Original paper

Diode 1470 nm Laser Turbinoplasty versus Partial Surgical Inferior Turbinectomy for Treatment of Inferior Turbinate Hypertrophy.

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Abstract

Background: Nasal obstruction is a common complaint in patients attending otolaryngology clinics which is infrequently due to inferior turbinate hypertrophy. Patients not responding to medical treatment can benefit from turbinate reduction surgery, which aims at relieving this symptom.
Objectives: To evaluate the effects of diode 1470nm laser turbinoplasty of inferior turbinate versus partial surgical inferior turbinectomy in patients with nasal obstruction due to hypertrophy of inferior turbinate.
Methods: A prospective comparative study had been done at Al Kafeel Hospital, Kerbala from February to October 2016. Fifty patients were included and equally divided into two groups of 25 patients for each. First group was treated with partial surgical inferior turbinectomy and the other one with laser turbinoplasty. Patients were evaluated for improvement in symptoms at follow up on 2 days, 1week, 1month, 3months, and 6months.
Results: Patients' age range from 16-50 years with a mean ± Standard deviation 28.18 ± 7.27 years. Females were 30 (60%) of the sample with no significant difference between both groups in regard to age and gender distribution. Both procedures are evenly effective in reducing the turbinate size after 6 months. However crusting, post-operative pain, blood loss, and the number of days of nasal packing was found to be significantly less in laser turbinoplasty group as well as faster improvement in nasal obstruction and healing and less hospital stay.
Conclusion: Diode laser1470 nm turbinoplasty is a safe and effective procedure, because of its precise localization of coagulative effects on soft tissue. In comparison to partial surgical inferior turbinectomy diode laser1470 nm turbinoplasty shows less bleeding, postoperative pain and crustations with no nasal packing as well as earlier healing and nasal obstruction relieve.
Keywords: chronic hypertrophic rhinitis, inferior turbinate hypertrophy, laser turbinoplasty, partial inferior surgical turbinectomy, nasal obstruction.

Introduction

Inferior turbinate hypertrophy causing chronic nasal obstruction is a common presentation in rhinology work. Allergic rhinitis, idiopathic rhinitis, vasomotor rhinitis and resulting hypertrophy in septal deviation are the commonest precipitating factors for the inferior turbinate hypertrophy [(1,2)]. Certain chronic inflammatory nasal disorders, such as allergic or vasomotor rhinitis cause inferior turbinate hypertrophy as a result of collagen deposition beneath the basement membrane of nasal mucosa as well as mucous gland hyperplasia. Deviation of the nasal septum to one side is often associated with inferior turbinate hypertrophy on the contralateral side. When no response to medical treatment occur, surgical reduction of the inferior turbinates will be a good choice [(2, 3)].

For the treatment of nasal obstruction secondary to inferior turbinate hypertrophy.

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Different surgical approaches are present, which includes total or partial turbinectomy, turbinoplasty, submucosal resection, corticosteroid injections, cryosurgery, laser- assisted turbinoplasty, argon plasma surgery, monopolar and bipolar electrocautery methods, and radiofrequency (RF) volumetric tissue reduction [4-6].

However, no single method is ideal therapeutic procedure, and either is related with particular side effects or disadvantages that could be early or late complications that could lead to long-term effects such as bleeding, recurrence and atrophic rhinitis [7,8].

The objective of this study was to estimate and compare the improvement in symptoms as well as complications following diode laser1470nm for inferior turbinoplasty and partial surgical inferior turbinectomy in patients with a chronic nasal obstruction due to inferior turbinate hypertrophy.

Patients and Methods

A comparative study of prospective approach had been conducted at Al Kafeel Hospital, Kerbala from first of February, 2016 to the end of October, 2016. Fifty patients of different age groups and both genders were included in the study. Patients were randomly divided into two groups according to the type of surgery, by doing each procedure in every other patient with consideration to age and gender.

Each group includes 25 patients. Patients with bilateral nasal obstruction with no response to medical therapy and all patients without previous surgical history to the nose with normal nasopharyngeal examination were considered eligible for the study. Any patient presented with nasal obstruction due to other causes such as severe septal deviation, trauma to the nose, concha bullosa or nasal polyposis, or those who lost to follow-up visits were excluded from the study.

Patients were informed about their status and details of the operation, follow up plan and study prior to operation, verbal and written consent were taken from each patient from the beginning.

A detailed medical history and examination was done for all patients and focusing on nasal symptoms such as nasal obstruction, nasal discharge, headache, sneezing and night snoring. Endoscopic evaluation and computed tomography of the nasal cavity was performed for all the patients.

Surgical procedure:

The first group was treated with partial surgical inferior turbinectomy (PSIT) and the other one treated with laser turbinoplasty. And all operations were carried out under general anesthesia with oral endotracheal intubation with throat pack.

Partial surgical inferior turbinectomy (PSIT):

Xylometazolin nasal drops soaked on cotton and put inside the nasal cavity in contact with inferior turbinate. The inferior turbinate is first slightly medialized using a Hill's elevator, this allows easier access to inferior meatus by introducing a long Killian nasal speculum one blade medial to turbinate and another blade lateral to the turbinate. A polypoid fringe of inferior turbinate was trimmed by Heymann's turbinectomy scissor. The inferior part of inferior turbinate was removed from anterior end to posterior end along its entire length, in the condition of a hypertrophic posterior end, it was also removed. Further, the trimmed part was removed from the nasal cavity. Siliastic sheets were inserted and fixed bilaterally, on completion both nostrils were packed with vaseline gauze, which was removed 48 hours after surgery, then patients were discharged, on a regimen of salt water nasal douches and broad spectrum antibiotics with an analgesic agent. Patients were informed to return after 7 days for removal of siliastic sheet. And they were kept on steroid nasal drops for two weeks and nasal douche for one month.

Laser turbinoplasty (LT):

A diode laser 1,470 nm system is used because of absorbance profile within human tissue; the system has both ablative and coagulative tissue effects. In addition to general anesthesia, local anesthesia used for 10–15 minutes, by using cotton pads with a mixture solution of 0.5% xylometazoline\2% xylocaine. By using flexible silica, we apply a contact mode laser endonasal.

The set of the diode laser is 4–6 W for the 1,470 nm diode laser system. Diode laser light is applied on inferior turbinate from posterior to anterior part and under endoscopic control with the suction of smoke which happens during the procedure (Fig.1). The effect of the laser will appear after that by blanching of inferior turbinate tissues. In case of enlargement of the head of inferior turbinate, we apply a spot of laser either submucosal or direct on the head of turbinate. Postoperatively, no packing needed.

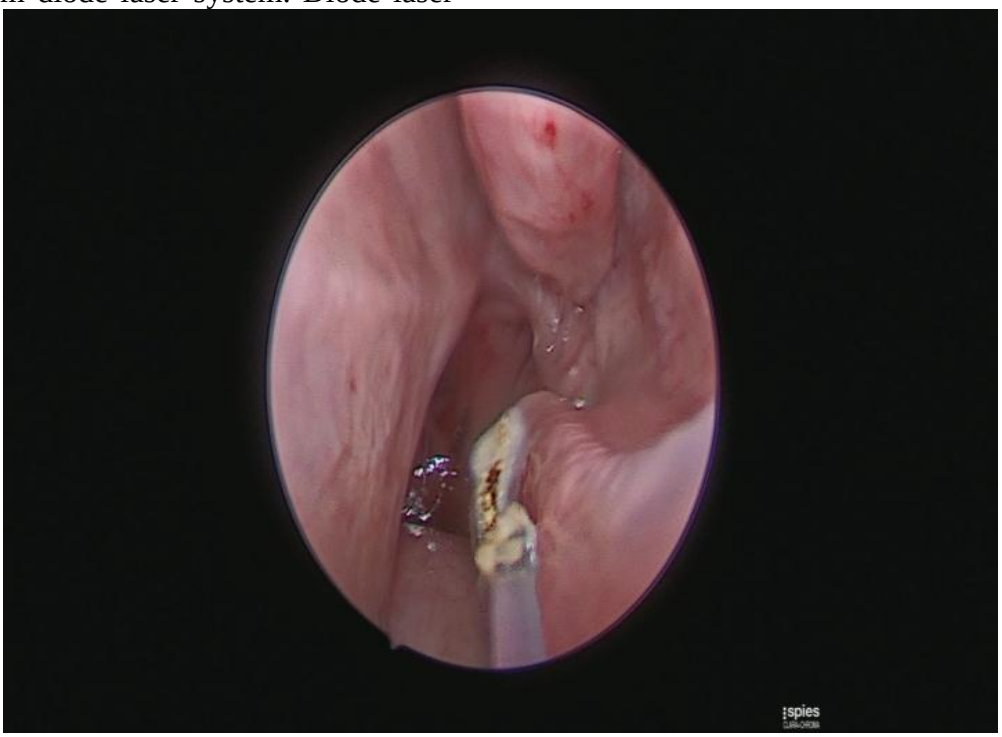

Figure 1. Contact mode application of laser light on inferior turbinate.

In both groups, nasal cavities were treated locally with an ointment composed of antibiotic and steroid.

Postoperative Follow up:

Routine follows up examination were then made at each visit on day 2, 7, 14, 30, 3 months and 6 months following surgical treatment.

On follow up, assessment of the nasal cavity postoperatively for crustations, blood clots, and synechiae.

After that, for every visit, patients in both groups were compared according to:

Nasal obstruction improvement, Nasal pain severity, Nasal crustations, and amount of tissue healing and synechiae formation.

Nasal obstruction assessment was done depending on Visual Analogue Score system (VAS) by scoring improvement of nasal obstruction out of 10 grades. Which then divided into score 1-3 "No improvement", score 4-7 "Partial improvement" and score 8-10 "Complete improvement" [(9)].

Nasal pain assessment was also done depending on VAS scoring for improvement of nasal pain that based upon 10 grades and categorized to 1-3 "mild pain", 4-7 "moderate pain" and 8-10 "severe pain" [(9)].

Nasal crustations_assessment and Tissue healing assessment were estimated

depending on the endoscopic scoring of Lund and Kennedy [8].

Data were entered and analyzed using statistical package for social science (SPSS) program version 21 (IBM SPSS statistics 21). Qualitative data were expressed as numbers (N) and percentage (%), while quantitative data were expressed as means and standard deviations (SD). Chi square for trends or independent Student's t test were used for statistical analysis accordingly and p value of less than (<0.05) were considered statistically significant.

Results

Fifty patients were included in this study, 30 (60%) females and 20(40%) males. Patients age ranged from 16-50 years with a mean age 28.18 years and the SD was 7.27 years) with no significant difference between the two groups in regard to age and gender distribution Table 1.

The 2 days assessment results shown in Table 2, revealed that there was no bleeding at the laser turbinoplasty group, where 56% patients with mild-moderate bleeding and 4% suffered from severe bleeding in partial surgical inferior turbinectomy group with a high statistical significant association. Also, the laser turbinoplasty group shows a highly statistical significant lower pain and no needs for nasal packing. However, no significant difference regarding nasal obstruction improvement.

The 2 weeks of postoperative follow up (shown in table 3) revealed no more bleeding in both groups, no significant difference in improvement of nasal obstruction both groups. But, the pain and crustations is significantly milder in laser turbinoplasty group.

Assessment of patients one month after operations shows a complete improvement of nasal pain in all patients. Further, a better improvement in nasal obstruction and crustations in LT group in comparison with partial surgical inferior turbinectomy with a high statistical significance as shown in table 4.

On assessing the patients after 3 months of operation, it appears that nasal obstruction was much improved as well as crustations in both groups to a similar extent, while the tissue healing was much better in laser turbinoplasty group than PSIT which was very significant statistically, as shown in table 5.

The assessment of patients after 6 months from operation shows that most patients in both groups were well improved and free of nasal secretion, nasal obstruction, nasal crustations, and tissue healing. However, the improvement was slightly better in LT group but with no statistical significance for all conditions as shown in figure 2.

The change in patient condition over the consequent visits for improvement in nasal obstruction, crustations presence, and tissue healing are demonstrated in figures 3,4 and 5 respectively.

Discussion

Surgical reduction of the hypertrophied inferior turbinate is the recommended treatment in patients with allergic rhinitis, when the nasal obstruction is unresponsive to medication. Techniques which destroy the turbinate mucosa lead to loss of turbinate function along with crusting and adhesions [6,7,10].

Laser turbinoplasty, which preserves turbinate function and nasal mucosa for mucociliary clearance has the advantages of mucosal preservation, controlled volume reduction, minimal trauma, enhanced precision, reduced bleeding, lower post-operative pain and crusting with no nasal pack, short hospital stay and providing marked improvements in the nasal obstruction [11,12].

Table 1. Age and gender distribution of the patients

		Partial inferior Turbinectomy (PSIT) N=25	**Laser Turbinoplasty (LT) N=25**	P value
Age (year)		Mean ± SD	Mean ± SD	0.833
		27.96 ± 6.74	28.40 ± 7.91	
Gender		N (%)	N (%)	
	Female	15 (60%)	15 (60%)	1.00
	Male	10 (40%)	10 (40%)	

Table 2. Comparison between improvement of symptoms of the two groups at 2 days postoperative follow up.

		PSIT N=25	**LT N=25**	**P value**
		N (%)	N (%)	
Bleeding	No bleeding	10(40%)	25(100%)	< 0.001
	Mild-Moderate	14(56%)	0	
	Severe	1(4%)	0	
Nasal obstruction Improvement	No	3(12%)	2(8%)	0.637
	Partial	22(88%)	23(92%)	
	Complete	0	0	
Pain	Mild	0 (0%)	15(60%)	< 0.001
	Moderate	15(60%)	10(40%)	
	Severe	10(40%)	0 (0%)	
Nasal packing	Yes	25(100%)	0 (0%)	< 0.001
	NO	0 (0%)	25 (100%)	

Table 3. Comparison for improvement of symptoms in the two groups at 2 weeks postoperative follow up.

		PSIT N=25	**LT N=25**	**P value**
		N (%)	N (%)	
Improvement of Nasal obstruction	No	3(12%)	2(8%)	0.159
	Partial	22(88%)	20(80%)	
	Complete	0(0%)	3(12%)	
Pain	Mild	6(24%)	15(60%)	0.0012
	Moderate	12(48%)	10(40%)	
	Severe	7(28%)	0 (0%)	
Crustations	Absence	0(0%)	0(0%)	0.0196
	Mild	20(80%)	25(100%)	
	Severe	5(20%)	0(0%)	

Table 4. Comparison between improvement of symptoms of the two groups at one month postoperative follow up.

		PSIT N=25	**LT N=25**	**P value**
		N (%)	N (%)	
Improvement of Nasal obstruction	No	0 (0%)	0 (0%)	0.0001
	Partial	15 (60%)	2(8%)	
	Complete	10 (40%)	23(92%)	
Crustations	Absence	0 (0%)	10(40%)	0.0002
	Mild	22 (88%)	15(60%)	
	Severe	3 (12%)	0 (0%)	
Healing	Good	10 (40%)	15(60%)	0.0872
	Moderate	13 (52%)	10(40%)	
	Poor	2 (8%)	0 (0%)	

Table 5. Comparison between improvements of symptoms of the two groups at 3 months postoperative follow up.

		PSIT N=25 N (%)	LT N=25 N (%)	P value
improvement of Nasal obstruction	No	0 (0%)	0 (0%)	0.6407
	Partial	3 (12%)	2(8%)	
	Complete	22 (88%)	23(92%)	
Crustations	Absence	21 (84%)	23(92%)	0.3889
	Mild	4 (16%)	2(8%)	
	Severe	0 (0%)	0 (0%)	
Healing	Good	13 (52%)	23(92%)	0.0021
	Moderate	10 (40%)	2(8%)	
	Poor	2 (8%)	0 (0%)	

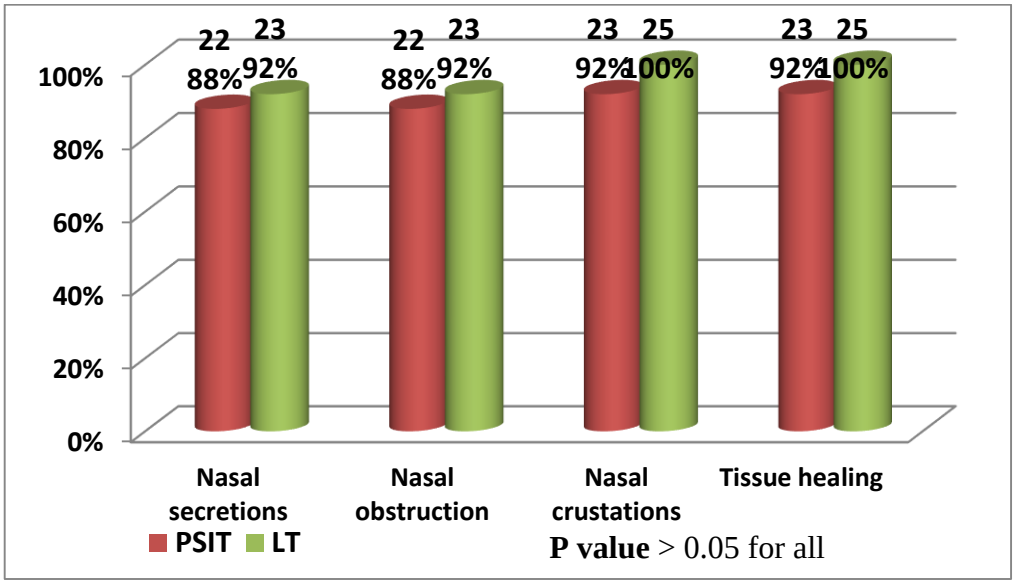

Figure 2. Comparison between improvement of symptoms in both groups at 6 months postoperatively.

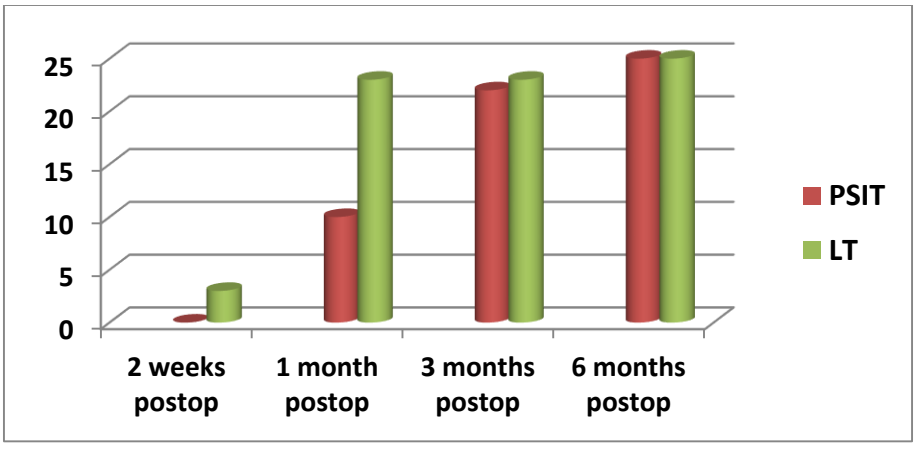

Figure 3. Improvement of nasal obstruction on postoperative follow up.

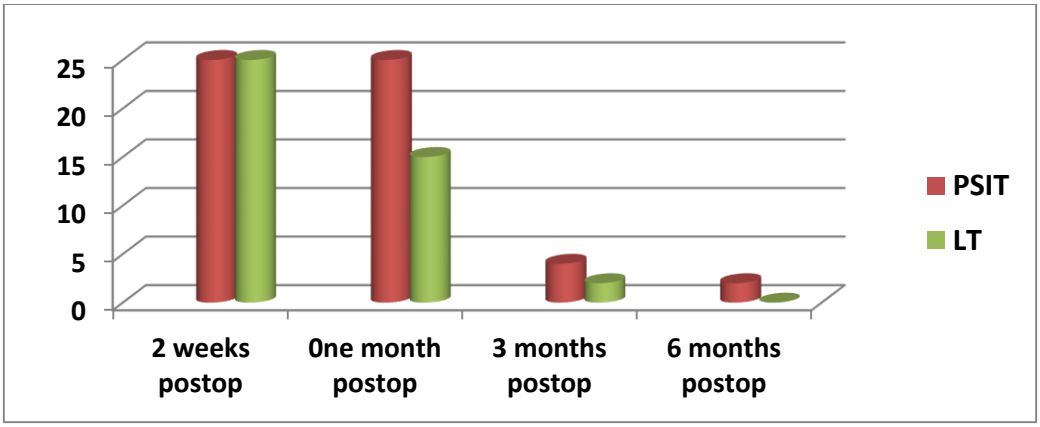

Figure 4. Nasal crustations on postoperative follow up.

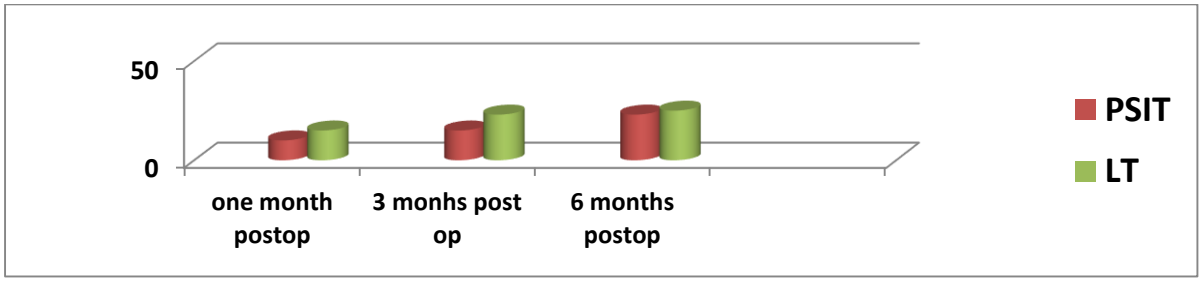

Figure 4. Tissue healing on postoperative follow up.

The intraoperative blood loss during laser turbinoplasty was nil or few drops which was significantly less than conventional turbinectomy because laser turbinoplasty has the advantage of precise and localized soft tissue ablation and coagulation. This is consistent with Caffier et al 2011 [13]. Further nasal packing was unnecessary in laser turbinoplasty group, a finding which agrees with Hoque et al 2010[14]. Similarly, postoperative nasal bleeding was seen more in patients with conventional surgery, a finding which consistent with the study of Rahman and Hossain 2010 [15].

No improvement in nasal obstruction in the first two weeks in both groups probably due to postoperative mucosal edema, blood clots, and crusting. However, starting from two weeks after surgery, but within shorter duration in Laser turbinoplasty group, it was significantly better. While, after 3 and 6 months, no significant difference was seen between the two groups. This indicates that, both procedures are equally effective in reducing nasal obstruction. But laser turbinoplasty is better than conventional turbinectomy in getting an earlier improvement of nasal obstruction. In this study, 92% patients in Laser group and 88% in conventional group were free of nasal obstruction after 6 months. And this result agrees with the finding of Rahman and Hossain 2010 and slightly better where they found that 86.5 % patients in Laser group and 79.2 % patients in non-laser group were symptoms free at 6 months [15].

Crusting was observed more in the conventional group than the laser turbinoplasty (LT) group. There was significantly less amount of crusting in LT group. This finding was consistent with the study of Rahman and Hossain study [15].

Tissue healing was better and faster in LT than in non-laser group. Starting from one month after operation and it was significantly better after three months were 92% of patients with good healing in LT group, in comparison to 52% of patients with good healing in non-LT group. This agrees with Bhandary et al [16], and this could be related to the advantages of mucosal preservation, controlled volume

reduction, minimal trauma in laser turbinoplasty.

Conclusion

Diode1470nm laser turbinoplasty and conventional turbinectomy are both effective in providing long standing symptom reduction in patients with inferior turbinate hypertrophy due to allergic rhinitis. Diode 1470nm laser turbinoplasty is associated with less immediate postoperative pain, bleeding, crusting, and faster improvement of nasal obstruction and tissue healing. Moreover, Diode 1470nm laser turbinoplasty require no post-operative nasal packing.

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