yousaf M, Malik SA, Zada B. Laser myringotomy and incisional myringotomy in children with otitis media with effusion. J Ayub Med Coll Abbottabad 2014;26(4):441–4.
4. Koopman JP, Reuchli AG, Kummer EE, Boumans LJ, Rijnties E, Hoeve LJ, *et al*. Laser myringotomy versus ventilation tubes in children with otitis media with effusion: a randomised trial. Laryngoscope 2004;114(5):844–9.
5. Youssef TF, Ahmed MR. Laser-assisted myringotomy versus conventional myringotomy with ventilation tube insertion in treatment of otitis media with effusion: long-term follow-up. Interv Med Appl Sci 2013;5(1):16–20.
6. Roberts JE, Rosenfeld RM, Zeisel SA. Otitis Media and Speech and Language: A Meta-analysis of Prospective Studies. Paediatrics 2004;113(3 Pt 1):e238–48.
7. Szeremeta W, Parameswaran MS, Issacson G. Adenoidectomy with Laser or Incisional Myringotomy for Otitis Media with Effusion. laryngoscope 2000;110(3 Pt 1):342–5.
8. Hegazy MH. Diode laser myringotomy for short-term middle ear ventilation (a pilot study on children). Egypt J Otolaryngol 2013;29(4):230–4.
9. Sedlmaier B, Jivanjee A, Gutzler R, Huscher D, Jovanovic S. Ventilation Time of the Middle Ear in Otitis Media With Effusion (OME) After $CO_2$ Laser Myringotomy. Laryngoscope 2002;112(4):661–8.
10. D'Eredit R, Shah UK. Contac diode laser myringotomy for medium duration middle ear ventilation in children. Int J Paediatr Otorhinolaryngol 2006;70(6):1077–88.
11. Cotter CS, Kosko JR. Effectiveness of laser assisted myringotomy for otitis media in children. Laryngoscope 2004;114(3):486–9.
12. Poyrazoglu E, Cinicik H, Gungor A, Gurpinar B, Yildirim S, Candan H. The effects of incisional myringotomy and $CO_2$ laser myringotomy on rat tympanic membranes. Int J Paediatr Otorhinolaryngol 2004;68(6):811–5.
13. Zanetti D, Piccioni M, Nassif N, Campovecchi C, Redaelli de Zinis LO. Diode laser myringotomy for chronic otitis media with effusion in adults. Otol Neurotol 2005;26(1):12–8.
14. Cohen D, Shechter Y, Slatkine M, Gatt N, Perez R. Laser Myringotomy in Different Age Groups. Arch Otolaryngol Head Neck Surg 2001;127(3):260–4.
15. American Academy of Family Physicians, American Academy of Otolaryngology-Head and Neck Surgery, American Academy of Pediatrics Subcommittee on Otitis Media With Effusion. Otitis media with effusion. Pediatrics 2004;113(5):1412–29.
16. Chang CW, Yang YW, Fu CY, Shiao AS. Differences between children and adults with otitis media with effusion treated with CO(2) laser myringotomy. J Chin Med Assoc 2012;75(1):29–35.
17. Lin SH, Lai CC, Shiao AS. CO2 laser myringotomy in children with otitis media with effusion. J Laryngol Otol 2006;120(3):188–92.

| *Received: 10 February, 2016* | *Revised: 13 July, 2016* | *Accepted; 1st August, 2016* |
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