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Partial laser turbinectomy: two year outcomes in patients with allergic and non-allergic rhinitis*

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SUMMARY

Objective: *The aim was to compare two year outcomes of partial laser turbinectomy in patients with allergic and non-allergic rhinitis with respect to nasal obstruction symptom scores and nasal peak inspiratory flow rates (nPIFR). This has not been reported previously.*

Method: *Fifty-four patients underwent partial laser turbinectomy (28 with allergic rhinitis, 26 with non-allergic rhinitis). NPIFR was measured preoperatively, at 3 months and two years postoperatively. A symptom score questionnaire was also completed.*

Results: *Both allergic and non-allergic patients showed a significant improvement in symptom scores and nPIFR at three months (n=54). The improvement in allergic patients was greater. In the 31 patients seen at two years, there was still a significant improvement in median symptom scores but no such improvement in median nPIFR. In allergic patients (n=18) at two years, there was no significant improvement in symptom and nPIFR scores. Non-allergic patients (n=13), however, did show sustained significant improvement in these scores ($p<0.05$). Eighty-seven percent (26/31) considered the operation successful and would recommend it to others.*

Conclusions: *Non-allergic patients derive a more sustained improvement in the medium term compared to allergic individuals when undergoing partial laser turbinectomy. The improvement in symptom scores in the group as a whole was still significant.*

Key words: laser turbinectomy, allergic, non-allergic, rhinitis

INTRODUCTION

Nasal obstruction, although not life threatening, can interfere with the quality of life. The nasal mucosal oedema and swelling associated with allergic (perennial or seasonal) and non-allergic (intrinsic or vasomotor) rhinitis cause a significant increase in the size of the inferior turbinates, and consequently there is a noticeable reduction of airflow through the nose.

Initially, conservative medical treatment with topical steroids and antihistamines (in allergic individuals) only provides relief to a limited number of patients (Von Haake, 1985; Lippert et al., 1997) and so surgical options are explored to improve nasal obstruction in the majority of patients referred to the ENT clinic with nasal obstruction (Mittelman, 1982). Surgical treatments such as cryotherapy (Puhakka, 1977), sub-mucous diathermy (Talaat et al., 1987), partial (Goode, 1988) or total (Ophir et al., 1985) inferior turbinectomy, sub-mucous resection of the inferior turbinate bone (House, 1951) and turbinate lateralization (Thomas et al., 1987) have all been used with varying degrees of success. The two drawbacks with the above techniques are poor long-term results and primary haemorrhage, which can be severe and occur in up to 10 % of patients (Dawes, 1987).

Recently the carbon dioxide laser has been used to reduce the size of the inferior turbinates with promising results on long-term follow-up (Lenz, 1985; Selkin, 1985; Fukuta et al., 1987; Levine, 1989; Mladina et al., 1991).

With this prospective study, we aim to measure the effects of laser partial turbinectomy on the nasal inspiratory airflow in allergic and non-allergic individuals in terms of symptom scores and nasal peak inspiratory flow rates (nPIFR).

MATERIALS AND METHOD

Local Ethics Committee approval was obtained to carry out this study. Informed written consent to take part in the study and attend for follow-up was obtained from each patient. Fifty-four adult patients (>18 years) with a history, examination and specific IgE antibody (RAST, radioallergosorbent test) results consistent with a diagnosis of allergic or non-allergic rhinitis were included. Criteria from the history included symptoms of nasal obstruction, rhinorrhea, ocular pruritis, postnasal drip, sneezing and anosmia. Examination criteria included nasal mucosal oedema, clear rhinorrhea and oedematous enlarged turbinates. Patients with other nasal pathology, including nasal polyps, septal perforations and gross septal deviations were

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excluded. Any patients who had undergone previous nasal surgery were also excluded. Patients with specific IgE scores greater than 40 IU/l and the above symptoms were diagnosed as allergic rhinitis. Those with specific IgE values less than 40 IU/l were diagnosed as non-allergic rhinitis. Specific allergens used were house dust mite, cat and dog epithelia, molds and grasses. All patients in the study had failed to respond to medical treatment and had hypertrophied inferior turbinates.

External temperature, humidity variation, and exercise, can all affect the degree of vascularity of the nasal mucosa. To standardise conditions prior to measurement nPIFR, the patient sat on the ward for 30 minutes. During this time the patients were asked about their nasal symptoms in a pre-operative assessment questionnaire and were asked to grade their nasal obstruction on a visual analogue scale (from 1-10) (see appendix). Measurements of nPIFR were then made using the Incheck nasal peak inspiratory flow rate meter (Clement Clarke International Ltd).

They were taught the correct method of using the meter and an average of 3 readings was recorded. Careful observation of technique was made, checking especially for alar collapse. All patients underwent bilateral laser partial inferior turbinectomy. The operations were performed under local or general anaesthetic, by two of the authors.

A volume of 2.2mls of 2% xylocaine with 1:80,000 adrenaline was injected into muco-cutaneous junction of the inferior turbinate. A silastic splint was inserted into each nasal cavity to protect the nasal septum during the procedure. The carbon dioxide (CO_2) laser in super-pulse mode set at 10 watts continuous power was used to reduce the anterior 30% of the inferior turbinate. The laser beam was mildly defocused to spread the area of laser contact. No nasal packs were used routinely after the operation and the patients were all discharged the same day from hospital.

Patients were invited to return to the out-patient department after 3 months and 2 years for follow-up examination and evaluation of their nasal airflow.

RESULTS

All 54 patients (19 female and 35 male) underwent laser partial inferior turbinectomy. The median age was 33 years (range, 18-70 years). They all complained of nasal obstruction as their main symptom. Twenty-six patients (48%) were classified with allergic rhinitis, with specific IgE results greater than 40 IU/l (range 45-2119 IU/l). The remaining 28 patients (52%) were diagnosed with non-allergic rhinitis, (specific IgE range: 1-35 IU/l).

As the study group did not conform to a standard distribution of symptom scores and airflow measurements, median values were used.

At three months, the group (n=54) showed a significant improvement in both median symptom score ($p<0.05$) and median nPIFR ($p<0.05$) compared to preoperatively (Table 1). The median pre-operative and post-operative symptom scores

Table 1. The statistical significance of symptom scores and nasal peak inspiratory flow rates (nPIFR) of all patients at three months and two years postoperatively using paired student's t-test. $p<0.05$ is taken as significant.

Three months (n=54)		
Symptom Score	Median	Standard deviation
Preoperative	5.00	1.56
Postoperative	8.00	1.46
t	-11.1	
p	p< 0.05	
nPIFR		
Preoperative	80.00	34.90
Postoperative	115.00	40.90
t	-9.9	
p	p<0.05	
Two years (n=31)		
Symptom Score	Median	Standard deviation
Preoperative	5.00	1.62
Postoperative	7.00	2.25
t	-4.2	
p	p<0.05	
nPIFR		
Preoperative	82.00	32.70
Postoperative	86.00	38.51
t	-1.56	
p	p>0.05	

Table 2. The statistical significance of symptom score and nasal peak inspratory flow rates (nPIFR) of allergic and non-allergic patients at three months postoperatively, using paired student's t-test. $p<0.05$ is taken as significant.

Three Months		
Allergic Patients (n=26)	Median	Standard deviation
Symptom score		
Preoperative	5.00	1.53
Postoperative	8.00	1.27
t	-7.70	
p	p<0.05	
nPIFR		
Preoperative	88.50	31.60
Postoperative	124.00	40.60
t	-8.08	
p	p<0.05	
Non-allergic Patients (n=28)		
Subjective Scores		
Preoperative	5.00	1.61
Postoperative	8.00	1.63
t	-7.94	
p	p<0.05	
Objective Scores		
Preoperative	73.5	37.20
Postoperatve	95.5	39.10
t	-6.11	
p	p<0.05	

were 5 (range, 3-8) and 8 (range 5-10) respectively. This is a median percentage increase of 40.0% (range 0-200%) in symptom score.

Pre-operatively, the median nPIFR was 80 l/min (range, 30-156 l/min), and post-operatively was 115 l/min (range,60-230 l/min).This represents a median increase in nPIFR of 38% (range 3-284%).

The improvement was also significant when the group was divided into allergic (n=26) and non-allergic individuals (n=28) (Table 2).There was no difference between the allergic and non-allergic groups in the pre- and post-operative symptom median scores and ranges. The allergic group experienced a greater percentage increase in nPIFR (42.5% compared with 37.5% in the non-allergic group).

When looking at post-operative morbidity there were no episodes of haemorrhage that required nasal packing or an overnight hospital stay and there were no episodes of secondary haemorrhage. At 3 months there were no cases of adhesions between the nasal septum and the lateral nasal wall and no patients were listed for revision surgery.

Thirty-one patients (57.4%) attended for follow-up at 2 years (Tables 1 and 3). Of these 18 were in the allergic group and 13 in non-allergic group. In this group (n=31) there was still a significant improvement in symptom scores compared to preoperatively, but no significant improvement nPIFR The median symptom score was 7 (range 2-10). The median percentage increase was 28.6% (range -33 to 200). The median nPIFR was 86 l /m (range 33-160l/m). The mean percentage increase was 10.5% (range -51.0 - 77.3%).

Table 3. The statistical significance of symptom scores and nasal peak inspiratory flow rates (nPIFR) of allergic and non-allergic patients at two years postoperatively using paired student's t-test. $p<0.05$ is taken as significant.

Two Years		
Allergic Patients (n=18)	Median	Standard deviation
Symptom Score		
Preoperative	5.00	1.67
Postoperative	7.00	2.41
t	-2.10	
p	p>0.05	
nPIFR		
Preoperative	95.00	31.10
Postoperative	93.00	37.90
t	1.75	
p	p>0.05	
Non-Allergic Patients (n=13)		
Subjective Scores		
Preoperative	5.00	1.61
Postoperative	8.00	1.98
t	-4.75	
p	p<0.05	
Objective Scores		
Preoperative	63.00	26.10
Postoperative	83.00	40.00
t	-1.15	
p	p<0.05	

Allergic patients, at two years (n=18), showed no significant improvement in both symptom score and nPIFR compared to preoperatively. They showed a mean percentage increase in symptom score of 18.3% (range -60 to 167%) and a median decrease of -11.5% in nPIFR (range -53.9 - 53.1%). Non-allergic patients (n=13) still showed a significant increase in both nPIFR and symptom score at two years (Table 3). There was a median increase of 50% (range 0 to 200%) in symptom scores. The median increase in nPIFR was 22.0% (range -26.1 to 77.3%).The difference in percentage change between the non-allergics and allergics with respect to symptom score was not significant ($p = 0.12$, using Mann-Whitney u test), but the percentage increase in nPIFR was significantly different between these groups ($p=0.04$) in favour of the non allergics.

Eighty-seven percent (26/31) of patients thought the operation was successful at 2 years and would recommend it to a relative or friend (83% of allergics, 92% of non-allergics).

DISCUSSION

Comparative studies of diathermy and cryotherapy with laser turbinectomy have proved the CO_2 laser technique to be very promising (Elwany et al., 1990). The CO_2 laser works by vaporising the inferior turbinate mucosa to a depth of 1mm, with this minimal effect on surrounding tissue rapid epithelial growth ensures minimal patient discomfort after the procedure. The effect is maintained with a high patient symptom score in the long term (82.1% after 12 months and 80.4% after 24 months)(Lippert, 1997). Nasal peak inspiratory flow rate measurement has been shown to be as sensitive as rhinomanometry or acoustic rhinometry in assessing nasal obstruction (Wilson et al., 2003). Measurement of specific IgE is a sensitive test for diagnosing allergic rhinitis (Gomez-Castillo et al., 1998) when considered with an appropriate history and examination. It is more expensive than skin prick tests but considered to be safer and not affected by anti-histamines and cardiac medications. There were shortcomings with this study. We used a questionnaire which has not been validated and only 31 out 54 patients attended for follow up at two years.

This study supports previous work in respect of CO_2 laser turbinectomy being a safe, reliable method of inferior turbinate reduction, which carries a minimal amount of morbidity.

Patient satisfaction with the procedure is high, probably due to the relatively early improvement of nasal obstruction. We know from other studies that the effect is long lasting with 77.1% of patients satisfied at 5 years (Lippert, 1998). This study attempted to ascertain whether allergic or non allergic patients would benefit more from laser partial turbinectomy.

The relatively larger oedematous inferior turbinates in allergic patients appear to respond as effectively to non-allergic group in the short-term, but this not sustained in the medium term.

The improvement in nPIFR at 3 months was still present at two years considering the group as a whole, but diminished.

However, it would seem that non-allergic patients derive more sustained improvement in terms of symptom scores and nPIFR in the medium term compared to allergic patients, although 83% (15/18) of allergics would still recommend the operation.

In our ever increasing world of evidence based medicine, we have found the results from this study helpful in recommending this treatment to patients and we are able to guide patient expectation as to the likely increase in their nasal airflow after a laser partial inferior turbinectomy depending on their allergic status.

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Appendix 1. Questionnaires used in the study.

Preoperative nasal obstruction symptom score questionnaire.

1. On a scale of 1-10 (1= extremely poor, 10=excellent), how would rate your nasal airflow?

1 2 3 4 5 6 7 8 9 10

2. What other nasal symptoms do you regularly suffer with?

Runny nose: yes ❑ no ❑
Sneezing: yes ❑ no ❑
Loss of sense of smell: yes ❑ no ❑
Post nasal drip (catarrh): yes ❑ no ❑
Other symptoms

Postoperative assessment: At three months and two years

1. On a scale of 1-10 (1=very poor, 10=excellent), how would you now rate your nasal airflow?

1 2 3 4 5 6 7 8 9 10

2. Did you suffer any immediate side-effects following the surgery?

Bleeding ❑
Crusting ❑
Unpleasant smell ❑
Dryness of nose ❑
Other

3. Was the operation a success? Yes ❑ No ❑

4. Would you recommend the operation to close friend or relative? Yes ❑ No ❑

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