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Efficacy of 940 NM Diode Laser in Relieving Nasal Obstruction Due to Inferior Turbinate Hypertrophy a Prospective Study

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Abstract.

Background

Nasal obstruction is one of the oldest and most common human complain. Lower turbinate hypertrophy is the most frequent reason of the nose obstruction. Etiologically speaking, the causes of hypertrophy of turbinate mucosa include chronic non allergic and allergic hypertrophic rhinitis in which the dilatation of venous sinusoids in the submucosal leads to submucosal swelling. Nose obstruction attributed to hypertrophy of lower turbinate can be approached by a list of operative interventions. Preservation of physiological role of turbinate and negligible adverse outcomes are the main goals required for optimum turbinate reduction operative approach.

Patients and methods. A prospective study done in a private clinic from 1st of Fab to 30th of July 2017. On forty patients complaining of bilateral chronic nasal obstruction due to inferior turbinate hypertrophy.

Examination made up using anterior rhinoscopy and rigid endoscopy. Nasal obstruction is subjectively graded and inferior turbinate hypertrophy endoscopically graded. Laser procedure was done by diode laser (940nm)with a power of (5w) , exposure duration of 20 sec and interstitial mode using a fiberoptic tip of 400mmin diameter with length of 9mmand stainless steel applicator of 7.5 cm length .

Aim of study: To evaluate the efficacy of 940 nm diode Laser in relieving nasal obstruction due to inferior turbinate hypertrophy a prospective study

Results: At the end of the first postoperative month all patients showed significant improvement in nasal obstruction that correlate with objective improvement of inferior turbinate hypertrophy.

Conclusion: A reduction of hypertrophied inferior turbinate by diode laser (940nm) is an effective and safe procedure that can be done under local anesthesia with a mild tolerable pain

Keywords: diode laser ,nasal obstruction ,inferior turbinate hypertrophy.

INTRODUCTION:

An emergency is a medical situation that calls for urgent treatment and effective leadership. At any moment, emergency situations will occur. In delivering treatment in emergency situations, nurses play a vital role. In order to prevent excessive morbidity, physicians should be mindful of life-threatening conditions[1].

Despite being very common health issue, turbinate hypertrophy is not well recognized by a lot of people. The problem is common to the extent that it can affect all individuals at some point of their life. As it can complicate conditions such as nasal allergies and some other nasal problems, treatment of these conditions is recommended to avoid turbinate hypertrophy [1]. Typically, the enlargement of inferior turbinate is transient and there will be spontaneous resolution of associated nasal obstruction; however, enlargement may become chronic and the

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condition is called nasal turbinate hypertrophy[2]. Enlargement may involve the mucosa and or the bone; however, the extent to which these enlargements require medical intervention is still not well recognized and sufficient controversy exists among ENT specialists regarding treating turbinate in patients with clinical manifestations[3].
There is great variation in subject response to nasal obstruction resulting from inferior turbinate hypertrophy (ITH) ranging from indifference to substantial disturbance of quality of life. The chronic inflammatory reaction in association with vasomotor or allergic rhinitis leads to collagen aggregation in the turbinate submucosal tissue in addition to bone reshaping. Operative options to reduce inferior turbinate are diverse and are all associated with satisfactory results for a while but unfortunately are associated with a number of side effects and post-operative adverse outcomes such as synechie formations, pain, crusts and bleeding. The three basic requirements for a surgical approach to be optimum include preservation of satisfactory nasal function, minimal post-operative complications and effective turbinate volume reduction[4]. An efficient and easy approach involves the use of laser turbinate reduction (LTR). The superiority of laser operative approach involves good wound healing, high precision and inexistence of bleeding[5]. Less invasive and more selective surgery accompanies the use of diode laser thereby reducing postoperative risk and period of hospital stay. Actually, it has the ability to bring to the fabric up to 60 W of laser energy at 810 nm wavelength and this provides excellent tissue vaporization, precise cutting and precise coagulation[6].

Patients and methods

A prospective study was carried out at a private clinic on forty patients (28) males and (12)females their mean age is 28.5(17 to 40) years old , their occupations , student, teacher ,free job, housewife ,the data were collected from 1st of Fab to 30th of July 2017 .All patients suffered from bilateral chronic nasal obstruction due to IT hypertrophy refractory to medical treatments for at least one month, involving mainly topical and systemic steroids, antihistamines and decongestants. History taken carefully, severity of nasal obstruction subjectively graded into grade two: (16) patients (40%) , grade three (24) patients (60%). The duration of nasal obstruction ranged from one month to two years. Routine radiological examination (CT-scan for the nose and paranasal sinuses) was performed to exclude chronic rhinosinusitis and other sino nasal pathologies. The main cause of nasal obstruction for all patients were allergic and vasomotor rhinitis, the aggravating factors were mainly acute rhinitis, exposure to dust and fumes. Examination was performed systematically with anterior rhinoscopy and nasal endoscopy ,the hypertrophied inferior turbinates are endoscopically graded. Grade two: (8) patients (20%), grade three: (20) patients (50%) and grade Four: (12) patients (30%) . Prior to endoscopic examination, patients are prepared by application of cotton pack impregnated with lidocaine (10%) and xylometazoline 0.1% (decongestant) for 15 minutes**.**

Medical laser system:

The laser system used in this study is diode laser (940 nm), Epic^{TM} BIOLASE with maximum power of 10 W, continuous and pulsed mode and fiberoptic delivery system.

Operative procedure

The procedure in all patients were performed under LA with endoscopic guide using a cotton pledgets soaked with 10% lidocaine to be inserted along the inferior and medial walls of IT with injection infiltration of 2% lidocaine to both medial and inferior walls of IT using insulinsyring and for 15 minutes.Patients in supine position with 30^{0} head elevation wearing water soaked surgical towels. Under endoscopic guide the laser delivered with the fiberoptic tip of 400 Mm in diameter with length of 9 mm to be inserted interstitially into the anterior end of the IT.Stainless steel applicators of 7.5cm length, through which an optical fiber of 400Mm in diameter was threaded, is inserted interstitially along the inferior and medial walls of IT. The laser used in a continuous mode with a power of (5) W and exposure duration of (20 sec).The duration of operation for each IT was ranged from 10 to 20 minutes.Anterior nasal packing was needed in four cases(10%) for 15 minutes.All patients received medications includes short term oral systemic antibiotic, simple analgesia and saline nasal douching.Patients followed one week , one month,three months and six months.postoperatively, at each visit

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endoscopic examination, suction clearance and removal of debris with grading of IT were performed under endoscopic guide.

RESULTS:

The procedure was done bilaterally for all patients under local anesthesia by diode laser with a power of 5 W and a mean duration of operation of 15 minutes(10-20) minutes. Evaluation of patients was carried out one weak , one month ,three months and six months postoperatively.Foreach visit nasal obstruction subjectively graded, IT hypertrophy objectively (endoscopically) graded .

Nasal obstruction:

All patients get improvement during the first postoperative week, (8) patients (20%) with three grades improvement, (4) patients (10%) with two grades improvementand (28) patients (70%) with one grade improvement. At one month postoperatively; (4) patients (10%) with three grades improvement, (28)patients(70%) with two grades improvementand (8) patients(20%) with one grade improvement. At three monthspostoperatively (2) patients (5%) with three grades improvement ,(32) patients (80%)with two grades improvement and (6) patients (15%) with one grade improvement .At six months postoperatively ; None patient (0%) get three grades improvement , (12) patients (30%) with two grades improvement and (28) patients (70%) with one grade improvement. Table 3.1

Table No: 1 Post-operative evaluation of nasal obstruction

Grades improvement	One week post op	One month Post op	Three months Post op	six months post op
Three grades Improvement	20%	10%	5%	0
Two grades Improvement	10%	70%	80%	30%
One grade Improvement	70%	20%	15%	70%

Inferior turbinate hypertrophy:

All patients get improvement of inferior turbinate hypertrophy by endoscopic grading.At first postoperative week; (4) patient (10%) with three grades improvement, (8) patients (20%) with two grades improvement and (28) patients (70%) with one grade improvement. At one month postoperatively; (8) patients (20%) with three grades improvement, (16) patient (40%) with two grades improvementand (16) patient (40%) with one grade improvement. At three month postoperatively ;(4) patients(10%) with three grades improvement , (24) patients(60%) with two grades improvement , (12) patients (30%) with one grade improvement.At six month postoperatively(12) patients (30%) with two grades improvement and (28) patients(70%) with one grade improvement. table 3.2

Table No:2 Postoperative evaluation of inferior turbinate hypertrophy

Grades Improvement	One week Post op	One month Post op	Three months Post op	Six months postop

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Three grades improvements	**10%**	**20%**	**10%**	**0%**
Two grades improvements	**20%**	**40%**	**60%**	**30%**
One grade improvements	**70%**	**40%**	**30%**	**70%**

Post-operative complications

Crusting over the inferior turbinate was present in all patients after one week post-operative period. One month post operatively no crustationwas noticed for all patients**Pain:**.After one week post-operative period, (24) patients (60%)experienced a burning sensation with persistence of this sensation in (12) patients (30%) for one month post operatively.

Bleeding: Minor early post-operative bleeding was observed in four patients (10%) that required nasal packing for 15 minutes.

Nasal dryness: (12) patients (30%) experienced this symptom for seven to ten days.**Rhinorrhea:** (8) patients (20%) experienced post-operative rhinorrhea for five to seven days.

Discussion

One of the common health issues seen in every day ENT practice is the obstruction of the nose in association with inferior turbinate hypertrophy. For the volume reduction of inferior turbinate, a number of surgical approaches have been recommended.In the current study we used diode laser (940nm) with power of 5 W, Cw mode and interstitial technique.

According to duration of procedure: The mean time was (15) minutes per turbinate while **Pradipta Kumar Parida** [(54)]Find that the mean time was (10.8) minutes.**Hamdi CakliCemal Cingi**[(55)]by this studythe mean duration of operation was (3) minutes.**Md. Rojibul Hoque1, AsaduzzamanRasel**[(56)]the mean duration of operation was(8) minutes.RonaldSroka PhD [(57)]mean duration of operation was**(**3-10)minutes per turbinate.

For nasal blockage: In the current study All patients get improvement during the first postoperative week, (8) patients (20%) with three grades improvement, (4) patients (10%) with two grades improvementand (28) patients (70%) with one grade improvement. At one month postoperatively; (4) patients (10%) with three grades improvement, (28)patients(70%) with two grades improvementand (8) patients(20%) with one grade improvement. At three months post operatively (2) patients (5%) with three grades improvement ,(32) patients (80%)with two grades improvement and (6) patients (15%) with one grade improvement .At six months postoperatively ; None patient (0%) get three grades improvement , (12) patients (30%) with two grades improvement and (28) patients (70%) with one grade improvement.

Pardipta Kumar Pardipa (54) has demonstrated effective relief of nasal obstruction in all enrolled cases. Indeed, nasal obstruction got worse in some patients during 2 to 3 days post-operatively; however, all patients experienced significant improvement in nasal function by the end of the 1st week post-operatively in addition to substantial reduction in nasal airway resistance six month later. **Volk, Pantel** did the procedure as an outpatient operation under local anesthesia on 41 patients using a diode laser with 980 nm wavelength and 8 W power in a continuous wave mode. They have reported 78% better nasal flow of air after 8 weeks. “Turbinoplasty significantly improved the mean (SD) nasal airflow by 37.1% (52.4%) (95% confidence interval [CI], 20.6%-53.7%), from 509.8 (189.2) cm^3/s (95% CI, 450.1-569.5) to 660.9 (285.4) cm^3/s (95% CI, 570.8-751.0) ($P < .001$)” (58).

In another study, a comparison has been carried out between Ho: YAG laser and diode laser, and the results of improvement in nasal airflow were in favor of diode laser in comparison with Ho: YAG laser, 74.4 % versus 67.5 %, respectively, within three years of operation (57).

In a further study, KTP laser at 6 W in a continuous mode showed 73.33 % improvement in nasal airflow within

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one month of the operation (59). In yet another study, CO2 laser has been used to treat 39 adult patients with inferior turbinate hypertrophy and the results after 12 months pointed to significant improvement in visual analogue symptomatic scale in comparison with baseline figures (60).

For IT hypertrophy

In the present study All patients get improvement of inferior turbinate hypertrophy by endoscopic grading.At first postoperative week; (4) patient (10%) with three grades improvement, (8) patients (20%) with two grades improvement and (28) patients (70%) with one grade improvement At one month postoperatively; (8) patients (20%) with three grades improvement, (16) patient (40%) with two grades improvementand (16) patient (40%) with one grade improvement. At three month postoperatively ;(4) patients(10%) with three grades improvement , (24) patients(60%) with two grades improvement , (12) patients (30%) with one grade improvement**KumarParida**[54]fined that all of patients had shrunk intact inferior turbinate at 3 months of follow up.**Md. Rojibul Hoque1, AsaduzzamanRasel** [56]fined asignificant subjective improvement (86%) of nasal cavity volume6 months after laser surgery.

Post-operative complication: In the current studycrustation over the ITwas present in all patients after one week post-operative period, by one month post operatively no crustationwas noticed for all patients ,**KumarParida**[54]has reported crusting within one and 3 months of follow up, to be present in 88.9 % and 66.6 %, respectively.

SabarinathVijayakumar[59] **find**The most frequently encountered adverse outcome was crusting and it has continued for up to one month in some patients.

RonaldSrokaPhD[57] find that after diode laser treatment, nasal obstruction accompanying crust and edema persisted for up to 4 weeks after diode laser in comparison with only 1 to 2 weeks following Ho: YAG laser.

According to intra-operative and post-operative pain ,the present study showed that all patients (100%) experienced a mild tolerable pain during operative procedure, burning sensation has been described by(24) patients(60%)in the one week post-operative period with persistence of this sensation in (12) patients(30%)for one month post operatively.**Hamdi CakliCemal Cingi**[55]fined that the pain was excellently accepted by the patients.**SabarinathVijayakumar**[59]**fined**aBurning feeling was observed in (3 %) of patients at time of procedure**. Ronald SrokaPhD**[57] find thatadverse outcomes such as pain and nasal dryness were uncommon and reported during the first post-operative week only.**Pedro Paulo Vivacqua**[61] **(Comparison of Turbinectomy techniques with CO2 laser and diode laser)**Pain was variable in range from mild to severe and that moderate to severe pain was more in association with CO2 laser, whereas, mild pain was more in association with diode laser. Nasal dryness and pain were seen in 3 (10 %) and 4 (13.3 %), respectively.

For bleedingin the current study minor early post-operative bleeding was observed in four patients (10%) that required nasal packing for 15 minutes.**Pedro Paulo Vivacqua**[61]find that bleeding intra-operatively was predominantly mild in both types; however, bouts of moderate to severe bleeding were more often seen in association with CO2 laser than with YAG laser.**Md. Rojibul Hoque1, AsaduzzamanRasel**[56]find that minor bleeding was observed in 2of 30 (6.67%) of the patients but did not require nasal packing.According to **Volk, Pantel** [58], immediate or remote complications were not reported by patients and nasal packing was not necessary.

CONCLUSION

Reduction of hypertrophied inferior turbinate by diode laser (940nm) is an effective, safe, minimally invasive procedure can be done with local anesthesia, in outpatient department, with a mild tolerable pain.

Recommendation

We recommend studying the efficacy of diode laser (940nm) in treating inferior turbinate hypertrophy with a large number of patients .

It’s recommended also to study the efficacy of other types of laser in the treatment of inferior turbinate hypertrophy in comparison with diode laser.

CONFLICTS OF INTEREST:

The author have declared no conflicts of interest

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