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The Holmium:YAG laser for treatment of inferior turbinate hypertrophy*

E. Serrano[1], J. Percodani[1], E. Yardeni[1], L. Lombard[1], F. Laffitte[2], J.J. Pessey[1]

[1] Service d'ORL et de Chirurgie Cervico-Faciale, CHU de Rangueil, Toulouse, France
[2] Plateforme Laser, CHU de Rangueil, Toulouse, France

SUMMARY

Chronic hypertrophic rhinitis is sometimes refractory to local, as well as general, medical treatment. Before undertaking surgical reduction of the inferior turbinates, there is indisputably a place for cauterisation or laser vaporisation of the inferior turbinate mucosa. The authors present a study of 46 patients treated by the holmium:YAG laser for chronic hypertrophic rhinitis. The results after only one laser session are satisfactory in 89.1% at 6 months' follow-up and in 52.2 % with a mean follow-up of 16.2 months. No major secondary effects were observed.

Key words: chronic hypertrophic rhinitis, inferior turbinate dysfunction, nasal obstruction, turbinectomy, laser.

INTRODUCTION

The use of different lasers in surgery of the inferior turbinates has been the object of numerous publications (Mittleman, l982; Selkin, 1985; Levine 1989; Klossek, 1992; Freche, 1993; Ossof, 1994). These authors used the CO_2, KTP, or the YAG lasers. The more recently developed holmium:YAG (Ho:YAG) laser, initially used in orthopedics (arthroscopy), has found today incontestable applications in otorhinolaryngology. The support of the Ho: YAG laser is a YAG crystal of which the active medium is holmium. It is a pulsed laser, with a wave length of 2.1 μm. It may be transmitted by the classic fiber optics. The laser ray is absorbed preferentially by water. Its strong absorption and its weak dispersion make it particularly interesting for sectioning and vaporisation of hard tissue. Shapshay described its use in endonasal surgery (Shapshay, 1991). Experimental studies have shown its potential interest in otology (Qadir, 1993). The aim of this study is to present the functional, as well as the anatomic, results in a series of 46 patients treated by Ho:YAG laser vaporisation of the inferior turbinate mucosa, for chronic nasal obstruction.

Patients and methods

From May 1995 to April 1997, 46 patients were treated by Ho: YAG laser vaporisation of the inferior turbinate mucosa. They presented with mucosal hypertrophy of the inferior turbinates within the context of chronic obstructive allergic or non-allergic rhinitis, refractory to appropriate medical treatment. Clinical, endoscopic and rhinomanometric evaluations were realized pre-operatively, and at six months post-operatively. The clinical parameters studied were: nasal obstruction, anterior and posterior rhinorrhea, sneezing, olfactive anomalies and headaches. Nasal comfort was included in the patient's degree of satisfaction. At each evaluation, all patients underwent an endoscopic examination of the nasal fossa, as well as active anterior rhinomanometry using an ATMOS® rhinomanometer 200. A questionnaire was sent to each patient in order to evaluate the long-term follow-up. The mean follow-up was 16.2 months, with a range of 6 to 27 months. The following parameters were studied: nasal obstruction, rhinorrhea, sneezing, post-nasal drip, olfactory disorders and headaches. The following subjective scale was used: stable, worsening, improvement, appearance, disappearance. The appearance of nasal dryness or crusting was noted for each patient. In asthmatic patients, the evolution of asthma after intervention was evaluated using the same subjective scale as for the rhinological symptoms. Nasal comfort was included in the degree of the patient's satisfaction. We did not practice rhinomanometric examinations in the long-term follow-up, as it seems to us that subjective nasal comfort or discomfort is of greater significance than rhinomanometric data, which only measures nasal permeability objectively. The material used for this study was: Verapulse™ Surgical Laser, Coherent Medical Inc., Palo Alto, California. In all cases, the energy used was 0.8 Joules, 5 pulsations/second, and a power of 4 Watts. The mean total energy applied was 0.53 kiloJoules. In all cases topical local anaesthesia was applied, using cotton imbibed with naphazolinated xylocaine 5%. The intervention

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was realized in an ambulatory setting, and no post-operative nasal packing was used.

RESULTS

Our series consisted of 25 males and 21 females, with a mean age of 32 years (14 to 62 years). An allergic context was found in 18 cases. All cases were refractory to the preoperative medical treatment.

The pre-operative functional symptoms were the following:

- nasal obstruction: 46 cases
- anterior rhinorrhea: 14 cases
- sneezing: 16 cases
- posterior rhinorrhea: 15 cases
- olfactory disorders: 11 cases
- headaches: 8 cases.

Pre-operative endoscopy of the nasal fossa found a bilateral inferior turbinate hypertrophy in all cases.

Pre-operative rhinomanometry showed a significant increase in nasal resistance in all cases: mean values of nasal resistance at 150 Pa: left = 0.77 Pa/ml/s (normal < 0.60 Pa/ml/s); right = 0.91 Pa/ml/s (normal < 0.60 Pa/ml/s); total = 0.33 Pa/ml/s (normal < 0.30 Pa/ml/s). These values are reversible after vasoconstrictor pulverisation, confirming the role of the hypertrophic inferior turbinate mucosa in the nasal obstruction (mean values of nasal resistance at 150 Pa: left = 0.6 Pa/ml/s; right = 0.49 Pa/ml/s; total = 0.25 Pa/ml/s).

The post-operative course was uneventful in all cases. No immediate or secondary epistaxis was observed, and no pain was noted by the patients. Nevertheless, a persistent nasal dysesthesia, due to post-operative oedema, in some patients was noted at 14 to 21 days, leading us to prescribe a post-operative treatment of nasal lavage with saline solution and local corticotherapy for a one-month period. The subjective functional results at 6 months are shown in Table 1. As to appreciation of nasal comfort, 41 patients felt improvement (89.1 %), and 5 patients felt no change (10.9%). The anatomic, functional and rhinomanometric correlations are shown in Table 2.

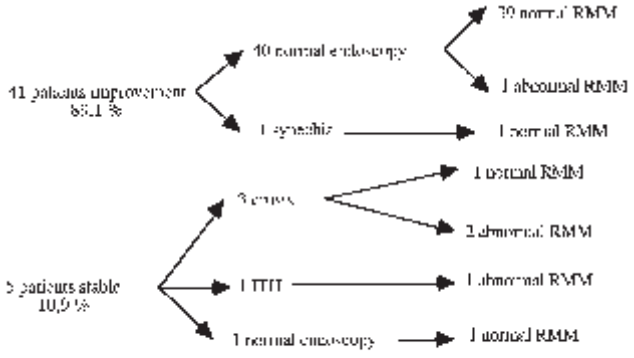
Table 1: Subjective results at 6 months.

	pre operative	6 months
nasal obstruction	46 cases	5 cases
anterior rhinorrhea	14 cases	6 cases
sneezing	16 cases	6 cases
posterior rhinorrhea	15 cases	2 cases
olfactive anomalies	11 cases	2 cases
headaches	8 cases	1 case

The outcome of nasal endoscopy was normal in 40 patients, with a residual inferior turbinate hypertrophy in 1 patient, the presence of crusting was found in 3 cases and in 1 case, an asymptomatic, minor synechia was found between the inferior turbinate and the septum. Rhinomanometry showed the following mean values of nasal resistance at 150 Pa, before vasoconstrictor spray:

- left = 0.57 Pa/ml/s
- right = 0.56 Pa/ml/s
- total = 0.26 Pa/ml/s

Table 2: Anatomic, functional and rhinomanometric correlations at 6 months.



RMM : rhinomanometry
HTI : inferior turbinate hypertrophy

Rhinomanometry was normalized in 42 patients (39 patients with normal endoscopy, one patient with synechia and one patient with crusting). In 4 cases, elevated nasal resistance persisted (one patient with normal endoscopy, one patient with residual hypertrophic inferior turbinate and 2 patients with crusting). In total, 5 patients felt no improvement in nasal function, but one of them had normally permeable nasal fossa at endoscopy, as well as a normal rhinomanometric examination 6 months post-operatively. This one treatment failure with normal endoscopic and rhinomanometric evaluation raises the problem of nasal obstruction with preserved permeability (hydration state, sensory receptors, subjectivity).

The symptomatic evolution during follow-up (mean: 16.2 months) is shown in Table 3. Nasal obstruction disappeared in 17 cases (37%), improved in 8 cases (17.4%), and remained unchanged in 20 cases (43.4%). Laser seems to have no significant effect on other rhinological symptoms, such as rhinorrhea, sneezing, olfactory disorders or headaches. Post-nasal drip remained unchanged in 11 cases (24%), worsened in 2 cases (4.3%), improved in 1 case (2.1%), and disappeared in 1 case (2.1%). It should be noted that post-nasal drip appeared following the intervention in 7 cases (15.2%). Fourteen patients (33.3%) noted the appearance of nasal dryness. No case of crusting rhinitis was seen. No case of post-operative worsening of asthma was noted, while it was stable in 8 cases (17.4%), and improved in 2 cases (4.3%). Twenty-three patients (50%) continued medical treatment for rhinitis and/or asthma. Five patients have undergone a bilateral partial inferior turbinectomy. As for the evaluation of nasal comfort, 24 patients (52.2%) noted a global improvement after the intervention and were satisfied, whereas the situation remained unchanged for 22 patients (47.8%).

Table 3: Evolution of the symptomatology.

	stable	worsening	improvement	appearance	disappearance
Nasal obstruction (46 cases)	20	0	8	0	17
Anterior rhinorrhea (14 cases)	7	0	4	0	3
Sneezing (16 cases)	11	0	0	1	5
Posterior rhinorrhea (15 cases)	11	2	1	7	1
Olfactive anomalies (11 cases)	8	0	0	3	3
Headaches (8 cases)	3	0	3	0	2

DISCUSSION

Laser vaporisation of the inferior turbinate mucosa is one of the therapeutic alternatives in the treatment of hypertrophic inferior turbinates in the context of chronic rhinitis, whatever the aetiology (allergic or non-allergic). We propose this modality in cases of failure of an appropriate and well-conducted medical treatment. In our series, we obtained satisfactory functional, endoscopic, and rhinomanometric results in 89.1% of the cases at six months (patients satisfied by the intervention) and in 52.2% with a mean follow-up of 16.2 months with only one laser session. Kawamura, in a series of 389 patients presenting with a perennial allergic rhinitis treated by CO2 laser, found excellent or good results for nasal obstruction in 78% of the cases at one month post operatively. In that study, 72 patients were followed-up for two years, and amongst these, 27 patients required a second laser treatment for recurrence, with excellent or good results in 84.7% of the cases (Kawamura, 1993). Lippert reports a series of 184 patients treated in one session by a CO_2 laser, with 87.5% good results at 6 months, 82.1% at one year, and 80.4% at 2 years (Lippert, 1997). Most authors recognize the efficacy of laser vaporisation of the inferior turbinate mucosa, regardless of the type of laser employed. Levine, in a series of 58 patients treated by KTP laser, with a follow-up of 24 to 48 months, found an improvement in obstructive symptoms of 84% (Levine, 1991). Mladina, in a prospective study of 78 patients presenting with a non-allergic rhinitis and treated by CO_2 laser, with a follow-up of 12 to 24 months, found a subjective improvement in 88.4% of the cases, with an objective decrease of nasal resistance (Mladina, 1991). The effectiveness of Ho:YAG laser treatment of nasal obstruction in our study, with a disappearance rate of 89.1 should be noted. This treatment is less effective when used for other signs of nasal hyperreactivity (rhinorrhea, sneezing, olfactory disorders, headaches). The ineffectiveness (73.3%), worsening (4.3%), or the appearance of post-nasal drip after the intervention (15.2%) should equally be taken into account. Therefore, patients who present with predominantly secretory symptoms do not seem to be good candidates for laser treatment. The effectiveness on nasal obstruction is attenuated at 16 months with 54.3% good results (25 out of 46 patients note improvement or disappearance of nasal obstruction). In these cases, a second session may seem necessary. In the case of failure, inferior turbinate reduction is then proposed. No short- or long-term complication with laser has been reported. The use of the Ho:YAG laser in rhinology has been particularly studied by Shapshay and Kautzky (Shapshay, 1991, 1993; Kautzky, 1992). Its advantages include the possibility of bone and soft tissue removal with only a minor thermal effect on surrounding tissue. Its interest lies in the permanent control, as a function of the power used, on the deep tissue effects. Mucosal and bone healing occurs without complication. This healing is retarded, but complete, in studies carried out in vivo in dogs by Shapshay (Shapshay, 1991). These authors do not find excessive crusting, and this type of laser has preventive haemostatic capacities.

CONCLUSION

In conclusion, when evaluating the efficacy of different types of laser in inferior turbinate pathology, the improvement in nasal obstruction obtained with the Ho:YAG laser seems to be smaller than that obtained by the others, in cases where it is used in one session for vaporisation of the inferior turbinate mucosa. It seems, however, to have a supplementary role in bone pulverisation (Metson, 1996).

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E. Serrano, M.D.
Service d'ORL et de Chirurgie Cervico-Faciale
CHU de Rangueil
F-31403 Toulouse Cédex 4
France
Tel.: +33-5-61-322611