LASER REDUCTION OF INFERIOR TURBINATES IN CHILDREN

Y T Pang, D J Willatt

ABSTRACT

Perennial nasal obstruction in children refractory to medical treatment may be managed by turbinate reduction. Turbinectomy may involve a risk of significant postoperative bleeding and requires nasal packing. Submucosal diathermy is followed by nasal congestion and crusting; recurrent nasal obstruction is frequent at fifteen months. This study assesses the benefits of carbon dioxide laser reduction of inferior turbinates in 20 children.

Intraoperative blood loss was negligible and no nasal packing was required. There was minimal postoperative discomfort which required no analgesia. No postoperative haemorrhage was recorded. The children were able to drink and eat by 4 and 6 hours respectively. Relief of nasal obstruction occurred one to seven days postoperatively and was confirmed by rhinohygrometry. Nasal patency was maintained on eighteen to twenty-four months follow up. Mucosal healing was completed by four weeks. Mucosal saccharin clearances were normal postoperatively. We conclude laser turbinectomy is an excellent means of turbinate reduction in selected children.

Keywords: *inferior turbinate hypertrophy, laser turbinectomy, nasal obstruction, children.*

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INTRODUCTION

Nasal obstruction is a common symptom of perennial rhinitis. This is believed to due primarily to mucosal hypertrophy of the inferior turbinate[1]. Children with inferior turbinate hypertrophy may be successfully managed with oral antihistamines, chromoglycates and steroidal sprays. However, whereas mucosal hypertrophy is initially reversible, continued hypertrophy leads to varicosity of the venous plexus unresponsive to medication[2]. Failed medical treatment is an indication for surgery. The aim of surgery is to reduce the bulk of the inferior turbinate either by surface and submucosal diathermy, cryotherapy[3], turbinoplasty[4], partial and radical turbinectomy, laser turbinectomy[5,6]; or lateralising the inferior turbinate into an intranasal antrostomy.

Submucosal and surface diathermy are initially followed by three weeks of nasal congestion and crusting; and unfortunately recurrent obstruction is frequent at fifteen months post surgery[7]. Rare instances of profuse postoperative bleeding have been reported[8]. Cryotherapy has gained little popularity as relief of nasal obstruction may again only be temporary[9]. Thompson[10] in an extended follow-up of children who underwent inferior turbinectomy reported a 68% sustained improvement in airway with no excessive dryness or crusting in the nose. However inferior turbinectomy requires post nasal packing and 3.4% - 8.9%[11] suffer significant postoperative haemorrhage.

Laser reduction of inferior turbinate may confer many advantages. Freedom from postoperative packing should be a distinct advantage in children. To date there has been no study in a purely paediatric population. The aim of our study is to evaluate the role of laser turbinectomy in children with chronic nasal obstruction due to perennial rhinitis which is refractory to medical treatment.

SUBJECTS AND METHOD

Children with nasal obstruction due to allergic or non allergic rhinitis refractory to medical treatment of six months duration were examined. Those with nasal blockage secondary to bulky inferior turbinates were entered into the study. Children with a deviated nasal septum, rhinosinusitis and previous nasal surgery were excluded.

Twenty patients, eleven boys and nine girls, were entered into the study. The age range was 6 to 15 years with a mean age of 11.25 years. Table I shows the sex and age distribution of the children. All the children had nasal obstruction; in addition, three had rhinorrhoea and three others had hyposmia. Informed consent was obtained. Pre and postoperative rhinohygrometry and saccharin clearance tests were performed in co-operative children. Postoperative rhinohygrometry was performed at two weeks, one month, three months and six months. Postoperative saccharin clearance was measured at three months.

Table I - Age and sex distribution of the children in the study

Age	Male	Female
6-12 years	7	4
> 12 years	4	5

Mean age = 11.25 years

Rhinohygrometry works on the principle of condensation of expired air on a cold metal plate. This test gives a rough indication of nasal patency. This is a semi quantitative method

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which is useful in children as they are unable to co-operate in anterior rhinomanometry. We use a polished metal plate with concentric semicircles marked on it with a vertical line dividing the surface into two halves. The test is performed at room temperature at about the same time in the day with the child in sitting position. The child is asked to breathe in and out normally for several times before introducing the metal plate in a horizontal position one centimetre below the nostril directly under the columella. After several cycles of expiration, a consistent misting pattern is seen and the area is marked with indelible ink and measured. The area is measured separately for each nostril.

Saccharin clearance test is used to quantify the ciliary activity of the nasal mucosa. A small piece of saccharin is placed at the anterior end of the inferior turbinate and the time for the child to be able to taste the saccharin is noted. This is a difficult test to perform in children as most of them are not able to tolerate the test.

Laser turbinectomy is performed under general anaesthesia with endotracheal intubation. No premedication is given. Induction is with thiopentone and suxamethonium and anaesthesia maintained with an oxygen, nitrous oxide and enflurane mixture.

The patient is placed supine with wet gauze protecting the face leaving only the nostril exposed. Cocaine paste is applied to the inferior turbinate and nasal cavity bilaterally to vasoconstrict and decongest the nasal mucosa. Meanwhile, a Sharplan carbon dioxide laser is sighted through a Zeiss operating microscope with 300 mm objective lens. Protective glasses are worn by theatre staff. A large split ear speculum is introduced into the nostril to visualise the inferior turbinate and to protect the surrounding tissue from any stray laser beams. Mucous and the cocaine paste is removed by a plastic Yanker type suction catheter. It is then placed at the split end of the speculum to remove fumes from the operative field.

The laser is set to continuous mode at 15 watt. Using the defocussed beam, the mucosa of the anterior two-third of the inferior turbinate is vapourised. No nasal packing is required. The operation can be completed within 15 minutes.

Intra and postoperative bleeding, nasal packing, the time at which postoperative drinking and eating occurred, postoperative discomfort and appearance of the turbinate were monitored. The children were reviewed at two, four weeks, four, six months and subsequently six monthly. During each visit, the patients were questioned on their nasal symptoms and nasal patency was assessed.

RESULTS

All twenty children completed laser reduction of the inferior turbinates. Table II shows a summary of the post-operative results at a follow-up of between eighteen to twenty-four months.

Table II - Results of postoperative follow up at one year.

Complaints	Improved	Same	Worse
Nasal obstruction	18	02	
Rhinorrhea		03	
Hyposmia	03		

Intra-operative bleeding was between 5 - 10 ml. No nasal packing or splints was required in any child. There were no instances of postoperative bleeding. None of the patients needed analgesia during the hospital stay or after discharge. Two patients complained of some postoperative discomfort which did not require any analgesia.

The children were able to take fluids within two to six hours (mean = 4 hours). Eating followed soon afterwards within six to twelve hours (mean = six hours). All the children were discharged within twenty-four hours.

On follow up, eighteen reported improvement in nasal airway by one week. Fifteen of the children reported improvement by thirty-six hours. Two children indicated that their nasal obstruction remained the same. There was initial crusting in the nasal cavity which cleared up over the next four weeks. By the fourth week, the inferior turbinate is fully healed. None of the patients was found to have synechiae or atrophic rhinitis.

In six patients who were able to co-operate, saccharin clearance test was performed. The pre and postoperative figures were not significantly different using the paired t-test ($p = 0.2$). Fifteen children who completed the rhinohygrometry test, showed an improvement in their airway.

At follow-up to date, ie between eighteen to twenty-four months, eighteen patients have experienced relief from nasal obstruction. Two of the twenty found the laser treatment to be below expectation.

Rhinorrhea was not improved in the three children complaining of the symptom preoperatively. Those with hyposmia found an improvement in their sense of smell following laser turbinate reduction with a concomitant improvement in taste.

DISCUSSION

Use of laser in rhinology is promising. Selkin[6] treated 9 patients in the 15 to 20 years age group with none below 15 years. McCombe et al[13] used laser cautery on his patients, the youngest being 11 years. In our laser study, we specifically studied laser turbinectomy in children alone.

Mittelman[5] found laser turbinectomy provided sustained relief of nasal obstruction in 27 of 30 patients with little early or late morbidity. The failure in 3 patients on long-term follow-up was ascribed to insufficient initial vapourisation of turbinate tissue. On reviewing the 2 children who did not obtain improvement from our laser treatment, there was inadequate reduction of the inferior turbinate due to hypertrophy of the turbinate bone. In this situation we now resort to limited trimming of the turbinate bone.

The varied surgical interventions in the treatment of obstructive perennial rhinitis secondary to turbinate hypertrophy serve to confuse the practising otolaryngologists. Is laser turbinectomy just another means of turbinectomy that could be obtained more cheaply by a pair of turbinate scissors? We think not. Laser turbinectomy offers quite a significant number of advantages compared to conventional methods, especially in selected children.

The low intra operative blood loss is crucial to children with their relatively low circulating blood volume. The use of cocaine we feel is important in decreasing the vascularity of the nasal mucosa. The paste acts topically and with minimal systemic effect. It acts rapidly and is removed three to five minutes after application. Together with the haemostatic quality of the carbon dioxide laser the operative field becomes virtually bloodless.

Post-operative nasal packing is uncomfortable, and children are likely to prematurely remove their own packs. Those who suffer from primary haemorrhage usually require haemostasis in theatre. Laser turbinectomy allows children freedom from nasal packing with little risk of postoperative

haemorrhage.

Postoperative discomfort is encouragingly minimal when compared to the other procedures; a benefit also noted by Selkin[6] and Elwany and Harrison[9]. None of our patients required analgesia.

Rapid recovery from anaethesia and surgery means a child is mobile on average four hours postoperatively. We have recently offered this procedure as a day procedure, discharging the patient six hours after the operation if there is no complication.

An improved airflow to the olfactory area brought about the improved sense of smell and taste in 3 children. We measured nasal patency by rhinohygrometry which showed a significant improvement after the laser treatment. This is not the ideal method as it only measures nasal patency during expiration and not inspiration. There is a large intraindividual and interindividual variation. We tried to minimise any environmental influence by performing the test in the same room at about the same time of the day. Nevertheless, this is a simple way of testing the child's nasal patency without elaborate testing which will prove difficult in a child. We were able to obtain results in fifteen children. The remaining five could not complete the test satisfactorily to allow meaningful interpretation of results.

There does not appear to be a significant change in mucociliary activity as documented by the saccharin clearance test. As we were able to obtain a measurement in only six children, this result cannot be taken as representative. This result is similar to that obtained by Elwany and Harrison[9]. Further studies will be needed to determine the influence of laser on mucociliary clearance.

Finally the turbinates heal rapidly after laser treatment. By the end of four weeks, the turbinates have completely healed with no residual crusting. Other authors have this advantage compared to non laser techniques[5,6]. Long term complications of synechiae and atrophic rhinitis have not been documented thus far in a follow-up of eighteen to twenty-four months.

The main disadvantage of the laser is its expense and it may not be freely available in all ENT departments. Nevertheless, we would recommend its use in children in whom nasal packing and post-operative management are likely to be a problem. This is especially so in children under twelve years.

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