Adenoidectomy With Laser or Incisional Myringotomy for OME

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Otitis media with effusion (OME) is the most common cause of hearing loss in the pediatric population. In children under 15 years of age, otitis media remains the most frequent diagnosis in an ill child, accounting for almost 25 million patient visits per year, and 40% of all pediatric visits. The overall cost to the United States healthcare system is estimated at 5 billion dollars per year.1 As such, any new therapy for otitis has important public health implications. Most middle ear effusions resolve spontaneously. For those that do not, medical therapies (antibiotics, steroids, antihistamines) have limited efficacy.2 Thus, surgical therapy aimed at improving middle ear ventilation and Eustachian tube function has gained widespread acceptance.

Among the surgical options, myringotomy with tympanostomy tube placement is the most widely practiced. Tympanostomy tubes are highly effective for children with middle ear effusion with most remaining free of middle ear disease while the tubes remain patent and functional.3,4 Incisional myringotomy alone is not effective in the treatment of acute otitis media, probably due to the short duration of middle ear ventilation (only a few days).3,4,5

Recently, carbon dioxide laser myringotomy without tube placement has been advocated as an alternative treatment for acute otitis media and for refractory otitis media with effusion. At scientific meetings,6 in the lay press,7 and via Internet websites,8 proponents of this technique have described it as a "safe, painless, effective way to treat infants and young children with ear infections." No published clinical trials support or refute these contentions.

Laser myringotomies have the advantage of longer patency, averaging 1-3 weeks depending on the size of the opening created.9 It is logical that if laser myringotomy is ever warranted, it would be where an intermediate length of middle ear ventilation is desirable. One such setting is myringotomy performed in concert with adenoidectomy for refractory OME. Several studies have shown that performing adenoidectomy while simultaneously improving middle ear ventilation increases the chances for resolution of refractory OME. Further, these studies show that myringotomy with or without tube placement is superior to adenoidectomy alone.10-12

Laser myringotomy using an integrated carbon dioxide laser and video imaging system (OtoLAMÒ, ESM Medical Systems, Needham, MA) was introduced to the United States market in 1998. The system, which sells for between $35 and $70,000, uses a scanning protocol to deliver a relatively even distribution of laser energy over a prescribed surface area via a hand-held video-otoscope. Apart from this, it differs little from laser delivery devices available for the past 20 years. Proponents of laser myringotomy cite several advantages over myringotomy and tube placement including avoidance of general anesthesia, decreased negative effects on the tympanic membrane, and decreased cost.

Laser myringotomy is not a new idea. Lyons and colleagues (1978) experimented with carbon dioxide lasers in guinea pig ears, creating controlled ossicular and cochlear lesions.13 Goode (1982) reported the first laser myringotomies in humans and described prolonged middle ear ventilation when compared to incisional myringotomy. He also noted that middle ear fluid would protect the middle ear and cochlea from the potentially damaging effects of the laser. 14 Soderberg and colleagues (1984) used scanning electron microscopy (SEM) to monitor interval healing of laser myringotomies in rats. Myringotomies in the upper rear quadrant of the pars tensa completely closed between 15 and 24 days. 15 In 1994, DeRowe and colleagues developed a silver halide optical fiber that was able to transmit carbon dioxide laser energy efficiently. This fiberoptic delivery system was coupled to a comfortable, hand-held otoscope and used to perform laser myringotomies on guinea pigs. Their study was able to demonstrate a dose dependent relationship between energy parameters and myringotomy patency with the most important variable being exposure duration. 16

Cohen and colleagues (1998) reported the use of carbon dioxide laser for myringotomy in children. Using the laser, they performed myringotomy (spot size between 1.6 and 2.0 mm) on 21 pediatric ears (ages 3-7 years) under general anesthesia and demonstrated average patency rates between 2 and 3 weeks (healing times varied between less than 1 week (3 of 21) and greater than 4 weeks (3 of 21)). 10 of 21 (47%) patients had recurrence of their middle ear effusions within two months of the initial procedure. 17 In this preliminary study, no comparison to incisional myringotomy was attempted.

Despite claims of efficacy and safety, no controlled clinical trials of laser myringotomy in children have been published. In anecdotal reports presented at several national otolaryngology meetings in 1998-1999, 6,18,19 and in mailings to members of the American Society of Pediatric Otolaryngology, the Center for Integrated Outcomes in Health Care (The Children's Hospital of Buffalo) described a protocol using topical anesthesia for office-based laser assisted myringotomy using the OtoLAMÒ system. They cited advantages relating to convenience, cost, and avoidance of general anesthesia.

We saw an opportunity to test the effectiveness of laser myringotomy in the treatment of OME without incurring the expense of purchasing the OtoLAMÒ system and without exposing our patients to the pain and emotional distress of myringotomy without sedation or adequate anesthesia. Adenoidectomy with myringotomy is a proven therapy for refractory OME in children over the age of four years. 11,12 This treatment modality can be offered to the families of such children, especially in the springtime when the season is favorable and tympanostomy tubes pose problems for avid summer swimmers.

Unfortunately, each year several children returned for their post-operative visits with persistent effusion after the myringotomy incision had healed. If the use of the laser could extend the duration of middle ear ventilation to 2-3 weeks, healing of the nasopharynx and improvement in Eustachian tube function might decrease the incidence of persistent effusion.

In the study by Szeremeta et al (2000)20, as in that reported by Garin and Remacle (1999), laser myringotomy was performed safely at the time of adenoidectomy. 21 A controlled opening in the drum can be created that remains patent for several weeks and, at least in these small series, healed without visible damage to the drum in all cases. Several children in our series were seen for problems related to their adenoidectomies during the first week after surgery and all had patent openings following laser myringotomy. At a mean of 17 days post-operatively, 8 of 39 middle ears were still ventilated in the laser myringotomy group compared with none in the incisional myringotomy group. Clearly, laser myringotomies last longer.

Unfortunately, laser myringotomy at the time of adenoidectomy added about ten minutes to the procedure and involved the use of expensive, fragile equipment with no demonstrable improvement in outcome. The prevalence of effusion in the two groups at first post-operative visit was not statistically different.

OME is the leading cause of conductive hearing loss in childhood. Hearing loss secondary to chronic effusion may have an adverse effect on the development of cognitive, linguistic, and communicative skills.22 The goals of any surgical treatment for this disorder should include reversing conductive hearing loss, reestablishing normal middle ear ventilation and drainage, minimizing complications, and reducing future recurrences. In the treatment of refractory OME, Mandel and colleagues (1992) demonstrated that incisional myringotomy alone offers no advantage over observation when measuring percent of time with effusion or the number of subsequent episodes of acute otitis media. Myringotomy with tube insertion provides longer middle ear ventilation (average of 12.43 months), and more time without effusion, but is not without risks including chronic otorrhea, tympanosclerosis, chronic tympanic membrane perforation, and tube retention. 3,4

If laser myringotomy is to find a place in the treatment of refractory otitis media with effusion, the value of an intermediate duration of middle ear ventilation must be demonstrated. At this time, laser myringotomy, with its increased cost, greater duration of surgery, and potential for accidental injury to patient and operating room staff, cannot be advocated as a replacement for incisional myringotomy when an

concomitant adenoidectomy is performed. Its value as a sole treatment for refractory OME can only be established by controlled clinical trials.

REFERENCES

1. 10 Gates GA. Cost-effectiveness considerations in otitis media treatment. Otolaryngol Head Neck Surg 1996; 114:525-30.
2. Rosenfeld, R. What to expect from medical treatment of otitis media. Pediatr Infec Dis J 1995;14:731-37.
3. Mandel EM, Rockette HE, Bluestone CD, Paradise JL, Nozza RJ. Efficacy of myringotomy with and without tympanostomy tubes for chronic otitis media with effusion. Arch Otolaryngol Head Neck Surg 1989; 115:1217-24.
4. Mandel EM, Rockette HE, Bluestone CD, Paradise JL, Nozza RJ. Efficacy of myringotomy with and without tympanostomy tubes for chronic otitis media with effusion. Pediatr Infec Dis J 1992;11:270-77.
5. Le CT, Freeman DW, Fireman BH. Evaluation of ventilation tubes and myringotomy in the treatment of recurrent or persistent otitis media. Pediatr Infec Dis J 1991;10:2-11.
6. Brodsky L, Brookhouser PE, Waner M, Shaha, S. The safety and efficacy of office-based ventilation tube insertion: The role of the otoscan laser. Middle Section, The Triological Society, Milwaukee, WI. Jan 22-24, 1999.
7. Marsa L. Five ways to treat an ear infection. Child Magazine 1998; 11:64-65.
8. ESC Link, ESC Medical Systems: Breakthrough treatment for ear infections: OtoLAM. http://www.earinfections.com/
9. Silverstein H, Kuhn J, Choo D, Krespi YP, Rosenberg SI, Rowan PT. Laser assisted tympanstomy. Laryngoscope 1995; 106:1067-74.
10. Maw AR, Parker AJ. A model to refine the selection of children with otitis media with effusion for adenoidectomy. Clin Otolaryngol 1993; 18(3):164-70.
11. Paradise JL, Bluestone CD, Rogers KD, et al. Efficacy of adenoidectomy for recurrent otitis media in children previously treated with tympanostomy-tube placement. Results of parallel and randomized and nonrandomized trials. JAMA 1990; 263(15):2066-73.
12. Gates GA, Avery CA, Prihoda TJ, Cooper JC. Effectiveness of adenoidectomy and tympanostomy tubes in the treatment of chronic otitis media with effusion. N Engl J Med 1987; 317:1444-51.
13. Lyons GD, Webster DB, Mouney DF, Lousteau RJ. Anatomical consequence of CO2 laser surgery of the guinea pig ear. Laryngoscope 1978; 86:1749-54.
14. Goode RL. CO2 laser myringotomy. Laryngoscope 1982; 92:420-23.
15. Soderberg O, Hellstrom S, Stenfora L. Myringotomy made by CO2 laser - an alternative to the ventilation tube? An experimental study. Acta Otolaryngol 1984; 97:335-41.
16. DeRowe A, Ophir D, Katzir A. Experimental study of CO2 laser myringotomy with a handheld otoscope and fiberoptic delivery system. J Clin Laser Surg Med 1994; 15:249-53.
17. Cohen D, Siegel G, Krespi J, Schechter Y, Slatkine M. Middle ear laser office ventilation (LOV) with a CO2 Laser Flashscanner. J Clin Laser Surg Med 1998; 16(2):107-9.
18. Brodsky L, Waner M, Shaha S. Otitis media in children: Increasing treatment of versatility with the use of the CO2 Flashscanner Laser. Southern Section, The Triological Society, New Orleans, LA, Jan 14-16, 1999.
19. Brodsky L, Shaha S, Waner M. Office based laser assisted myringotomy using CO2 flashscanner laser: The effects of sustained middle ear ventilation without tubes - Clinical, satisfaction and financial outcomes. Eastern Section, The Triological Society, Providence, RI, Jan 29-31, 1999.
20. Szeremeta W, Parameswaran MS Isaacson G. Adenoidectomy With Laser or Incisional Myringotomy for Otitis Media With Effusion. Laryngoscope 2000; 110:342-5.
21. Garin P, Remacle M. Laser-assisted myringotomy combined with adenoidectomy in children: Preliminary results. Acta Otorhinolaryngol Belg 1999;53(2):105-8.
22. Fria TJ, Cantekin EI, Eichler JA. Hearing acuity of children with otitis media with effusion. Arch Otolaryngol 1985; 110:-16.