International Surgery Journal
Andrews CJ et al. Int Surg J. 2015 Nov;2(4):612-619
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20151089

Research Article

Efficacy of KTP-532 laser assisted turbinoplasty and submucosal diathermy using monopolar cautery on symptomatic patients with hypertrophied inferior turbinates

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Received: 24 August 2015
Accepted: 07 October 2015

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ABSTRACT

Background: Hypertrophy of the turbinate mucosa is commonly associated with rhinitis. Patients with nasal turbinate dysfunction present with symptoms require surgery once it has become refractory to medical treatment. This study aimed to compare the efficacy of laser assisted turbinoplasty using KTP (potassium titanyl phosphate)-532 laser and submucosal diathermy using monopolar cautery on symptomatic patients with hypertrophied inferior turbinates.
Methods: A prospective study was conducted on thirty two patients between the age group 15 to 62 yrs. A detailed history, clinical examination and specific radiological investigation were done. Sixteen patients were subjected to laser turbinoplasty and the remaining sixteen were subjected to submucosal diathermy (SMD) using monopolar cautery. Post operatively all patients were assessed at 2 wks and thereafter at monthly intervals for 10 months. The improvement of symptoms at 2 wks post operatively and at 8 to 10 months was recorded. The clinical data and observations were analyzed statistically.
Results: Comparing the benefited group and the cured group between laser and SMD on hypertrophied inferior turbinates at the end of 9 months, though statistically not significant (P >0.05), laser has a definite role in improving the patients satisfaction and complaints. The lack of post-operative pain, less post-operative discomfort and very minimal bleeding found in cases subjected for laser assisted turbinoplasty compared to SMD.
Conclusions: KTP - 532 laser provides an excellent means of achieving symptomatic relief when compared to SMD. Further, it has advantage of very minimal or no bleeding, lack of postoperative pain, discomfort and marked reduction in size of the turbinate.

Keywords: Submucosal diathermy, KTP - 532 laser, Hypertrophied inferior turbinates, Turbinoplasty, Monopolar cautery, Rhinitis, Nasal polyposis

INTRODUCTION

Chronic nasal airway obstruction is one of the most frequent symptoms with which an Otorhinolaryngologist is confronted. The cause is multifactorial which includes deviated nasal septum, nasal polyposis, benign and malignant tumours, foreign bodies or hypertrophied turbinates.[1] If septal deviations are excluded, the main structure contributing to this problem are nasal turbinates especially inferior turbinate.[2] Inferior turbinate hypertrophy may be developmental, with concha bullosa, or an extremely large bony component of turbinate, or the turbinate may be enlarged as a consequence of pale, boggy and oedematous mucosa over the turbinate.[3] Moreover, in allergic nose inferior turbinates are the main shock organs.[4] Swelling of this structure obstructs the inferior part of the nasal cavity which is the most important part of nose with regard to nasal air flow. The cause of symptoms for turbinate dysfunction in most of these patients is either allergic rhinitis, vasomotor rhinitis

or polypoidal hypertrophied turbinates. Patients with nasal turbinate dysfunction present with symptoms such as watery nasal discharge, nasal obstruction, congestion, facial pressure or pain.

Fortunately, the mucosal swelling associated with turbinate hypertrophy is usually reversible and is improved by controlling the underlying inflammatory process.[5] Long standing cases may become irreversible, either due to sub mucosal venous sinuses becoming varicose and unresponsive to sympathetic nervous system stimulation or medical treatment or because of fibrosis.[6,7] Once the inferior turbinates becomes unresponsive to all therapeutic means and a state of chronic swelling supervenes, the only option is surgery.[6,7] Surgical procedures on inferior turbinate rather than reducing the size of inferior turbinate and improving the air way have some other effects.[8,9] Following the surgical procedures on the turbinate, there will be fibrous proliferation and scar formation on the superficial layers of sub mucosa, making the receptors hypoactive and thereby reducing the allergic response. Collagen III, fibronectin and matrix metalloproteinase-9 were increased in turbinate tissue reduction in experimental animals.[10] Submucosal diathermy produces (SMD) effects by applying an alternating current in a megahertz frequency range to the tissue while the KTP (potassium titanyl phosphate)-532 appears to be an effective laser for the photocoagulation of the turbinates to relieve refractory vasoactive dysfunction.[11,12] Photocoagulation properties of KTP-532 laser helps in reducing the mucous secreting glands in either in their number or function in the nasal mucosa.[13] The major advantage of surgical procedures using laser is the lack of pain, so that it is applicable to Children. This study has been conducted with an aim to estimate and compare the efficacy of laser assisted turbinoplasty using KTP-532 laser and that of submucosal diathermy using monopolar cautery on symptomatic patients with hypertrophied inferior turbinates.

METHODS

Subjects and study design

A prospective study was conducted on thirty two patients between the age group 15 to 62 yrs. who presented to the Out Patient clinic in the Department of ENT, for a period of 19 months. Patients with symptomatic hypertrophied inferior turbinates refractory to medical treatment were included in the study. Patients with other significant nasal diseases such as polyps, granulomatous conditions, malignancies of nose and paranasal sinuses were excluded from the study.

Patients were subjected to a thorough clinical examination and a detailed history had taken. Patients who gave a significant history of allergy or any significant family history of allergy had under gone allergy test- skin prick test. Anterior and posterior rhinoscopy was done for all the patients and the condition of the turbinates was assessed. Informed written consent was obtained from the patients and the study design was approved by the Institutional Ethics committee.

All the patients had under gone radiographic evaluation with plain radiographic of paranasa sinuses to find the effect of hypertrophied turbinates on sinuses. 60% of the patients had also under gone computed tomogram (CT) scan of paranasal sinuses. Others were not able to afford CT scan due to financial circumstances. Diagnostic nasal endoscopy was done for all cases to assess the status of turbinates preoperatively and post operatively. Preoperatively all the patients were treated with antihistamines and decongestants. All the cases were operated under general anesthesia (GA). Patients were randomly divided into two groups.

Operative procedures

In KTP-532 group, laser vaporization of the mucosa over the inferior turbinate was done starting anteriorly and continuing posteriorly through the inferior boarder of the turbinate and the posterior most ends of the turbinate was totally vaporized. Laser beam was directed from the machine to the site of surgery using a fibro optic delivery system called entostat of 5 mm size passing through the laser handle (Figure 1 A). Laser handle is a dual tunnel curved hand piece, through one tunnel passes the entostat and the other tunnel is for suction. With this handle beam is directed at right angles to tissue and the site of surgery was visualized using an endoscope. Average time of surgery was 15 to 30 mts and the power used ranges from 6 to 8 watts. Post operatively patient was treated with antibiotics, analgesics, and decongestants. All patients were discharged on second post-operative day after cleaning the crusts.

The cases selected for SMD was having associated septal deviation and septolasty was also done simultaneously. All the cases were operated under GA. Before doing SMD, local infiltration of inferior turbinates was done with 2% Xylocaine and 1: 200000 adrenaline. Following this streaking of the inferior turbinate was done along the inferior boarder of the whole turbinate extending from anterior to posterior end was done using a SMD needle (Figure 1B). The average blood loss during the procedure was approximately between 10 to 15 ml. Following the procedure, a paraffin soaked glove pack was introduced to both the nostrils. Glove pack was removed on 2nd post-operative day and patient was discharged.

In patient who had under gone septoplasty, after removing the glove pack a dental wax plate was introduced between the septum and the turbinate and was removed after one wk. During this one weak period patient was kept on antibiotics, analgesics and decongestants. Patient regularly followed up for 2 wks and at monthly intervals for 10 months. During each visit cleaning was done in outpatient department and advised

local douching with alkaline nasal douche. The improvement of symptoms at 2 wks post operatively and at 8 to 10 months was recorded in a prepared questionnaire. The clinical data's and observations were analyzed statistically.

Statistical analysis

The statistical analysis was performed using SPSS (version 16.0). Chi – Square test was applied to find the significant difference between the groups. P less than 0.05 were considered as significant.

RESULTS

Thirty two patients between the age group 15 yrs. and 62 yrs. was the study group. Almost half of them i.e., 18 [56.25%] were in the 20 to 40 yrs. age group. While the remaining 9, are in the age group more than 40 yrs. [28.12%] and the 5 are in less than 20 yrs. age group i.e., 15.06%. Incidence of hypertrophied inferior turbinates is more common in 20 to 40yrs age group probably because this is the age group which is more exposed to allergens. There is no sex preponderance for hypertrophied inferior turbinate as such. But, in our study males dominates the females [male: female 25:11] as the study group belongs to a geographic area where the males are more exposed to occupational hazards and allergens.

Table 1: Subjective post-operative evaluation of patients after 2 to 4 wks. after the laser surgery,

Grading	A	B	C	D	Benefited group A+B	Percentage (A+B) %	Completely cured Group A %
Nasal obstruction	1	6	4	2	7	53.84	7.69
Nasal discharge	1	2	4	3	3	30	10
Head ache	2	2	5	2	4	36.36	18.18
Anosmia / hyposmia	0	5	3	0	5	31.25	0
Sneezing	9	1	2	0	10	83.33	74.99
Mouth breathing	2	1	3	1	3	42.85	28.57
Snoring	0	2	2	0	2	50	0
Dryness in throat in morning	1	2	3	1	3	42.85	14.28
Generalized itching of body	3	0	1	0	3	75	75
Sore throat	2	1	0	0	3	100	66.66
Itching and watering of eyes	2	2	1	0	4	80	40

A – Completely cured; B – Partially cured; C – Unchanged; D – Worsened

Table 2: Subjective evaluation of symptoms at 6 to 9 months following the laser surgery.

Grading	A	B	C	D	Benefited group A+B	Percentage (A+B) %	Completely cured Group A %
Nasal obstruction	5	4	3	1	9	69.23	38.46
Nasal discharge	4	3	1	2	7	70	40
Head ache	3	1	2	1	4	36.36	27.27
Anosmia / hyposmia	7	0	0	1	7	87.5	100
Sneezing	3	6	3	0	9	74.99	24.99
Mouth breathing	2	2	2	1	4	57.14	28.57
Snoring	2	1	1	0	3	75	50
Dryness in throat in morning	2	3	2	1	5	71.42	28.57
Generalized itching of body	3	1	0	0	4	100	75
Sore throat	0	1	0	0	1	33.33	0
Itching and watering of eyes	2	2	1	0	4	57.14	28.57

A – Completely cured; B – Partially cured; C – Unchanged; D – Worsened

Laser assisted turbinoplasty

The 16 patients who underwent laser assisted turbinoplasty surgery ranged from 19 years to 51 years in age with a mean of 30 years. More than half of the patients (56%) belong to the 15 to 30 year age group. The male to female ratio of these patients was 12:4. The most common complaint encountered was bilateral nasal obstruction-in 13 patients (81.25%). Other common complaints were bouts of sneezing 75%, nasal discharge 62.5%, head ache 68.75%, mouth breathing 43.75%, itching, hyposmia for 50% and watering of eyes for 31.25%.

Table 3: Subjective evaluation after submucosal diathermy at 2 to 4 wks.

Grading	A	B	C	D	Benefited group A+B	Percentage (A+B) %	Completely cured Group A %
Nasal obstruction	2	2	4	5	4	30.76	15.38
Nasal discharge	3	3	2	3	6	54.54	27.27
Head ache	1	4	5	2	5	41.66	8.33
hyposmia	0	0	4	2	0	0	0
Sneezing	4	2	4	0	6	60	40
Mouth breathing	0	2	3	0	2	40	0
Snoring	1	2	2	0	3	60	20
Dryness in throat in morning	1	1	1	0	2	66.66	33.33
Generalized itching of body	0	0	1	0	0	0	0
Itching and watering of eyes	2	1	0	0	3	99.99	66.66

A – Completely cured; B – Partially cured; C – Unchanged; D – Worsened

Table 4: Subjective evaluation of patients following submucosal diathermy at 6 to 9 months.

Grading	A	B	C	D	Benefited group A+B	Percentage (A+B) %	Completely cured Group A %
Nasal obstruction	1	5	4	3	6	46.15	7.692
Nasal discharge	1	5	3	2	6	54.54	9.09
Headache	2	5	5	0	7	58.33	16.66
Anosmia/hyposmia	2	0	4	0	2	33.33	33.33
Sneezing	1	3	6	0	4	40	10
Mouth breathing	2	1	2	0	3	19.99	13.33
Snoring	2	1	2	0	3	60	40
Dryness in throat in morning	1	1	1	0	2	66.66	33.33
Generalized itching of body	0	0	1	0	0	0	0
Sore throat	0	0	1	0	0	0	0
Itching and watering of eyes	2	1	0	0	3	99.99	66.66

A – Completely cured; B – Partially cured; C – Unchanged; D – Worsened

Analysing the data at 2 to 4 wks. many patients had their symptoms completely resolved or partially resolved as a result 0 as a result of surgery (Table 1). Out of 13 patients who had bilateral nasal obstruction pre operatively, 7 pts i.e., 53.84% benefited from surgery. One patient was fully cured. Out of 12 patients who had significant sneezing pre operatively, l0 patients had benefited from surgery i.e., 83.33%. 9 patients were completely cured .When considering other complaints, 3 out of 10, 4 out of 11 , 3 out of 7 ,and 3 out of 4 reported benefit in nasal discharge, head ache, mouth breathing and generalised itching of the body respectively.

Objective evaluation of the 16 patients who had hypertrophied inferior turbinates bilaterally on examination at 2 to 4 wks. showed the turbinates had reduced in size. 3 patients had excessive nasal discharge i.e. 30%. Excessive crusting was seen in 6 out of 16 patients i.e., 37.5%. Olfactory assessment was done for all cases who complained of pre-operative hyposmia, using coffee powder and eucalyptus oil. For 3 patients, their hyposmia remained as such and for 5 patients there was a mild improvement of symptoms. One patient out of 16 had synechiae. One case had necrosis of turbinate bone which was removed. These patients came-up for

regular follow-up at monthly interval and the data collected in 6 to 9 months following the surgery regarding their subjective symptoms are tabulated in table 2. In the post-operative period repeated endoscopic cleaning and removal of crusts repeatedly improved of their complaints. Out of the 16 patients, 4 patients were fully satisfied with complete resolution of symptoms. One patient was totally dissatisfied with the procedure.7 patients had their symptoms partially cured. For three patients their problems remained as such. One patient lost followed up.

Table 5: Comparing the cured group between laser assisted turbinoplasty and submucosal diathermy at 6 to 9 months post operatively.

Parameters	Laser N value	Laser %	Laser ratio	SMD N value	SMD %	SMD ratio	P value
Nasal obstruction	13	38.46	5/13	13	7.692	1/13	0.16
Nasal discharge	10	40	4/10	11	9.09	1/11	0.25
Headache	11	27.27	3/11	12	16.66	2/12	0.91
Hyposmia	1	100	1/1	2	100	212	--------
Sneezing	12	24.99	3/12	10	10	1110	0.86
Mouth breathing	7	28.57	217	5	40	2/5	0.83
Snoring	4	50	2/4	5	40	2/5	0.70
Dryness in throat in morning	7	28.57	217	3	33.33	1/3	0.67
Generalized itching of body	4	75	%	1	0	011	0.81
Sore throat	3	0	0/3	0	0	0/0	--------
Itching and watering of eyes	5	28.57	2/5	3	66.66	2/3	0.54

Table 6: Comparison of benefited group between laser turbinoplasty and submucosal diathermy at 6 to 9 months post operatively.

Parameters	Laser %	Laser ratio	SMD %	SMD ratio	P value	Laser N value	SMD N value
Nasal obstruction	69.23	9/13	46.15	6/13	0.42	13	13
Nasal discharge	70	7/10	54.54	6/11	1.00	10	11
Headache	36.36	4/11	58.33	7/12	0.52	11	12
Hyposmia	100	1/1	100	2/2		1	2
Sneezing	74.99	9/12	40	4/10	0.66	12	10
Mouth breathing	57.14	417	60	3/5	0.62	7	5
Snoring	75	3/4	60	3/5	0.8	4	5
Dryness in throat in morning	42.85	517	66.66	2/3	0.54	7	3
Generalized itching of body	100	4/4	0	0/1	0.40	4	1
Sore throat	33.33	1/3	0	0/0	------	3	0
Itching and watering of eyes	57.14	4/5	100	3/3	0.78	5	3

Submucosal diathermy

Sixteen patients had undergone SMD as the therapeutic modality of treatment for hypertrophied inferior turbinates. Their ages ranged from 15 yrs to 62 yrs with a mean of 30 yrs. Here more than half of the patients belong to the age group between 15 and 30 years. The male to female ratio of these patients was 9:7. The most common complaint encountered was nasal obstruction. 13 (81.25). Head ache in 12 patients (75%), Sneezing in 10 patients (62.5%), nasal discharge in 11 patients (68.75%), nasal discharge in 11 patients (75%), were the other common complaints. Two out of 13 patients were completely cured as far as their nasal obstruction is considered (15.38%) (Table 3). Their symptoms were completely cured following surgery. But, 4 patients was benefited following surgery i.e., their nasal obstruction was either completely resolved or partially resolved (15.38%). 6 out of 11, 5 out of 12, 2 out of 5, 6 out of 10 showed improvement in nasal discharge, headache, mouth breathing and sneezing respectively following laser surgery.

The objective evaluation showed that all the patients who

had hypertrophied inferior turbinates in the pre-operative phase had reduction in size in the post-operative phase. Foul smelling nasal discharge was found in 5 cases. Most of the cases had crusts fromation over the turbinates. Three cases had synechiae formation. On olfactory assessment for 4 cases, their problem remains as such. For 2 cases, worsening of hyposmia was present. These patients came for regular follow-up at monthly intervals and those patients who did not came for follow-up, subjective evaluation was made by a questionnaire made in the spoken language of the patient and sent to the patients address. The results obtained were tabulated and analyzed at 6 to 9 months interval (Table 4).

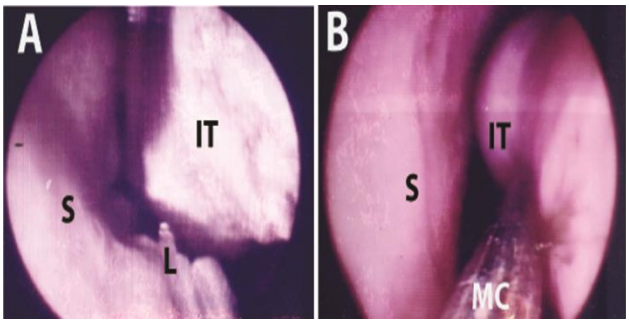

Figure 1: Intra-operative view during A) The laser turbinoplasty and B) submucosal diathermy using monopolar cautery (S: septum, IT: inferior turbinate, L: laser beam, MC: monopolar cautery).

Six patients out of 13 was having relief of nasal obstruction [46.15%],but only one patient out of 13 had their disease completely cured 7.692%. Six patients out of 11, 7 patients out of 12,4 patients out of 10,3 patients out of 5 had considerably improved in their symptoms with regard to nasal discharge, headache, sneezing and snoring respectively following surgery at six to nine months period. So over all out of 16 patients who had undergone SMD, 3 patients were fully satisfied with the procedure (18.75%), for 5 patients their problems has partially cured (31.25%) and for another 5 their problem remained as such. Three patients was totally dissatisfied with the procedure (18.75%). Objective evaluation showed all the patients had their turbinates moderately shrunken following surgery. Nasal air way was found to be adequate. No crusting was noted. On olfactory assessment for two cases olfactory perception was increased.

Comparing the benefited group and the cured group between laser and submucosal diathermy on hypertrophied inferior turbinates at the end of 9 months, though statistically not significant ($p > 0.05$), laser has a definite role in improving the patients satisfaction and complaints. Other important findings were lack of post-operative pain, less post-operative discomfort and very minimal bleeding during the procedure for laser assisted turbinoplasty cases compared to sub mucosal diathermy (Table 5 and 6).

DISCUSSION

When the hypertrophied inferior turbinates become refractory to medical treatment, the only treatment for reducing the size of turbinate is surgery. Procedures such as laser turbinoplasty combines advantages of both groups as it initiates intense submucosal fibrosis and at the same time vaporises the part of the redundant hypertrophied tissues.[7]

The success of any treatment of symptoms and signs related to hypertrophied inferior turbinates is measured by long term resolution of symptoms. The patients in our series were followed up for a period ranging from a minimum of 2 months to a period 15 months with a mean of almost one year. The follow-up evaluations of degree of improvement were used as primary indicators of the effectiveness of treatment modality. The subjective evaluation of efficacy of any surgery on hypertrophied inferior turbinates was difficult and not accurate. This is because a standard reporting system and staging of this disease cannot be satisfactorily obtained due to its dynamicity.

Subjective assessment of the patients who had undergone laser surgery showed that as a whole 68.75% of the patients benefited following the surgery. Their symptoms were partially or totally cured. 25% of the patients had their symptoms totally cured, where as in SMD 50% of the patients was benefited following the surgery and for 18.75% of individuals their problems was completely resolved. Objective assessment of all the patients showed their turbinates has reduced in size. Though, the turbinate has reduced in size in all the patients in the study group (Both Laser and SMD), symptomatically the laser group had excellent results.

Elwany and Harrison, compared four different techniques of surgery on hypertrophied inferior turbinates i.e., partial inferior turbinectomy, inferior turbinoplasty, cryo turbinectomy and laser turbinectomy on 80 patients with nasal obstruction due to non-allergic rhinitis.[14] The results found that partial inferior turbinectomy and laser turbinectomy improved nasal breathing in 77% of patients and enhanced olfactory acuity in 78% of patients who had pre-operative hyposmia. In the present study, laser turbinoplasty and SMD improved nasal breathing in 69.23% and 46.15% and enhanced olfactory acuity in 87.5% and 33.33% respectively. This study is concentrated on hypertrophied inferior turbinates causing nasal obstruction and there by hyposmia.[14]

The complications that reported the previous study such as synechiae and excessive crusting in the post-operative period remains same in the present study too. Further, both the studies showed that laser surgery has less post-operative discomfort, less pain, faster healing and very minimal bleeding compared to SMD.[14]

Lippert and Werner made a comparative study of laser turbinectomy and submucosal diathermy on 533 patients with hyperplastic inferior turbinates.[15] They used CO_2 laser and ND:YAG laser for their surgeries. Two years post operatively, overall success rate, as defined by patient's satisfaction, was 79.6% for the CO_2 laser, 68.3% for ND:YAG laser and 36% for SMD. The drawback of our study compared to Lippert and Werner study was that total number of patients was small in our study group. The parameters for objective evaluation of efficacy of laser surgery and SMD was the size of turbinates, presence of discharge, synechiae and crusting in present study whereas in Lippert and Werner study an addition to the above parameters they have also included rhinomanometry for objective assessment of patients pre operatively and post operatively due to lack of instruments.[15]

In this study, laser did significantly better in the post-operative phase compared to SMD in terms of general morbidity and subjective air flow. Though the authors have reported regarding the morbidity and complications in laser turbinoplasty, they have mentioned regarding only one complication i.e., Flu -like syndrome. Another drawback of this study was that the study group was very small and the post-operative follow-up was only for 6 weeks.

Fukutake and Shita published their experience regarding laser surgery for hypertrophied inferior turbinates as a consequence of allergic rhinitis.[16] CO_2 laser was used as it was assumed that allergic reaction could be inhibited by the creation of scar tissue in the superficial layers of submucosa, where the allergic reaction seems to occur. Levine and Ohio studied the immediate and long term effects of laser photocoagulation of nasal turbinates using KTP-532 Laser on 63 patients.[17] Nine patients had persistent symptoms and they were having no improvement of symptoms. Both the study groups used KTP-532 laser with a continuous mode of 8 watts, hand pieces used to deliver the laser beam at right angles to the tissue.

No major complication has been reported in any of the study groups except synechiae which occurred in 1 patient out of 20 cases. Present study also had synechiae in one case. The other complication encountered was necrosis of turbinate bone which occurred in one case. In the SMD group, 3 patients had synechiae and 2 patients were having foul smelling nasal discharge. The fewer incidences of complications were probably using all these procedures were done under GA where adequate visualization and proper positioning of the patient is easier to attain. Although, it is difficult at this point to know the exact reason for the effectiveness of laser photocoagulation in the treatment of turbinate dysfunction there are several possible explanations. It may be related to the creation of a submucosal layer of scar tissue as described by Fukutake and Shita.[16] The scar could prevent the rapid swings in turbinate congestion and decongestion that so often cause many of the patients' symptoms. It is also possible that the surface mucous secreting glands are decreased either in number or function.[18] The present study as well as that of Levine initially showed moderate nasal crusting, nasal obstruction and thickened nasal secretions in the first month following surgery which was subsequently relieved later.[13] In the present study, this was revealed by repeated endoscopic cleaning in the outpatient department. Levine has specifically described regarding the hand piece used for delivery of the laser beam and also regarding the use of endoscope for better visualization.[14] Present study has also used a similar hand piece for delivering the laser beam. It allows the laser energy to be delivered at nearly right angles to the tissue. Direct observation of the field through nasal endoscopes provided control over the area that was being photocoagulated. The KTP-532 laser appears to be an excellent alternative for treating hypertrophic inferior turbinate.[19,20]

CONCLUSION

Of the 16 patients who underwent SMD, considering the overall symptoms and the patient acceptance, 3 patients was fully satisfied, while 5 patients were partially satisfied following the procedure. For, 5 patients the complaints remained as such and three patients were totally dissatisfied following the procedure. 30% of patients also showed a decrease in general allergic response. The major complications in the post-operative period were synechiae for 3 cases, bleeding for 2 cases and foul smelling nasal discharge for 2 cases. All these complications developed in the first 3 wks. following the surgery. More than 50%of patients complained of severe discomfort and pain in the 1st and 2nd post-operative days. Of the 16 patients who underwent laser assisted turbinoplasty, out of 13 patients who had nasal obstruction as the chief complaint, 9 were benefited following the procedure 69.23%. 60% of patients also showed a decrease in generalized allergic response. The complications that were faced in the post-operative period in the laser study group include, excessive crusting over the turbinates for 6 cases, necrosis of the turbinate bone and synechiae for one case. All these complications occurred in the first month following the surgery. Therefore, the KTP-532 laser with curved hand pieces and nasal endoscopes together provides an excellent means of achieving symptomatic relief for patients compared to SMD. It has also the advantage of very minimal or no bleeding, lack of postoperative pain, discomfort and marked reduction in size of the turbinate on follow-up.

ACKNOWLEDGEMENTS

We acknowledge the valuable help of Dr. Ajith TA, Professor, Department of Biochemistry, Amala Institute of Medical Sciences; Thrissur, Kerala, India during the preparation of this manuscript.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Andrews CJ, Paul RO. Efficacy of KTP-532 laser assisted turbinoplasty and submucosal diathermy using monopolar cautery on symptomatic patients with hypertrophied inferior turbinates. Int Surg J 2015;2:612-9.