

ORIGINAL ARTICLE**STUDY OF CO₂ LASER IN OTOLARYNGOLOGY AT GMERS MEDICAL COLLEGE, SOLA, AHMEDABAD****Hardik Shah¹, Neeraj Suri², U B Shah³**¹Associate Professor; ²Assistant Professor; ³Professor, Department of ENT, GMERS Medical College, Sola, Ahmedabad**Correspondence:** Dr. Hardik Shah, E mail: hmpvshah@yahoo.com**ABSTRACT****Aim:** Aim of our study was to compare the surgical otolaryngology cases (vocal cord lesions, dacryocystitis, tonsillitis, and oral cavity growth) operated with laser and with conventional technique.**Methods:** 89 patients were reviewed. Laser was used in 50 cases.**Results:** We found that postoperative pain and intraoperative bleeding was less in patients operated with laser technique. Haemostasis was better achieved. But surgical technique in cases operated with laser needs expertise training.**Conclusion:** The CO₂ laser is associated with precise and predictable soft tissue interaction, minimal damage surrounding normal tissue and minimal formation of char.**Keywords:** - CO₂ laser, vocal cord, dacryocystitis. Oral Sub Mucosal Fibrosis,**INTRODUCTION**

L-A-S-E-R stands for light Amplification by stimulated emission of Radiation. The CO₂ laser is the mainstay of laser in otolaryngology. It is the most widely used, well understood, and well studied of all the medical lasers and is used for incision, excision and vaporization of tissue. It was first used clinically in ENT by strong and Jako (1972)¹.

It was Einstein in 1917 who discussed stimulated Emissions². In 1958 Townes publishes first theoretic calculations of then titled laser³. In 1961, Neodymium doped was developed followed by Nd: YAG and Argon in 1964⁴⁻⁶.

In this study different types of otolaryngology surgical cases were operated with laser and conventional technique. We have discussed the advantages and disadvantages of laser. The laser approach though successful can be technically challenging.

The purpose of the current study was to compare operative results of surgical cases using laser and with conventional technique, and also to compare the outcome between both techniques.

MATERIAL & METHODS

It is a prospective study from 2011 to 2012, carried out in department of ENT, GMERS medical college sola.

Out of 90 patients, only 89 were included in this study as they were regular in follow up.

In this study, different otolaryngology surgical cases were taken up which includes Vocal cord nodule (9), Vocal cord polyp (3), Tonsillitis (23), sub mucous fibrosis (2), Oral cavity growth and leucoplakia (18), Endoscopic dacryocystorhinostomy (31) and Ear lobe keloid (3). Besides a detailed history and complete ENT examination was done. Patients were explained regarding laser complication and advantages and disadvantages. Proper consent was taken. Surgery with laser or without laser was based on surgeon preference. Post operatively patients were examined at 1 week, 1 month, and 3 months thereafter.

Statistical Analysis:

The Paired samples (t) test was used to calculate the change in pre operative and postoperative parameter such as pain, bleeding, voice change. Independent sample t test and x² nonparametric analysis were used to compare numerical variables and proportions respectively b/w laser and nonlaser cases. The Fisher exact test was used to examine probability of success. Statistical analysis was carried out using Excel.

RESULTS

Eighty nine patient [(Male (29), female (60), mean age (31.5)], underwent surgery. Of these 50 were operated

with laser. Demographics of the study population are summarized in table 1 while comparison of data shown in table 2. In Post op pain, haemostasis, intraoperative bleeding P value (<.05) which was significant in laser cases (degree of freedom=1).

Table 1: Demographics of the study population

Variables	Frequency (%)
Age(year) (mean)	31.5
Gender	
Male	29 (35.6)
Female	60 (67.4)
Medical history	
Vocal cord polyp	3 (3.4)
Vocal cord nodule	9 (11.1)
Dacryocystitis	31 (34.8)
Tonsillitis	23 (25.8)
Sub mucous fibrosis	2 (2.2)
Oral cavity growth - Leukoplakia	18 (20.2)
Surgery	
Laser	50 (56.2)
Without Laser	39 (43.8)

Surgical technique

In dacryocystitis laser was used for incision and ablation of flap. Injury to septum and turbinate can occur because of scatter or reflection of laser beam, it can be avoided by using low power and short exposures (.5 to .7 second) especially in recurrent cases where adhesions have formed.

In oral cavity surgical defect was not sutured or grafted but was left to heal by secondary intention. In tonsillectomy bleeding was to minimal with less postoperative pain but electrocautery was used for ligation of large blood vessels (>5mm) where laser could not achieve required hemostasis.

Table 2: Comparison of Baseline characteristics and surgical outcome of both groups

	Laser (%)	Without laser (%)
No. of Patients	50	39
Age (year) (Mean)	29.1	30.6
Gender		
Male	12 (24.0)	17 (43.6)
Female	38 (76.0)	22 (56.4)
Medical history		
VC Polyp	2 (4.0)	1 (2.6)
VC Mobile	4 (8.0)	5 (12.8)
Tonsillitis	13 (26.0)	10 (25.6)
Dacryocystitis	20 (40.0)	11 (28.2)
Submucous fibrosis	2 (4.0)	-
Oral cavity growth and Leukoplakia	8 (16.0)	10 (25.6)
Ear lobe keloid	1 (2.0)	2 (5.1)

Vocal cord lesions are gradually vaporized to the level of mucosa avoiding entry into reinke's space and the deeper vocalis muscle. Intermittent exposure at low

power setting lengthens the time of operation but it is important to limit thermal injury to surrounding tissues. Suction device is kept close to laser impact site to remove hot steam of vaporization. The CO2 laser with a .3mm impact spot is used at 1 to 3 w of power in a pulse mode of .1 second. All patients were given dexamethasone long acting steroid one day prior surgery to prevent laryngeal edema.

If the surgeon chooses large spot (>.5mm) or continuous exposure or high power it may result in poor voice quality because of mucosal scarring and fibrosis.

DISCUSSION

In last few years, the availability of many different laser wavelengths has expanded the application of laser technology to include laryngology, bronchology, rhinology, otology, general otolaryngology. Surgeon can choose wavelengths from CO2, Nd: YAG, Argon, KTP but CO2 laser is renowned for its precision, particularly when coupled with microscope for delicate atrumatic surgery.

It wavelengths of 10.6 micron is at the neck of absorption of water. This characteristic is important because absorption of this wavelengths helps to penetrate into soft tissue with little heat dissipating to adjacent tissues. The laser light is then (3) transformed within tissue to thermal energy, raising the tissue temperature to 100⁰ c and vaporizing the tissue water content. So CO2 is a precise cutting tool, ideal for excision of small lesions on delicate structures such as vocal cords.

Mitashi et al (1976) described the interaction of CO2 laser with human tissue⁸. A rapid thermal drop of laser energy in tissue surrounding the incision results in shallow and predictable tissue penetration with minimal edema. The haemostatic capability of CO2 laser is limited to blood vessels not larger then capillaries (15mm). The CO2 laser beam can be focused to create a precise cut and defocused to produce coagulation of small blood vessel (1mm).

In this study we found that (a) cases done with CO2 laser had improved precision with fine focusing, maintained haemostatis. (b) It can be send down in fibreoptic channel in endoscope to reach areas otherwise inaccessible. (c) One probe does work of many instruments.

For patients it is advantageous in form of (a) Less postoperative pain, less apparent bleeding and swelling (b) reduced surgical time. (c) Reduced cost of surgery as it becomes a daycare procedure (d) earlier return to work.

Disadvantages are, (a) operative areas to be equipped with oxygen and drugs and CPR (b) expert training is required (c) imprecisely aimed laser beam can destroy and burn healthy tissue (d) fire hazard has to be tackled with proper eye gear for surgeon and covering the

patients face with water soaked drape. (e) In cases of micro laryngeal laser assisted surgery laser flex endotracheal tubes has to be used (f) cost factor to the patient will be higher if the set up for LASER has to be made commercially viable.

CONCLUSION

The CO₂ lasers is associated with precise and predictable soft tissue interaction, minimal damage surrounding normal tissue and minimal formation of char. Apart from providing precision in surgery, it also provides bloodless dissection with minimal instrumentation that leads to quicker recovery. Through their use, many patients that previously required admission can be done on outpatient basis.

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