Comparative evaluation of pain response in operculectomy procedures using conventional, electrocautery and Laser techniques

Anjhana Asok*, Rahul Bhandary, Mamatha Shetty, Smitha Shetty

Email: anjhanaasok91@gmail.com

Abstract

Background: The operculum is a soft tissue covering the crown of a partially erupted tooth which is difficult to access with normal oral hygiene methods. The inflammation of operculum is called as pericoronitis or operculitis. The surgical removal of operculum is known as operculectomy. Objective: The aim of this study is to compare the pain response between different techniques like conventional, electrocautery and Laser after operculectomy, and to compare the efficacy between the same. Methodology: A total of 30 patients ranging from 17-40 years of age with operculum were selected. The enrolled patients were randomly divided into three groups (10 patients each) as follows: Group A (scalpel), Group B (electrocautery) and Group C (Diode Laser). The pain response was evaluated using the Visual Analog Scale (VAS) on the seventh day post operatively in all the groups. Statistical analysis: The Kruskal-Wallis test was used to compare the pain between the groups, and multiple comparisons of pain was compared using Mann-Whitney U test. Results: The study showed that there was a significant difference in VAS scores of pain when the three treatment methods were compared on the seventh day (P<0.05). It also showed that the laser group displayed significantly lower VAS scores. Conclusion: This study indicated significant differences between Laser, scalpel and electrocautery in terms of patient perception, pain, post-operative time and discomfort. More satisfactory results were obtained in the laser group compared to electrocautery and scalpel group.

Key words: Electrocautery, inflammation, Laser, operculum, pericoronitis.

Introduction

The operculum is a soft tissue covering the crown of a partially erupted tooth. This area is difficult to access, and hence the normal oral hygiene methods remain ineffective, leading to inflammation of the soft tissue. This inflammation of the soft tissue surrounding the crown of a partially erupted tooth is called pericoronitis. The accumulation of bacteria and debris below the soft tissue covering the tooth, or a mechanical trauma caused by biting on the operculum by an opposing tooth may be the causes for pericoronitis. It is known to appear between 17-24 years of age, when the third molars start to erupt, and are most commonly seen with the partially erupted/impacted mandibular third molars.¹ The term pericoronitis was first introduced into the dental literature by Bloch in 1921.² The microorganisms associated with pericoronitis are:

Anjhana Asok
Third year postgraduate student, Department of Periodontics, 4th floor, A B Shetty Memorial Institute of Dental Sciences, Deralakatte, Nitte University, Mangalore - 575018, Karnataka

Rahul Bhandary
Professor, Department of Periodontics, 4th floor, A B Shetty Memorial Institute of Dental Sciences, Deralakatte, Nitte University, Mangalore - 575018, Karnataka

Mamatha Shetty
Reader, Department of Periodontics, 4th floor, A B Shetty Memorial Institute of Dental Sciences, Deralakatte, Nitte University, Mangalore - 575018, Karnataka

Smitha Shetty
Reader, Department of Periodontics, 4th floor, A B Shetty Memorial Institute of Dental Sciences, Deralakatte, Nitte University, Mangalore – 575018, Karnataka

* Corresponding Author

Streptococcus species, Actinomyces, Prevotella, Bacteroides, Fusobacterium, Campylobacter, Staphalococcus, Lactobacillus and Haemophilus. Most of the microbes responsible for causing pericoronitis are obligatory anaerobic bacteria.3

The operculum is managed by excising the excessive soft tissue which covers the third molar, and the procedure is known as operculectomy. The traditional methods of performing operculectomy is by conventional surgery, by electrocautery and by use of Lasers. Each of the three procedures are different in terms of haemostasis obtained, healing time, the width of the incision given and requirement of anaesthesia.2 Hence, the aim of the present study was to compare the pain response using scalpel, electrocautery and Laser techniques after operculectomy, and to compare the efficacy between the different techniques.

Materials and methods

Study design
A total of 30 patients aged between 17–40 in the outpatient department of Periodontology were selected and distributed evenly into three groups, i.e, the scalpel group (Group 1, n= 10), the electrocautery group (Group 2, n = 10) and the Laser group (Group 3, n = 10). A written informed consent was obtained from all the patients. The patients with operculum, and those who had no systemic conditions that would contraindicate routine surgical procedures were included in the study. Pregnant and lactating mothers, current smokers, patients who demonstrated poor oral hygiene maintenance after phase I therapy, grossly decayed teeth and patients with known allergy to local anaesthetic agent were not considered to be participants in the study.

Procedure
In group 1, 2% local anaesthetic agent with 1:80,000 adrenaline was infiltrated at the surgical site, and the excision was performed using No. 15 BP blade. Any remaining tissue tags were removed using Castroviejo scissors. The haemostasis was obtained using sterile gauze and direct pressure pack (Figure1a).

In group 2, the site was anaesthetized and excision of the pericoronal flap was performed using the needle and loop electrodes. The electrodes were used in light brushing strokes, and the tip was kept in motion all the time. The burnt tissue were removed with moist gauze (Figure 2a).

A soft tissue incision was performed after topical application of the local anaesthetic agent using a Diode Laser with a wavelength of 810 nm, for patients in group 3. The burnt tissue were removed with moist gauze (Figure 3a).

Post-surgery, the patients were advised to take paracetamol if they had discomfort after the effects of anaesthesia wore off. They were instructed to avoid hot food for 24 hours and to avoid smoking. They were advised to rinse twice daily with a 0.2% chlorhexidine gluconate solution for two weeks, and were recalled for follow up on the seventh day post operatively for assessment of pain (Figures 1a, 2b, 3c).
The evaluation of pain was done using the VAS after the one week post-operative period to assess for any interference with the patients routine activities, their mood, changes in speech and sleep. The patient’s pain level was assessed by the VAS scores ranging from no pain (score - 0) to severe pain (score - 10) with the treatment outcomes. The patients were asked to make a vertical mark between two endpoints on the pain scale and related to the pain scale. The left end point was designated as “no pain”, whereas the right end point was nominated as “worst pain imaginable.”

**Statistical analysis**

The collected information was summarised by using frequency, percentage, mean, median, standard deviation and range. To compare pain between the groups, the Kruskal-Wallis test was used. Multiple comparison of pain was assessed using Mann-Whitney U Test. The “p” value less than 0.05 was considered significant.

**Results**

The post-operative pain was assessed on the seventh day using VAS. The mean and standard deviation for the three techniques are tabulated in Table 1. A significant difference in VAS scores of pain, when the three treatment methods were compared on the seventh day (P<0.05) is seen with the group treated with Laser, showing significantly lower VAS scores.

Figure 4 demonstrates the VAS scores among the groups, seventh day post operatively. A statistically significant difference was noted in the scores between the groups treated with scalpel and electrocautery, and scalpel and Laser. However, no significant difference was noted in the scores between the electrocautery and Laser group.

**Table1:** Comparison of the mean VAS scores of the levels of pain for three groups observed on the seventh day

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>S.D</th>
<th>MEDIAN</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCALPEL</td>
<td>3.4</td>
<td>1.77</td>
<td>3.5</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>ELECTROCAUTERY</td>
<td>0.7</td>
<td>1.05</td>
<td>0</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>LASER</td>
<td>0.2</td>
<td>0.42</td>
<td>0</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

*VAS - Visual Analogue Scale, SD - Standard Deviation

**Discussion**

Pericoronitis is an inflammatory and infective condition of the soft tissue, contiguous to and overlying a tooth crown, most frequently encountered in the mandibular third molars. Minimal or no post-operative complications, acceptable healing and optimum patient satisfaction is the primary goal of any periodontal surgical procedure. Surgical excision with scalpel is the most widely used and traditional form of treatment. The drawbacks of using scalpel technique is the need for management of intraoperative and post-operative bleeding, need for anaesthesia, suturing, risk of post-operative infection, edema and impaired visibility due to bleeding. But, despite all these drawbacks, the scalpel technique is considered the gold standard and a traditional technique, which provides good tactile sensation, easy to perform, inexpensive, less time consuming and uneventful healing. In the view of the present study, patients operated with Laser showed less post-operative pain and discomfort. Chau et al. demonstrated that scalpel yields greater incision-related blood loss when compared with electrosurgery blade.

Electrocautery/thermal cautery makes use of direct/alternating current, which when passed through a electrode generates heat. The heat generated by the electrode is used to cause tissue destruction and haemostasis. It is contraindicated in patients with pacemakers, and shows poor post-operative healing in patients who have undergone irradiation, diabetes or blood dyscrasias. Electrocautery has the advantage of being able to cut on the side as well as the tip, the availability of angulated electrode, ease of cutting the tissue, achieving immediate
and consistent haemostasis, the ability to cause less collateral tissue damage, painless wound and the self-disinfecting ability of the tip. The need of administering local anaesthesia, the burning flesh odour, less tactile sensitivity, damage to the surrounding bone and the inability to use it around dental implants are a few disadvantages of the use of electrocautery. In the present study, less post-operative pain was experienced by patients in the electrocautery group than with the use of scalpel. The use of Laser on the other hand does not require administration of anaesthesia, and production of low or no heat makes it safe to be used around dental implants.

The Diode Lasers have a compact and portable design, surgeries result in less patient discomfort, less chair side time, reduced bacteraemia, reduced bleeding, reduced healing time and a reduction in edema and post-operative bleeding. This reduced bleeding is seen as a result of sealing of the capillaries by protein denaturation and by stimulation of production of clotting factor VII. The impact of Laser on the tissues causes cellular disintegration without the release of chemical mediators, because of which there is a reduced acute inflammatory response compared with scalpel created wound. The thin layer of collagen which is formed on the surface of the wound helps, being an impermeable dressing, thereby reducing the degree of tissue irritation by oral fluids. Furthermore, there is also lesser wound contraction. The slow cutting and eye damage by laser light are a few disadvantages of Laser.

Rajesh Kumar et al. analyzed the patient’s satisfaction and comfort level using Diode Laser and scalpel in the management of mucogingival anomalies, in which 70 patients were recruited for the study and randomly distributed into two groups, where surgical excision was carried out using scalpel and Laser. The pain and satisfaction level were assessed using VAS. The study confirmed less post-operative pain and discomfort in patients who underwent surgery by Laser.

In the present study, patients experienced less post-operative pain and discomfort with better satisfaction on the seventh day, which may be due to the result of the formation of protein coagulum on the wound surface by laser that act as a biological dressing and seals the sensory nerve endings and inhibit pain receptors at incision site.

The healing was satisfactory in all the three groups in this study. Two patients in the Laser group showed delayed healing. In a comparative study of electrosurgical and scalpel wounds, Nixon et al., showed delayed healing of electrosurgical wounds. Many studies also suggested that Laser surgical wounds heal rapidly with less scar tissue formation than conventional scalpel technique, but contradictory results have also been reported. The longer follow up with more number of patients would strengthen the results obtained by this study.

**Conclusion**

This study indicated significant differences between Laser, scalpel and electrocautery in terms of patient perception, pain, post-operative time and discomfort. Better results were obtained in the Laser group compared to electrocautery and scalpel group. The decision to use a Laser should be based on the proven benefits of haemostasis, a dry field, reduced surgical time and the general experience of less postoperative swelling. It could be concluded that within the limitation of this study, Laser therapy is superior to the conventional surgical treatment in terms of post-operative pain after operculectomy. However, further longitudinal studies are required to evaluate the long-term effects of Diode Laser on clinical as well as microbiological parameters. The bactericidal effect of Diode Laser on specific microorganisms needs to be determined by further studies. Taking into consideration the excellent clinical outcome, the Laser can be used as an alternative for soft tissue procedures like operculectomy.

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**References**