



DIODE LASER A SURGICAL TOOL IN ORAL AND LARYNGEAL LESIONS IN ENT: OUR EXPERIENCE AT TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Light amplification by stimulated emission of radiation (LASER), a surgical tool introduced in ENT surgery in early 70's. Using diode LASER, Otorhinolaryngologist can perform minimally invasive and more precise surgeries while reducing the risk and post-operative period in hospital, Wavelength of diode LASER is 810 nm to 1064 nm; this ensures a precise cutting and coagulation with excellent tissue vaporisation. **Materials And Method:** A review of 25 patients of age ranging from 30 years to 60 years was conducted at our tertiary care centre from June 2023 to December 2023. Patients presented with oral cavity and laryngeal lesions were treated with diode laser. Postoperative complications and efficacy of diode laser were studied after and interval of 1 week and 1 months and 3 months. **Results:** A total number of 25 patients are included in the study out of which 19 were male and 6 were female giving male: female ratio of 3.1:1. Buccal mucosa is the most common site for which diode laser is used to excise the lesions and showed satisfactory results. Diode laser surgery results in fewer post-operative complications, a quicker recovery, and a shorter hospital stay. **Conclusion:** Diode laser is minimally invasive and more precise surgical approach while performing oral and laryngeal surgeries and reduces risk and post-operative hospital stay. Due to strict theater regulations and the high cost of obtaining a laser machine, laser surgery is more expensive; however, diode lasers are less expensive than other lasers. The laser's flexible fiber delivery system is compatible with hollow instruments, allows for coaxial vision, and is ideally suited for oral cavity and laryngeal lesions. Its portability and diversity in functions make it a suitable alternative to the conventional laser.

KEYWORDS

Diode laser, laryngeal lesions, buccal mucosa, contact laser

INTRODUCTION

Light amplification by stimulated emission of radiation (LASER), a surgical tool introduced in ENT surgery in early 70's. Using diode LASER, Otorhinolaryngologist can perform minimally invasive and more precise surgeries while reducing the risk and post-operative period in hospital, Wavelength of diode LASER is 810 nm to 1064 nm; this ensures a precise cutting and coagulation with excellent tissue vaporization. The radiation is delivered by a flexible fiber coupled with an aiming beam. The diode laser penetrates tissue to a depth of 1 to 3 mm, and it is suitable for vascular lesions. It is used to remove and debulk airway pathology, including tumors throughout the airway.

Both in "contact" and "no contact" modality, allows a very effective use in endoscopy.

The advancement of technology and electronics are unique to medicine. Throughout history, machines have benefited humans. From the laboratory to routine conventional surgery, the laser's view has changed. A more realistic and balanced view of the benefits and drawbacks of laser technology has progressively replaced its initial integration into routine ear, nose, and throat surgical procedures. Most commonly used devices are the carbon dioxide (CO₂), argon, and neodymium: yttrium-aluminum-garnet (Nd: YAG) lasers.

Within the past few years, a lightweight, diode laser with a fiberoptic delivery system was introduced to the field of otolaryngology. Light at its particular wavelength is absorbed by tissues relatively independent of tissue type, which allows for homogeneous distribution at the surgical site. The main advantage of laser is its accurate incision, bloodless procedure, and reduced postoperative complications. There are some advantages that lasers have over traditional methods because of their special characteristics. A thorough evaluation of these characteristics and their interactions with biological tissues can improve their surgical application. It is difficult to deliver laser energy to the surgical site through small, dim passageways. The rationale behind selecting this topic is to understand what new surgical skills prospective laser users need to learn and, in order to obtain a desired surgical outcome, to systematically understand each laser's performance.

AIMS AND OBJECTIVES

- To study the demographic data of patients of oral lesions treated with diode laser.

- To study the common site for which laser showed effective results.
- To study the effectiveness and efficacy of diode laser in Otorhinolaryngology.

MATERIALS AND METHODS

The current study includes the review of 25 patients, who were treated with diode laser.

The majority of patients were operated under general anesthesia. For intubation, an oral endotracheal tube was used in every case, which was wrapped with aluminum foil or laser protective metallic tube with two bulbs was used. Bulb was inflated with methylene blue. The eyes were covered with a pad and moistened gauze to provide additional protection, and the surrounding area was completely covered with moist gauze. To evacuate the fumes, catheter is passed through nose.

All patients undergoing laser surgery with a Diode laser system were operated on in "contact" mode. With flexible silica fiber (core diameter of 400 or 600 micromm) fitted into a specifically made accurate fiber guidance system. In contact mode, tip of the laser is placed directly on the surface of tissue and used for photocoagulation (low and medium) and vaporization (high power). For premalignant lesions, after marking the limits the excision was performed. Healing following laser surgery generally went smoothly. After four to six weeks, re-epithelialization was completed, and in majority of patients, the newly formed epithelium looked healthy. There was little postoperative scarring and tissues were soft on palpation.

Complications were reported immediately and later on as they occurred. Patients underwent examinations after one week, one month, and three months following surgery.

All the excised lesions were sent for histopathological examination.

RESULTS

A total number of 25 patients are included in the study out of which 19 were male and 6 were female giving male: female ratio of 3.1:1.

Table 1: Distribution Of Patient As Per Anatomical Site Involved

Site	No of patients	Percentage
Tongue	8	32%
Buccal Mucosa	12	48%

Lower lip and angle of mouth	3	12%
Vallecula	1	4%
Larynx	1	4%
Total	25	100%

Table 2: Cases Operated With Diode Laser

Site	Diagnosis	No of cases
Larynx (Fig.1 a & b)	Internal laryngocele	1
Tongue (Fig.2 a & b)	Papilloma	8
Buccal Mucosa (Fig.3 a & b)	Leukoplakia?/OSMF	12
Lower lip and angle of mouth	Verucous lesions	3
Vallecula	Non- Hodgkin lymphoma	1

In our tertiary care hospital, buccal mucosa is the most common site for which diode laser is used to excise the lesions.

Table 3: Distribution Of Patient As Per Type Of Admission And Average Time Of Discharge

Type of admissions	Number of patients	Discharged	
		Within 24 hours	After 24 hours
O.P.D	21	19	2
Admission	4	4	-

Table 4- Complications Of Laser Surgery.

Sr. No	Types of complications	Larynx	Tongue	Buccal mucosa	Lip and angle of mouth	Total number of cases
1	Immediate edema	1	1	-	1	3
2	Bleeding		3	1	-	4
3	Granulation	1	-	4	-	5
4	Recurrence	1		2	-	3

DISCUSSION

In our study of 25 patients, diode laser was successfully used. Diode laser has been reported in the literature for treating a wide range of lesions from benign conditions to premalignant lesions.⁽¹⁾

In our study 6 cases were observed for bleeding while 84% cases had no bleeding as laser has a haemostatic effect.⁽²⁻⁵⁾

Diode laser has superior coagulation capability for treating laryngeal vascular lesions.⁽⁶⁾

Use of diode laser by contact (or extremely close distance) makes it much safer than other laser sources by avoiding damage due to "beam scape" in an open field.⁽⁶⁾

Hemostasis results in an increased visibility of the surgical site.^(7,8)

As a result we observed reduction in surgery time, particularly in cases of larynx and oral cavity where achieving hemostasis and good visibility is an issue.^(9,10)

In our study postoperative edema was noted in 3 cases. The reduced inflammation is accompanied by reduced postoperative pain, edema and swelling.

As laser doesn't crush, tear and bruise the tissue, wound didn't require suturing^(7,8) dressing and healed by second intention in our study.⁽⁵⁾

No patient in our study complained of severe pain. The pain was found to be significantly lower after a laser resection as it cuts nerve endings compared to a scalpel resection with conventional wound care. No case of infection or cross infection was seen in laser wound in our study as no direct contact was required with the tissue and the tip of the probe in contact mode is at very high temperature.⁽¹¹⁾

No accident due to use of diode laser was found in the study.

In our study inflammatory edema is noted in 3 cases as laser surgery is represented by the histological evidence of a thermal alteration around the zone of laser tissue ablation.

In our study slough was present in patients with minimal granulations in laryngeal cases due to the thermal damage around the laser incision/ablation. This mainly applies to the first 7 days of wound healing regard to histological and biochemical parameters⁽¹³⁻¹⁴⁾ and coincides with delayed inflammation.⁽¹²⁾

With the advancement in technology of laser the number of patients can be operated under local anaesthesia and on OPD basis in near future.

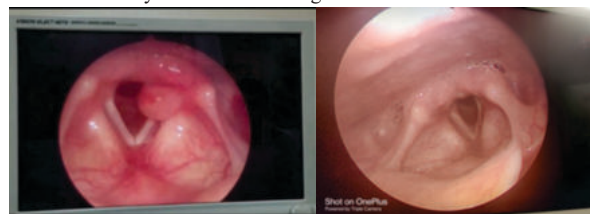
One significant disadvantage of operating from superficial layer to deep layer is that the surgeon does not know the precise depth of ablation or the characteristics of the ablated tissue at the bottom of the incision.

Advantages of diode laser to patients in form of 1) less post-operative pain, less apparent bleeding and swelling 2) less surgical time 3) low cost of surgery as it becomes a day care procedure 4) can resume work early.

Our preliminary results with this laser are encouraging, and we have demonstrated its clinical usefulness. Moreover, the fact that this laser can be applied in conjunction with topical anesthesia alone is testament to its convenience.

CONCLUSION

- Diode laser surgery results in fewer post-operative complications, a quicker recovery, and a shorter hospital stay.
- It can be utilized in "contact" mode for deeper tissue planes and are perfect for use in intranasal, oral cavity, and microlaryngeal applications. Bloodless dissection and minimal instrumentation needed while using diode laser.
- Due to strict theater regulations and the high cost of obtaining a laser machine, laser surgery is more expensive; however, diode lasers are less expensive than other lasers.
- Although more extensive, multicentric prospective research is required, the results of this review indicate that diode laser is a valuable instrument that should be taken into consideration during laryngeal surgeries.
- We undertook a study to determine the usefulness and effectiveness of a diode laser with a fiberoptic delivery system. We tested the laser in several clinical situations; we used it while performing on well defined growth over buccal mucosa and tongue, internal laryngocele, and for ablation of an oral papilloma, and vallecular cyst and hemangioma.
- The laser's flexible fiber delivery system is compatible with hollow instruments, allows for coaxial vision, and is ideally suited for oral cavity and laryngeal lesions
- Its portability and diversity in functions make it a suitable alternative to the conventional carbon dioxide, argon, and neodymium yttrium-aluminum- garnet laser.

**Figure 1.a)** Pre operative image of internal laryngocele**Figure 1.b)** Post operative image of internal laryngocele**Figure 2.a)** Oral leukoplakia - pre operative image**Figure 2.b)** Oral leukoplakia - post operative image**Figure 3.a)** Tongue lesion - pre operative image**Figure 3.b)** Tongue lesions - post operative image

Conflict Of Interest- There is no conflict of interest

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