



ISSN: 0975-833X

## RESEARCH ARTICLE

### COMPARISON OF HEALING PROCESS OF OPERCULECTOMY WITH LASER AND SURGICAL KNIFE - A CLINICAL STUDY

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#### ARTICLE INFO

##### Article History:

Received 14<sup>th</sup> October, 2015  
Received in revised form  
20<sup>th</sup> November, 2015  
Accepted 25<sup>th</sup> December, 2015  
Published online 31<sup>st</sup> January, 2016

##### Key words:

Pericoronitis,  
Operculum,  
Picasso diode laser.

#### ABSTRACT

**Aim:** To evaluate and compare the efficacy of conventional surgical knife to that of laser assisted excision of operculum in terms of patient comfort assessment, post-operative pain and healing.

**Materials and Methods:** This study was conducted in the department of Oral and Maxillofacial Surgery, Yenepoya Dental College, Mangalore. Study consisted of 20 patients with clinically diagnosed Pericoronitis who required excision of the Operculum. They were divided in 2 groups: A and B. Group A comprised of cases where operculum was excised with surgical knife and group B comprised of cases where operculum was excised using picasso diode laser. Clinical parameters such as patient comfort, post-operative pain and healing were assessed and compared between two groups.

**Results:** Group B showed significantly better results than Group A in terms of post-operative pain and wound healing.

**Conclusion:** The use of diode laser in excision of operculum has several advantages over surgical knife such as enhanced haemostasis, less post-operative pain and a better post-operative healing. Therefore, lasers can be considered as a better and acceptable alternative for excision of pericoronal flaps.

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**Citation:** B. H. Sripathi Rao, B. Gunachandra Rai and Sandarbh Saumya Sinha, 2016. "Comparison of healing process of Operculectomy with laser and surgical knife - A clinical study", *International Journal of Current Research*, 8, (01), 25368-25373.

## INTRODUCTION

Pericoronitis may be defined as an infection involving the soft tissues surrounding the crown of a partially erupted tooth. The resulting inflammation may be acute, subacute, or chronic in nature. Although theoretically any tooth may be involved in such an inflammatory process, in practice the mandibular third molar is affected in the vast majority of cases. Pericoronitis is a very common condition which affects both sexes equally and the incidence of which appears to be increasing. It may affect patients of any age but is most frequently seen in patients between 16 to 30 years of age, with the peak incidence in the 20 to 25 year old age group. (Geoffrey L. Howe, 1996) Pericoronitis has an average of 8% incidence associated with wisdom teeth. Pericoronitis classically presents with a history of acute pain along with swelling of the pericoronal tissues, and quite often tenderness on closing because of the occlusion of the swollen tissue with the opposing tooth. (Malhotra and Kaur, 2012) Acutepericoronitis is treated by local antiseptic lavage and gentle curettage under the flap, with or without systemic antibiotics. If the patient uses hot saline mouth baths

conscientiously, they are most effective therapeutic measure. The elimination of the impinging cusps of a maxillary molar, by either the extraction or grinding of the upper tooth, speeds resolution and eases pain. The application of a caustic below the gum flap also eases the pain and the prescription of suitable analgesic tablets is also of value in this respect. Once the acute phase is controlled, the offending molar is extracted or a wedge of hyperplastic pad of tissue is removed surgically. Some established methods of cutting oral soft tissue are conventional surgery, electro-surgery and use of lasers. The use of lasers in oral surgery is becoming standard for several procedures which are performed more efficiently and with less morbidity than with surgical knife. (Maiorana, 2003)

Literature study reveals that diode laser has several distinct advantages over surgical knife such as the ability to coagulate, cut, ablate or vaporize target tissue elements, enabling dry field surgery through the sealing of small blood vessels (haemostasis), decreased pain, disinfection of the tissue, reduced post-operative edema (through the sealing of small lymphatic vessels) and decreased amount of scarring, contributing to faster and more efficient treatment resulting in improved treatment outcome and increased patient comfort and satisfaction. (Malhotra and Kaur, 2012; Maiorana, 2003;

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Lomke, 2008) It has been observed that tissue overheating is a disadvantage while using leading to tissue damage which can be prevented by continuous movement and gentle cooling of the tip. (Maiorana, 2003) In this study we employed diode laser with the objective of comparing healing and its efficacy with conventional surgical knife in operculectomy cases.

## MATERIALS AND METHODS

This was an in-vivo randomized prospective study. The study protocol was reviewed and approved by the Yenepoya University Ethics Committee. The nature and purpose of the study and the surgical protocol was explained to the subjects and a written consent was obtained before commencing the study. All the treatment procedures were performed by the same operator in order to prevent inter-operator variations. This study was conducted in Department of Oral and Maxillofacial Surgery, Yenepoya Dental College, Mangalore. The study sample consisted of 20 patients (age between 17 to 30 years) with clinically diagnosed Pericoronitis who required excision of the operculum. They were randomly assigned into group A and group B of 10 each. Group A comprised of Operculectomy cases treated with surgical knife and group B comprised of Operculectomy cases treated using Picasso diode laser. The inclusion criteria was patients reporting with moderate to chronic recurrent pericoronitis in maxillary and mandibular 3rd molar region, who gave consent for procedure and who were fit for procedure under local anaesthesia. The exclusion criteria was Acute infection and medically compromised patients who were not fit for the procedure. The unit used in our study was AMD Picasso soft tissue diode laser which has one fiberoptic cable that is threaded thru a handle and used as the operating tip. It requires no water and air connections. (wavelength 810 nm, output energy 0.1-7W)



Fig. 1. Clinical Armamentarium

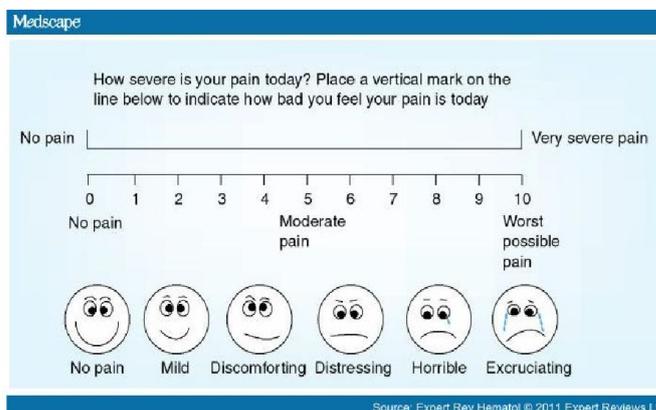
A thorough clinical examination and diagnosis was done. Patient were informed about the procedure and a written informed consent obtained. Pre-operative photographs were taken. The site was prepared with betadine using aseptic techniques. In group A, following local anaesthesia, the pericoronal flap was held with Adson's tissue holding forceps and excision was performed with a B.P. blade No. 12 and 15.

Any remaining tissue tags were removed. Haemostasis was obtained with sterile gauze by applying direct pressure. In group B, following local anaesthesia, pericoronal flap was held with adson's tissue holding forceps and resection was performed employing diode laser hand piece. The tip was used in light strokes. (Wavelength 810nm, power of 4.0 W) Suction was used to remove the unpleasant odour.



Fig. 2. Picasso Diode Laser Unit

Burnt tissue was removed with moist gauze. Haemostasis was achieved and wound debrided with betadine. Subjects were advised to take Paracetamol 500 mg twice daily for three post-operative days. They were instructed to have soft diet and avoid hot food and smoking for next 24 hours. All subjects were advised to maintain oral hygiene and rinse twice a day with a 0.2% chlorhexidine gluconate solution for 2 weeks. Patient were recalled after 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day following the procedure and during every follow up patient were evaluated for pain and healing. Photographs of intra-oral surgical site were taken and documented. Pain was recorded on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> postoperative day using (VAS) Visual analogue scale. (scale of 0 to 10, where 0 is no pain, 10 is severe pain) Wound healing- was assessed on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> postoperative day utilizing Landry, Turnbull and Howley index. (scale of 0 to 5 where 1 is very poor, 2 is poor, 3 is good, 4 is very good and 5 is excellent) The results were compared.



**Healing****Landry, Turnbull and Howley index****HEALING INDEX 1: VERY POOR**

Have two or more of the following

- Tissue color:  $\geq 50\%$  of oral mucosa is red
- Response to palpation: Bleeding
- Granulation tissue: Present
- Incision margin: Not epithelialized, with loss of epithelium beyond incision margin
- Suppuration present

**HEALING INDEX 2: POOR**

- Tissue color:  $\geq 50\%$  of oral mucosa is red
- Response to palpation: Bleeding
- Granulation tissue: Present
- Incision margin: Not epithelialized, with connective tissue exposed.

**HEALING INDEX 3: GOOD**

- Tissue color:  $\geq 25\%$  and  $< 50\%$  of oral mucosa is red.
- Response to palpation: No bleeding
- Granulation tissue: None
- Incision margin: No connective tissue exposed

**HEALING INDEX 4: VERY GOOD**

- Tissue color:  $< 25\%$  of oral mucosa is red
- Response to palpation: No bleeding
- Granulation tissue: None
- Incision margin: No connective tissue exposed

**HEALING INDEX 5: EXCELLENT**

- Tissue color: all tissues are pink
- Response to palpation: no bleeding
- Granulation tissue: none
- Incision Margin: no connective tissue exposed

**RESULTS AND OBSERVATION**

The study sample consisted of 20 patients (age between 17 to 30 years) with clinically diagnosed Pericoronitis who required excision of the operculum. They were randomly assigned into group A and group B of 10 each. Group A comprised of Operculectomy cases excised with surgical knife and group B comprised of Operculectomy cases excised using Picasso diode laser. The pain and healing scores were recorded on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day post-operatively. Collected data were analysed by percentage, mean, standard deviation and comparison was done using 'Chi square test' and 't' test.

Evaluation of pain on 2<sup>nd</sup> post-operative day shows a mean score of 2.4 in laser group and 4.6 in scalpel group with a standard deviation of 0.699 and 1.43 respectively and p value of  $< 0.001$  which is statistically significant. On 7<sup>th</sup> post-operative day evaluation shows a mean score of 1.1 in laser group and 3.2 in surgical knife group with a standard deviation of 0.568 and 1.229 respectively and p value of  $< 0.001$  which is statistically significant. On 14<sup>th</sup> post-operative day evaluation shows a mean score of 0.1 in laser group and 0.2 in surgical knife group with a standard deviation of 0.316 and 0.422 respectively and p value of 0.556 which is statistically not significant. On 30<sup>th</sup> post-operative day evaluation shows a mean score of 0 in both the groups so p value cannot be calculated. (Table 1). Evaluation of healing on 2<sup>nd</sup> post-operative day shows a mean score of 3.7 in laser group and 2.8 in surgical knife group with a standard deviation of 0.483 and 0.632 respectively and p value of 0.002 which is statistically significant. On 7<sup>th</sup> post-operative day evaluation shows a mean score of 4 in laser group and 3.4 in surgical knife group with a standard deviation of 0 and 0.516 respectively and p value of 0.005 which is statistically significant. On 14<sup>th</sup> post-operative day evaluation shows a mean score of 4.8 in laser group and 4.7 in surgical knife group with a standard deviation of 0.422 and 0.483 respectively and p value of 0.628 which is statistically not significant. On 30<sup>th</sup> post-operative day evaluation shows a mean score of 5 in laser group and 5 in surgical knife group with a standard deviation of 0 and 0 so t and p value cannot be calculated. (Table 2)

**Table 1. Comparison of pain score between laser and surgical knife on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> post-operative day**

T TEST for comparison of pain							
	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
2 DAY PAIN	LASER	10	2.4	0.699	-4.371	18	$< 0.001$
	KNIFE	10	4.6	1.43			
7 DAY PAIN	LASER	10	1.1	0.568	-4.905	18	$< 0.001$
	KNIFE	10	3.2	1.229			
14 DAY PAIN	LASER	10	0.1	0.316	-0.6	18	0.556
	KNIFE	10	0.2	0.422			
30 DAY PAIN	LASER	10	0	.000a	CANNOT BE CALCULATED		
	KNIFE	10	0	.000a			

**Table 2. Comparison of healing score between laser and surgical knife on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> post-operative day**

T TEST for comparison of healing							
	GROUP	N	Mean	Std. Deviation	t	df	P VALUE
2 DAY HEALING	LASER	10	3.7	0.483	3.576	18	0.002
	KNIFE	10	2.8	0.632			
7 DAY HEALING	LASER	10	4	0	3.674	9	0.005
	KNIFE	10	3.4	0.516			
14 DAY HEALING	LASER	10	4.8	0.422	0.493	18	0.628
	KNIFE	10	4.7	0.483			
30 DAY HEALING	LASER	10	5	.000a	CANNOT BE CALCULATED		
	KNIFE	10	5	.000a			



Fig. 4. Laser Group

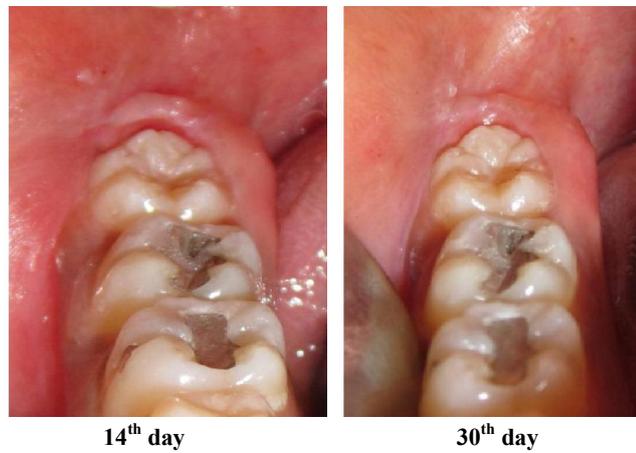


Fig. 3. Surgical Knife Group



Pre-Op

Post-Op

**DISCUSSION**

Treatment of Pericoronitis broadly classified into conservative and definitive management. Conservative management includes irrigation beneath the operculum to remove debris and inflammatory exudate, warm saline mouth wash and smoothing margins of opposing cusps. Symptomatic relief is with the use of antibiotics and analgesics. Definitive management includes extraction or operculectomy of the associated tooth. Operculectomy can be performed with various methods with certain advantages and disadvantages. There are various methods of cutting oral soft tissues. These are conventional surgery, electro-surgery and use of lasers. Each are different in terms of haemostasis, healing time, width of the cut, anaesthesia required and disagreeable characteristics such as smoke production, odour of burning tissue and undesirable taste. Excision of soft tissue with a scalpel results in excessive bleeding which obscures the operative field and increases the fear of surgery. It is the conventional, cheap and effective method. (Malhotra and Kaur, 2012; Douglass, 2003)

Lasers offer certain advantages. First of all the haemostatic property of laser is of great value and allows the surgeon to work with better visibility. Secondly, pain reduction is considerable when compared to conventional surgery and, even if the exact physiological process is still unknown, an alteration of the neural transmission and the decreased tissue insult has

been mentioned as factors. The better post-operative tissue healing and a reduction of scar tissue formation are due to decreased tissue collateral damage, less trauma, control of the depth of tissue damage, and fewer myofibroblastic cells in laser wounds. (Maiorana, 2003) Other advantage of the laser versus surgical knife surgery include bloodless field and highly decontaminated surgical bed which allow for less swelling and pain during the postoperative period. Moreover as is reported in literature these advantages also allow for the appearance of fewer myofibroblasts resulting in comparatively lesser wound contraction. (Haytac, 2006) There are very few studies comparing effects of laser and conventional techniques on operculectomy procedures. The aim of the study was to compare post-operative pain and healing of operculectomy cases with diode laser and conventional surgical knife. In our study post-operative pain was evaluated using Visual Analogue Scale on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day and results were compared between diode laser and surgical knife group. On evaluation patients in laser group had less post-operative pain compared to surgical knife group (mean score was less on 2<sup>nd</sup>, 7<sup>th</sup> and 14<sup>th</sup> day in laser group), showing that lasers operated operculectomy cases have less post-operative pain as compared to surgical knife. Reduction of pain in laser group may be due to the protein coagulum that is formed on the wound surface, thereby acting as a biologic dressing and sealing the ends of the sensory nerves. Pogrel *et al.* (1990), attributed this reduction in pain to the fact that the inflammatory reaction associated with laser application is reduced, since blood and lymphatic vessel sealing occurs, with prevention of the extravasation of fluids responsible for inflammation and pain. Moreover, laser irradiation cause sealing of the nerve endings in the surgical contact area and the denaturalized collagen layer formed on the surface of the surgical wound serves to isolate from the oral fluids. According to Pang *et al.* Pain relief mechanisms appear to originate in stimulating oxidative phosphorylation in mitochondria and through modulating inflammatory responses. (Pang, 2012) Our findings are consistent with findings of following authors: Shalawe *et al.* (2012) and Sherifa Mostafa M Sabra (2013) did a clinical study comparing pain between scalpel surgery and diode laser in operculectomy cases in impacted mandibular molar. Pain was recorded on 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> day of operculectomy and found degree of pain to decrease in scalpel surgery group by 84, 76, 56 and 32% and in diode laser group as 76, 60, 40 and 20% respectively. Results showed diode laser to be a better option compared to conventional scalpel surgery (Shalawe, 2012; Sabra, 2014). IzeIyamn *et al.* (2013) in a clinical study compared 810 nm diode laser with conventional surgery in soft tissue procedures such as operculectomies, surgical exposure of crown of teeth and found that post-operative pain was significantly reduced in all cases treated with the diode laser ( $P < 0.001$ ) which is statistically significant showing diode laser to be a better alternative over conventional surgery in management of soft tissue procedures. (IZE-IYAMU, 2013)

In our study post-operative healing was evaluated using Landry, Turnbull and Howley index on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day and results were compared between diode laser and surgical knife group. Healing initially started as poor healing with less granulation tissue and bleeding wound. Later on further follow up less bleeding surface was present and more

of granulation tissue was evident, finally progressing to clinically excellent healed tissues. On evaluation patients in laser group had faster and comfortable post-operative healing compared to surgical knife group (mean score was more on 2<sup>nd</sup>, 7<sup>th</sup> and 14<sup>th</sup> day in laser group), showing that lasers operated operculectomy cases have better post-operative wound healing as compared to surgical knife.

According to Cenk Haytac *et al.* (2006) diode laser in superpulse mode, releases bursts of higher peak powers and shorter pulse durations in the microsecond range. This mode allows the surgeon to deposit pulses of higher peak power into tissue with control, to confine the exposure to pulses that are within the thermal relaxation time of the tissue, and to use pulse repetition rates that allow cooling between individual pulses to reduce heat accumulation. The use of this mode may have beneficial effects on the control of post-surgical complications by preventing carbonization or charring, which may interfere with wound healing. (Haytac, 2006) Our findings are consistent with findings of following authors. Sherifa Mostafa M Sabra, (2013) conducted a clinical study comparing operculectomy healing process of impacted mandibular molar with surgical knife and diode laser. Healing increased in surgical knife group as 48, 64, 72 and 84% and in diode laser group as 60, 72, 80 and 96% on 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> day respectively. Laser method showed faster elimination of pericoronitis symptoms and enhanced healing process of soft-tissues. Soliman *et al.* (2014) in a clinical study compared the use of conventional surgery and diode laser as a treatment modality for treatment of impacted mandibular wisdom.

Patient were evaluated on 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 7<sup>th</sup> days post operatively. Diode laser demonstrated a significant fast healing of soft tissues. (Soliman, 2014) Nihat Akbulut *et al.* (2013) did a study to evaluate the efficacy of 810 nm diode laser for treatment of benign oral soft tissue lesions and found acceptable healing with minimal adverse effect. (Akbulut, 2013) Carlo Maiorana *et al.* studied the versatility of a super pulsed diode laser to uncover impacted teeth and found that the post-operative healing ensued without inflammation and complications. (Maiorana, 2006) Sushma S Lagdive *et al.* (2014) used semi-conductor diode laser for operculectomy cases and found that surface produced heals favourably as an open wound with enhanced faster results. (Lagdive, 2011) Izelyamn *et al.* (2013) in a clinical study comparing 810 nm diode laser with conventional surgery in orthodontic soft tissue procedures such as operculectomies and found that the patients treated with diode laser had an improved post-operative comfort. (IZE-IYAMU, 2013) Arcangelo *et al.* in a preliminary study of healing of diode laser versus scalpel incisions in rat oral tissues found that scalpel repair was equivalent or better than laser repair as a result of thermal damage to the tissues but also advocated the clinical use of the low level diode laser as an alternative to scalpel incision. When evaluating diode laser with conventional surgical knife surgery, it has certain distinct advantages such as dry operating field, decreased pain and better post-operative healing with overall better patient acceptance. The limitation of the present study was that the sample size was small consisting of twenty patients. Hence, a more elaborate study with larger number of clinical cases is essential to be more conclusive.

## Summary and Conclusion

This study was carried out in Department Of Oral and Maxillofacial Surgery, Yenepoya Dental College, Mangalore to compare healing process of Operculectomy with Laser and Surgical knife. Study consisted of 20 patients with clinically diagnosed pericoronitis who required excision of the operculum. They were divided in 2 groups A and B. Group A comprised of cases where operculum was excised with surgical knife and group B comprised of cases where Operculum was excised using Picasso diode laser. Assessment of pain was done using visual analogue scale (VAS) with a lesser mean score of 2.4, 1.1, 0.1 and 0 in laser group compared to 4.6, 3.2, 0.2 and 0 in surgical knife group on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day post-operatively. Assessment of healing was done using Landry, Turnbull and Howley Index with a greater mean score of 3.7, 4, 4.8 and 5 in laser group compared to 2.8, 3.4, 4.7 and 5 in surgical knife group on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup> and 30<sup>th</sup> day post-operatively. Following inferences were drawn from our study: Lasers operated operculectomy cases have less post-operative pain, have better post-operative healing as compared to conventional surgical knife and therefore can be considered as more comfortable and easily acceptable treatment modality by patients.

From the observations we gathered in our present study on "Comparison of healing process of Operculectomy with Laser and Surgical knife"- A clinical study: we concluded that there was a significant difference between surgical knife surgery and diode laser techniques in terms of patient comfort assessment, pain and wound healing. The diode laser group showed significantly better results than the surgical knife group. The findings of our study support the use of diode laser. However, further studies with more number of sample size is required to be more conclusive.

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