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Trans-nasal endoscopic holmium: YAG laser correction of choanal atresia

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Abstract

Five patients with choanal atresia were treated, using a trans-nasal endoscopic Holmium:YAG laser. The age of patients ranged from 15 months to 53 years. The nasal endoscope provides excellent visualization. The advantage of the Holmium:YAG laser is its fibre-optic delivery, allowing the laser to be hand-held, giving greater precision. Good nasal airways were achieved in four out of five cases with a single treatment. The procedure was found to be safe, quick, with minimal morbidity and a shorter in-patient stay.

Key words: Choanal atresia; Laser surgery

Introduction

Choanal atresia occurs in about 1:8000 live births (Healy *et al.*, 1978; Muntz, 1987). In most circumstances it is congenital and bilateral. Various surgical approaches have been advocated, the most common being either trans-palatal or trans-nasal. However, the introduction of nasal endoscopy has made the trans-nasal approach more versatile (Morgan and Bailey, 1990; Stankiewicz, 1990; El-Guindy *et al.*, 1992). In recent years CO_2 and Nd-YAG lasers have been used with increasing frequency (Healy *et al.*, 1978; Illum, 1986; Yuan *et al.*, 1993). In the surgery of the upper airway we wish to report the combined use of the nasal endoscope with the Holmium:YAG laser which is targeted through a flexible, fibre-optic carrier for vaporization of choanal atresia. Five cases have yielded good results and the technique holds promise for future management. We have found this approach to be safe, simple, quick, with reduced morbidity and hospitalization.

Materials and methods

We report on a sequence of five cases of unilateral choanal atresia, aged between 15 months to 53 years, all females, treated with the endoscopic, trans-nasal Holmium:YAG laser. Of the five cases, three were unilateral, congenital choanal atresia undergoing primary treatment. One case had an acquired choanal stenosis, as a complication of nasal/post-nasal packing for repeated epistaxis. The fifth patient, a 15-month-old child was born with bilateral membranous choanal atresia that had been already treated by trans-nasal perforations but had unilateral re-stenosis. The clinical diagnosis of choanal atresia was confirmed by nasal endoscopy and CT scanning.

All the patients were operated under a general anaesthetic through an oral, guarded Hunton-Oswal's endotracheal tube. Pre-operatively the nose was prepared with xylometrazoline spray and cocaine paste was applied to achieve maximum vasoconstriction. The nasopharynx was then packed with saline-soaked green gauze to identify and prevent injury to the nasopharynx (and the patient placed in a horizontal position). The atresia was visualized with a 2.7 mm–4 mm, 0° nasal telescope and vaporized using the flexible, fibre-optic trans-

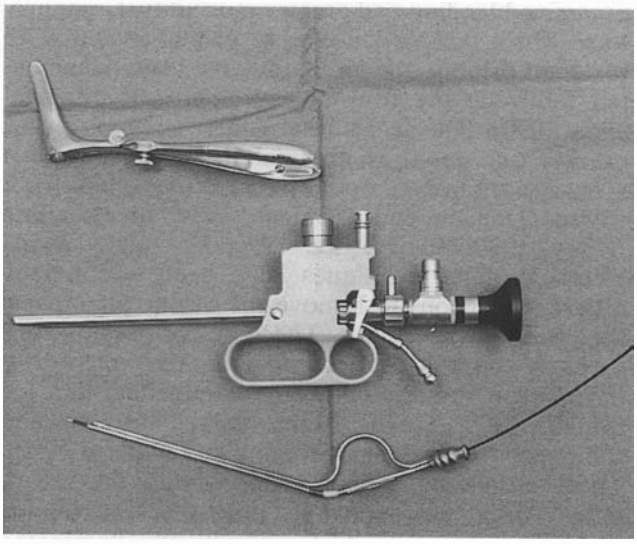

FIG. 1

Showing (a) Nasal speculum (2) Nasal endoscope and (3) Holmium:YAG Laser fibre-optic carrier with co-axial suction.

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TABLE I

Age	Type of atresia	No. of laser treatment	Duration of follow-up in months	Results
15 months	Unilateral & membranous	1	6	Good
14 years	Unilateral & membranous	1	Lost to follow-up	
26 years	Unilateral & membranous	1	15	Good
28 years	Unilateral & membranous	1	3	Good
53 years	Unilateral & membranous	1	7	Good

mitted Holmium:YAG laser (wave length 2.1 μm) at 10 watt power in a pulsed mode of 5–10 Hz (Figure 1), until the saline-soaked green gauze was visualized. The atresia was first vaporized along the floor of the nose and then gradually enlarged with particular attention to the posterior nasal septum. Due care was taken to avoid any injury to the nasopharynx. A clear operative field was maintained by intermittent suction. No nasal stents were used post-operatively and patients were discharged the following day. A review appointment was made for four weeks following the operation. A routine nasal endoscopic examination was carried out during follow-up to endorse the outcome of the surgery.

Results

The cases have been followed from three to 15 months. A normal functioning airway with healthy mucosa, no evidence of re-stenosis and symptom-free patient was defined as a good result. This was achieved in four out of five cases with one treatment (Table I). One patient failed to turn up for follow-up appointments.

Discussion

Various approaches have been described to deal with choanal atresia. The trans-palatal route provides excellent visualization but disadvantages are that it requires greater tissue handling, there is excessive bleeding and greater morbidity. Complications which include stunting of palatal growth with resultant orthodontic problems have been documented following the trans-palatal approach (Stankiewicz, 1990). The trans-nasal route, is simple, safe, quicker and requires minimal tissue handling but gives a more limited operative field to see and work within (Dehaen and Clement, 1984; Morgan and Bailey, 1990; Stankiewicz, 1990; El-Guindy *et al.*, 1992). Various techniques have been adopted by different surgeons to remove the atretic plate using the trans-nasal route. The use of perforators, curettes, backbiting forceps and the microdrills have been associated with columellar damage (Singh, 1990; Singh, 1991), palatal fistulae and submucous tunnelling (Morgan and Bailey, 1990). These pitfalls have been reduced with the use of nasal endoscopes and the operating microscope which provide a magnified and brilliantly illuminated field (Stankiewicz, 1990; El-Guindy *et al.*, 1992).

The introduction of the CO_2 laser in the management of choanal atresia by Healy *et al.* in 1978, opened a new dimension in this field. The CO_2 laser (wave length 10.6 μm), although quite suitable for superficial tissue ablation does not effectively vaporize bone and cartilage, and its use is also limited by requiring delivery through an operating microscope. Any obstructing condition of the nose such as a deviated septum or hypertrophic turbinate limits its application at the posterior choana and hence the need to find a flexible, fibre-optic laser system. The Nd;YAG laser (wave length 1.06 μm) can be delivered through a flexible, fibre-optic system but causes deep thermal tissue injury and requires a co-axial gas cooling (Yuan *et al.*, 1993).

The Holmium:YAG laser (wave length 2.1 μm) is transmitted through a flexible, fibre-optic filament and hence can be closely applied to tissues. It was found to be quick and gives precise vaporization of the atresia under direct visual control through a nasal telescope in a bloodless field. It causes minimal injury to the adjacent tissues which results in better healing, less scarring and hence no requirement for post-operative stenting. Unlike the Nd:YAG laser, the Holmium:YAG laser does not require a coaxial gas cooling system of its delivery tip, hence there is no potential risk of gas embolism (Yuan *et al.*, 1993). Another advantage of the Holmium:YAG laser over other lasers eg CO_2 and KTP:532 lasers is its capability to evaporate bone and hence it can be used to treat bony choanal atresia (Johnson, 1990). From this limited experience, it appears that this procedure has advantages over other conventional operations and deserves consideration as a modality of management for this difficult condition.

It needs to be established if this technique is equally beneficial to neonates. The properties of the Holmium:YAG laser are suitable but it was considered wiser to proceed on older patients first until the procedure was proven satisfactory. We now believe, we can attempt neonatal surgery when a suitable case presents.

References

Dehaen, P., Clement, P. A. R. (1984) Endonasal surgical treatment of bilateral choanal atresia under optic control in the infant. *Journal of Otolaryngology*, **14:** 95–98.

El-Guindy, A., El-Sherief, S., Hagrass, M., Gamea, A. (1992) Endoscopic endonasal surgery of posterior choanal atresia. *Journal of Laryngology and Otology* **106:** 528–529.

Healy, G. B., McGill, T., Jako, G. T., Strong, M. S., Vaughan, C. W. (1978) Management of choanal atresia with the carbon dioxide laser. *Annals of Otorhinolaryngology* **87:** 658–662.

Illum, P. (1986) Congenital choanal atresia treated by laser surgery. *Rhinology* **24:** 205–209.

Johnson, L. P. (1990) Nasal and paranasal sinus application of lasers. In *Lasers in Otolaryngology–Head and Neck Surgery* (Davis, R. K. ed.). W. B. Saunders Co., Philadelphia, pp 147–148.

Morgan, D. W., Bailey, C. M. (1990) Current management of choanal atresia. *International Journal of Paediatric Otorhinolaryngology* **19:** 1–13.

Muntz, H. R. (1987) Pitfalls to laser correction of choanal atresia. *Annals of Otorhinolaryngology* **96:** 43–46.

Singh, B. (1990) Bilateral choanal atresia: Key to success with transnasal approach. *Journal of Laryngology and Otology* **104:** 482–484.

Singh, B. (1991) A safer transnasal technique for the management of bilateral choanal atresia. *Journal of Laryngology and Otology* **105:** 1004–1005.

Stankiewicz, J. A. (1990) The endoscopic repair of choanal atresia. *Otolaryngology – Head and Neck Surgery* **103(6):** 931–937.

Yuan, H. B., Poon, K. S., Chan, K. H., Lee, T. Y., Lin, C. Y. (1993) Fatal gas embolism as a complication of Nd-YAG laser surgery during treatment of bilateral choanal stenosis. *International Journal of Paediatric Otorhinolaryngology* **27:** 193–199.

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