RESEARCH PAPER

Surgical Access via Bard Parker (BP) Blade – 15, Radiofrequency and Diathermy for Mandibular Impacted Third Molar – A Comparative Study

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ABSTRACT

Aim: To compare surgical access achieved using BP blade 15, radiofrequency, and diathermy during impacted mandibular third molar removal.

Materials and Methods: This experimental comparative study included 45 patients aged 18–35 years requiring surgical removal of impacted mandibular third molars. Patients were randomly allocated into three groups (n=15 each): BP blade (control), radiofrequency, and diathermy. Standardized surgical protocols were followed. Intraoperative parameters assessed were incision time and bleeding score. Postoperative parameters included pain (VAS), burning sensation (NAS), and wound healing (Landry's Healing Index) evaluated on postoperative days 1, 3, and 7. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant.

Results: BP blade demonstrated the shortest incision time, while radiofrequency and diathermy showed significantly reduced intraoperative bleeding. Pain and burning sensation were higher on postoperative day 1 in the diathermy and radiofrequency groups but reduced significantly over time, with no intergroup differences by day 7. Wound healing scores were significantly better in radiofrequency and diathermy groups during early postoperative periods, with comparable healing across all groups by day 7.

Conclusion: BP blade-15, radiofrequency, and diathermy are all effective for incision placement in impacted mandibular third molar surgery. The scalpel offers simplicity with less early discomfort but more bleeding, while radiofrequency and diathermy provide superior haemostasis. Radiofrequency shows a better balance between bleeding control and patient comfort.

Keywords: Radiofrequency; Diathermy; Impacted third molar; Haemostasis; Ward's incision

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INTRODUCTION

The surgical removal of an impacted mandibular third molar is one of the most frequently performed procedures in oral and maxillofacial surgery. Proper incision placement is essential to provide adequate access to the underlying bone and impacted tooth while minimizing tissue trauma. Incisions should be placed in areas with minimal risk of injury to adjacent vital structures, allowing tension-free closure that facilitates rapid and predictable postoperative healing.

Traditionally, surgical access for impacted third molar removal has been achieved using scalpels. However, advances in surgical technology have introduced alternative modalities aimed at improving patient comfort and reducing the iatrogenic effects associated with conventional techniques. [1] Methods such as lasers, electrosurgery, and radiofrequency have been increasingly investigated as potential alternatives to scalpels. These techniques are primarily evaluated based on their ability to improve haemorrhage control, enhance surgical visibility, promote faster postoperative healing, and increase patient comfort.

Electrosurgical techniques include electrolysis, electrocauterization, and electrochemical tissue destruction. The term electrosurgery, however, specifically refers to the use of high-frequency electrical currents during surgical procedures. [2] A clear understanding of the characteristics of different current frequencies and waveforms is essential for the safe and effective use of electrosurgery. Radiofrequency (RF) cautery, also known as radiofrequency ablation, functions by delivering high-frequency alternating current to biological tissues, producing localized heat that destroys target cells through coagulative necrosis. An alternating electromagnetic field is transmitted through an active electrode into the tissue, while the electrical circuit is completed using grounding pads. Although the electrode itself does not generate heat, rapid oscillation of tissue ions and dipole molecules converts electrical energy into heat around the electrode tip. At temperatures of approximately 50–100°C, protein denaturation and cellular dehydration occur, resulting in coagulative necrosis. Heat subsequently spreads through thermal conduction, producing localized coagulation, hemostasis, and controlled tissue destruction, making RF cautery effective for tissue cutting, ablation, and bleeding control. The major advantage of radiofrequency is the induction of hemostasis immediately after the placement incision. [3]

The use of radiofrequency in oral surgery has gained increasing acceptance. However, comprehensive comparative studies evaluating its efficacy, postoperative effects, advantages, and limitations relative to conventional scalpels and diathermy remain limited, and evidence regarding postoperative wound healing is still inconclusive.

Clinical studies have reported conflicting findings regarding the benefits of RF devices. Moreover, no clinical evidence currently exists on postoperative burning sensations following surgical removal of impacted mandibular third molars, and literature directly comparing surgical access using Bard Parker (BP) blade #15, radiofrequency, and diathermy is lacking. Therefore, this study aims to compare surgical access achieved using BP blade #15, radiofrequency, and diathermy during impacted mandibular third molar surgery and evaluate their effects on intraoperative

time, bleeding, postoperative pain, burning sensation, and wound healing.

MATERIALS AND METHODS

This experimental study evaluated and compared the efficacy of different incision modalities used to gain surgical access for the removal of impacted mandibular third molars. A total of 45 patients aged 18–35 years, who reported between April 2024 and January 2026, were included. All participants were diagnosed with impacted mandibular third molars requiring surgical removal.

Participants were selected according to predefined inclusion and exclusion criteria. Male and female patients classified as ASA I and indicated for surgical removal of impacted mandibular third molars were included. Patients with systemic comorbidities, bleeding disorders, cardiac diseases, syndromic conditions, infections at the surgical site, or those classified as ASA II, III, or IV were excluded. Individuals younger than 18 years or older than 35 years were also excluded. Written informed consent was obtained from all participants after explaining the study protocol. Ethical approval was granted by the Institutional Review Board.

The sample size was calculated using an F-test (one-way ANOVA: fixed effects, omnibus) with an effect size of 0.55, alpha error probability of 0.05, and study power of 90%, resulting in a total sample size of 45 patients, with 15 participants allocated to each group.

Patients were randomly assigned using simple randomization into three groups: Group B (control group; incision with BP blade 15), Group R (radiofrequency incision), and Group D (diathermy incision), with 15 patients in each group.

All patients underwent comprehensive preoperative clinical and radiographic evaluation using intraoral periapical radiographs (IOPA) or orthopantomograms (OPG). Standardized surgical protocols were followed for every case. Procedures were performed under strict aseptic conditions using 2% lignocaine with adrenaline (1:80,000) administered through inferior alveolar and long buccal nerve blocks. A standard Ward's incision extending through the mucoperiosteum to bone was used in all patients. Group B received the incision with a BP blade 15 [Figure - 1], Group R with a radiofrequency cautery unit [Figure - 2], and Group D with diathermy using a Colorado probe [Figure - 3]. Following flap reflection, impacted mandibular third molars were removed using conventional surgical techniques. The surgical site was irrigated and closed with 3-0 silk sutures. All patients received identical postoperative medications consisting of amoxicillin 500 mg three times daily for 5 days and aceclofenac 100 mg with paracetamol 325 mg twice daily for 3 days.

Patients were reviewed on the 1st, 3rd, and 7th postoperative days [Figure – 4,5,6]. Intraoperative parameters included incision time (seconds) and operator-assessed presence or absence of bleeding. Postoperative burning sensation was evaluated using the Numerical Analog Scale (NAS), pain using the Visual Analog Scale (VAS), and wound healing using Landry's Healing Index. The study outcomes were compared to determine the efficiency of surgical access achieved by the three incision modalities.

RESULTS

A total of 45 patients were included in the study, with 15 patients in each group. The

BP blade group comprised 40% males and 60% females, the diathermy group 53.3% males and 46.7% females, and the radiofrequency group 40% males and 60% females.

The mean operative time was shortest in the BP blade group (64.67 ± 12.12 seconds), followed by the diathermy group (72.47 ± 6.48 seconds) and the radiofrequency group (76.07 ± 16.29 seconds). The difference among the groups was statistically significant ($p = 0.044$). [Table- 1]

Intraoperative bleeding occurred in all patients in the BP blade group, whereas only four patients each in the diathermy and radiofrequency groups experienced bleeding, demonstrating a significant reduction in bleeding with these modalities ($p < 0.001$). [Figure- 5]

Pain scores decreased progressively in all groups. In the BP blade group, mean pain scores reduced from 3.33 ± 1.11 on Day 1 to 2.20 ± 1.26 on Day 3 and 0.73 ± 1.03 on Day 7. The diathermy group showed a reduction from 5.53 ± 1.30 to 3.00 ± 1.07 and 0.67 ± 0.72, while the radiofrequency group decreased from 4.27 ± 1.03 to 2.27 ± 1.10 and 0.60 ± 0.74 over the same period. The reductions were significant within each group ($p < 0.001$). Intergroup analysis demonstrated a significant difference only on Day 1 ($p < 0.001$), with higher pain scores in the diathermy group, whereas no significant differences were observed on Days 3 and 7. [Figure-6]

Burning sensation scores also declined over time. The BP blade group maintained minimal scores throughout, with no significant intragroup difference ($p = 0.229$). In contrast, the diathermy and radiofrequency groups exhibited higher burning sensation scores on Day 1 (0.67 ± 0.82 and 0.73 ± 0.80, respectively), which reduced to negligible levels by Day 7, showing significant intragroup improvement ($p < 0.001$). Intergroup comparison was significant on Day 1 ($p = 0.043$) but not on Days 3 and 7. [Table- 2]

Healing improved progressively in all groups. Mean healing ranks increased from 1.07 to 2.97 in the BP blade group, from 1.00 to 2.73 in the diathermy group, and from 1.10 to 2.73 in the radiofrequency group. These improvements were significant within all groups ($p < 0.001$). Intergroup comparisons showed significantly better healing in the diathermy and radiofrequency groups on Days 1 and 3 ($p < 0.001$), while no significant difference was observed by Day 7 ($p = 0.229$). [Figure-7]

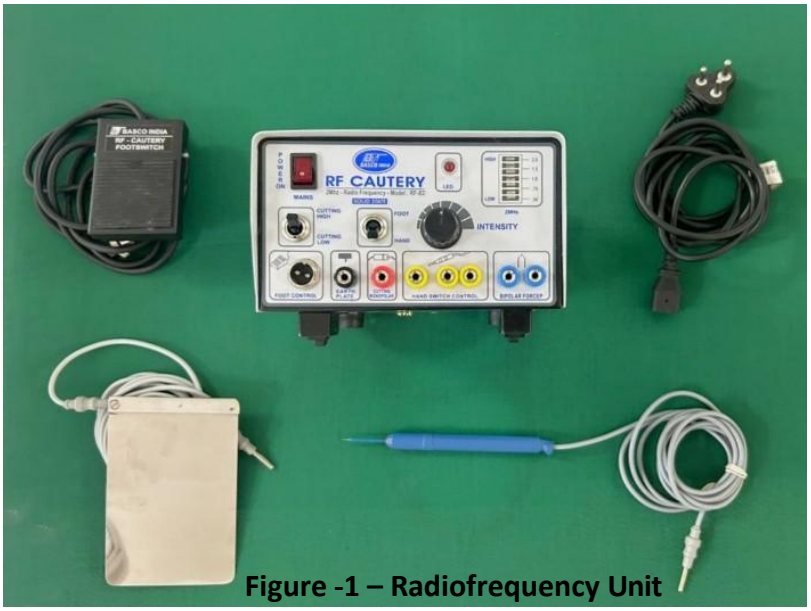

Figure -1 – Radiofrequency Unit

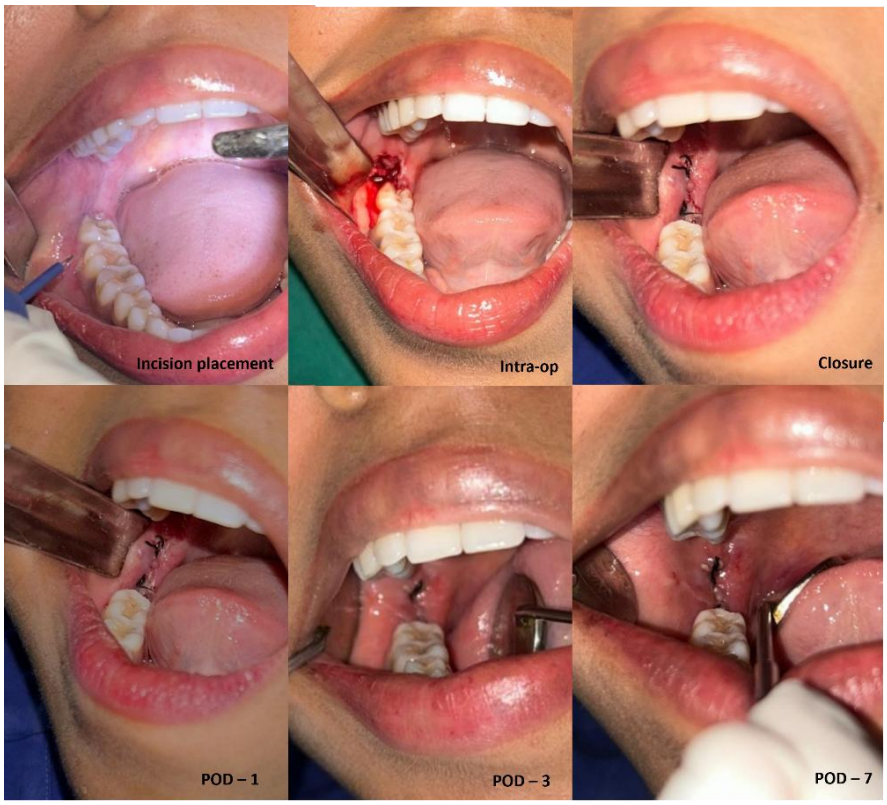

Figure -2 – Group R (Radiofrequency) – Intraoperative and postoperative follow-up

Figure -3 – Group D (Diathermy) – Intraoperative and postoperative follow-up

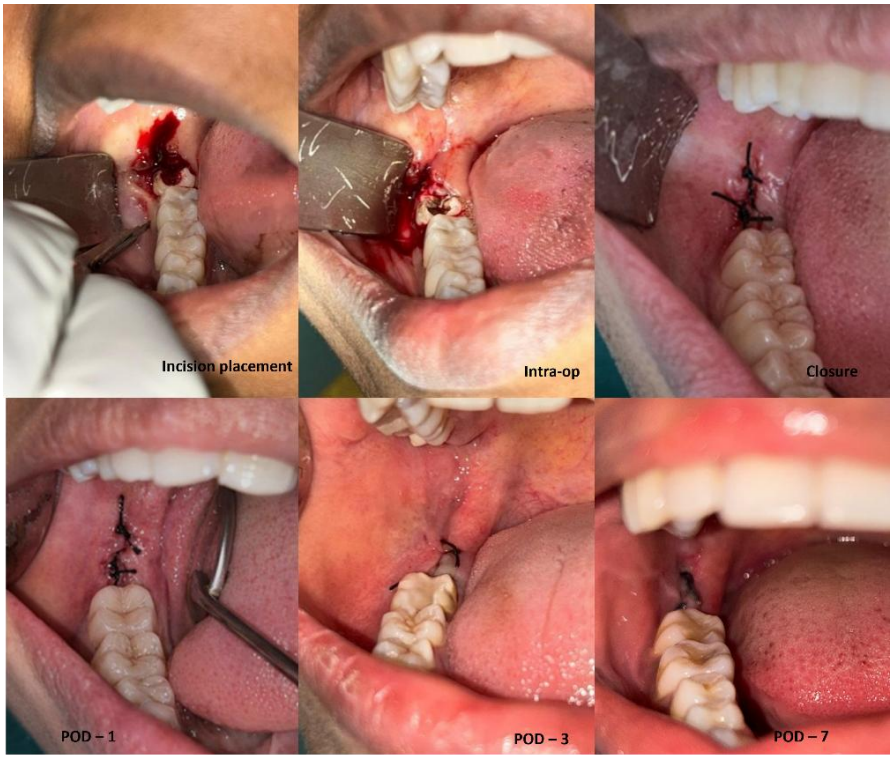

Figure -4 – Group B (BP Blade 15) – Intraoperative and postoperative follow-up

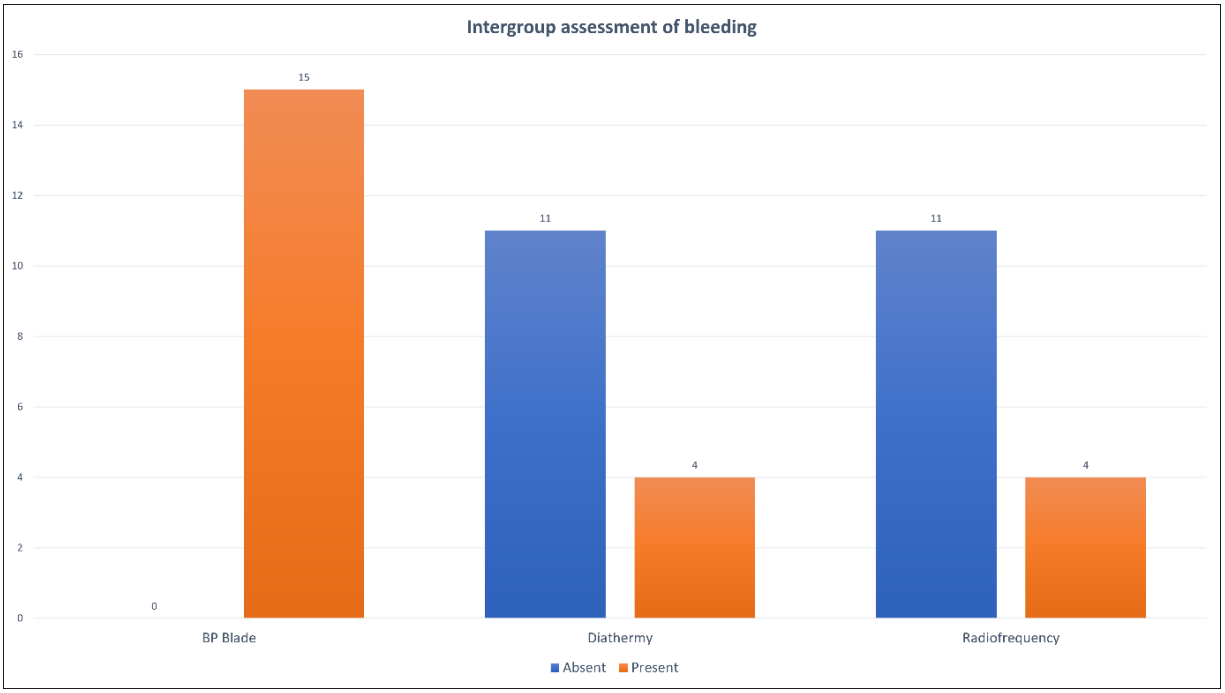

Figure -5 – Graphical representation of Intergroup assessment of bleeding

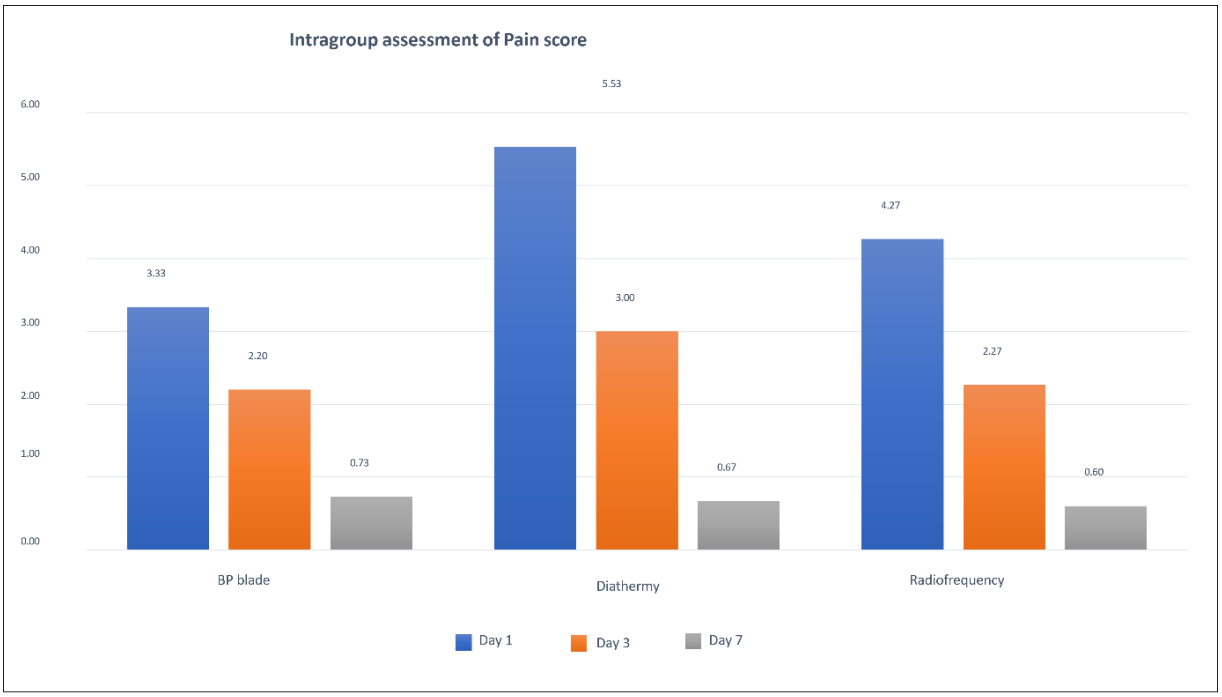

Figure -6 – Graphical representation of Intragroup assessment of pain score

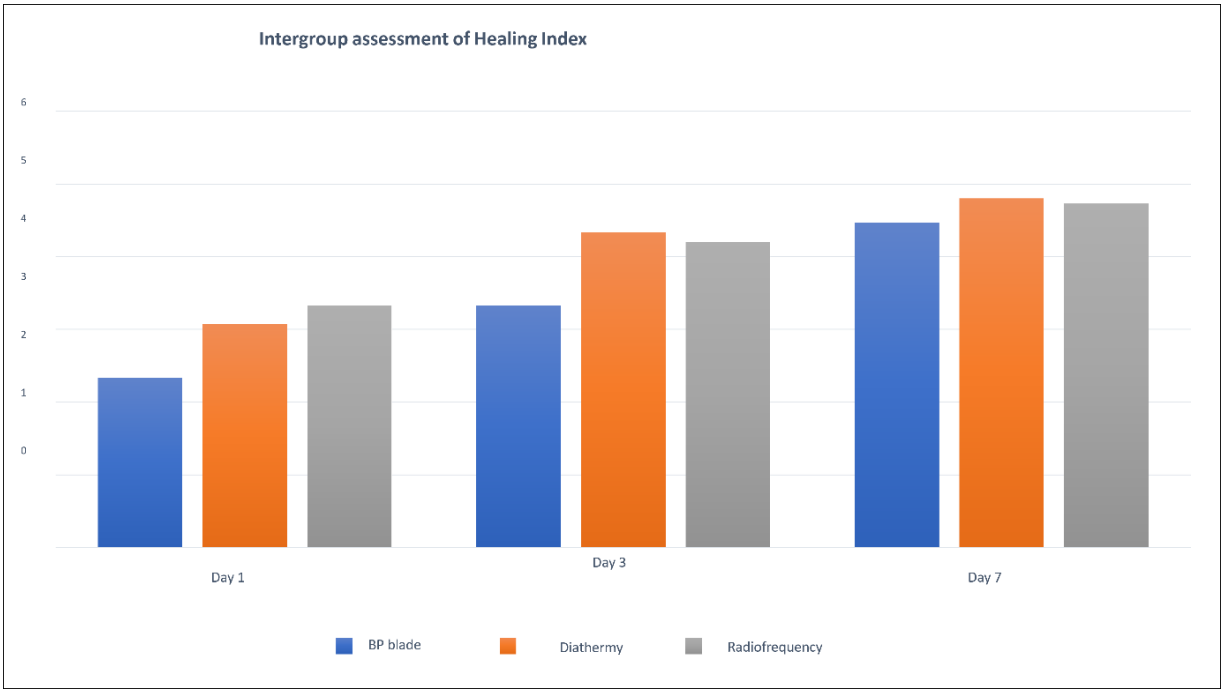

Figure -7 – Graphical representation of Intergroup assessment of Wound Healing

TABLES

		Mean	SD	95% CI for Mean		F	P value
				Lower	Upper		
Time (Secs)	BP blade	64.67	12.12	57.95	71.38	3.364	0.044
	Diathermy	72.47	6.48	68.88	76.05		
	Radiofrequency	76.07	16.29	67.05	85.09		

Table -1 – Intergroup assessment of tim

		Mean	SD	95% CI for Mean		F	P value
				Lower	Upper		
Burning Day 1	BP blade	0.13	0.35	-0.06	0.33	3.40	0.043
	Diathermy	0.67	0.82	0.21	1.12		
	Radiofrequency	0.73	0.80	0.29	1.18		
Burning Day 3	BP blade	0.07	0.26	-0.08	0.21	0.212	0.81
	Diathermy	0.13	0.35	-0.06	0.33		
	Radiofrequency	0.13	0.35	-0.06	0.33		
Burning Day 7	BP blade	0.00	0.00	0.00	0.00	*	*
	Diathermy	0.00	0.00	0.00	0.00		
	Radiofrequency	0.00	0.00	0.00	0.00		

Table -2 – Intergroup assessment of post-operative burning sensation

DISCUSSION

The success of surgical removal of impacted mandibular third molars is greatly influenced by surgical access, as the incision affects intraoperative visibility, hemostasis, and postoperative wound healing. Traditionally, scalpel incisions have been regarded as the gold standard for this procedure. However, advances in technology have introduced alternative modalities such as radiofrequency and diathermy, which aim to improve hemostasis, reduce intraoperative bleeding, and enhance comfort for both the patient and the surgeon.

The use of electrosurgical devices in oral surgery has evolved considerably. Early acceptance was limited by concerns regarding thermal damage, patient discomfort, and delayed wound healing. However, improvements in technology have enabled radiofrequency and diathermy units to deliver controlled energy with minimal lateral thermal spread, making them suitable for soft tissue incisions in the oral cavity. Radiofrequency operates at higher frequencies, allowing precise tissue cutting with simultaneous coagulation, whereas diathermy generates heat through tissue resistance, producing coagulation and effective hemostasis.

Radiofrequency cautery delivers high-frequency alternating current through an active electrode, while the electrical circuit is completed using grounding pads. Rather than heating the electrode itself, the alternating electromagnetic field causes ions and dipole molecules within the tissue to oscillate rapidly, generating heat around the electrode tip. At temperatures of approximately 50–100 °C, protein denaturation and cellular dehydration result in controlled coagulation and tissue destruction. Heat dissipates by conduction but decreases rapidly with distance, allowing localized cutting, coagulation, and hemostasis while minimizing collateral tissue injury.[4]

Diathermy converts the standard 50 Hz mains current into a high-frequency current ranging from 0.2 to 3 MHz. Electrical energy is converted into heat as it encounters tissue resistance, with minimal stimulation of nerves and muscles. The extent of tissue effect depends on current density, which increases as the area of current flow decreases. At the active electrode tip, tissue temperatures may reach approximately 1000 °C, while tissue 1 cm away remains close to physiological temperature. This localized heat generation enables effective cutting and coagulation while limiting thermal injury to adjacent tissues.[5]

Experimental and clinical studies suggest that radiofrequency causes less lateral thermal damage and

promotes better early wound healing than conventional monopolar electrocautery, although its hemostatic ability may be slightly inferior. Hasar ZB et al.[6], in a rat oral mucosa model, reported greater tissue coagulation with radiofrequency, whereas electrocautery achieved superior hemostasis.

In the present study, incision time was significantly shorter in the Bard Parker blade group than in the diathermy and radiofrequency groups. This may be attributed to the surgeon's familiarity with scalpel use and the absence of equipment preparation or calibration. Although radiofrequency and diathermy required slightly longer incision times because of careful device handling, the differences were small and are unlikely to be clinically significant. Previous studies have similarly reported that electrosurgical techniques may initially increase operative time but improve overall surgical efficiency by providing a clearer operative field. Goyal et al. reported significantly shorter incision and flap elevation times with electrocautery than with a scalpel, while Sharma and Sachdeva[7] also demonstrated reduced incision and flap elevation times with electrosurgery. These findings support the improved cutting efficiency and operative visibility associated with energy-based surgical modalities. Nagargoje et al., concluded that electrocautery was superior to the scalpel in terms of reduced incision time, decreased blood loss, and reduced postoperative pain. [8]

A significant reduction in intraoperative bleeding was observed with radiofrequency and diathermy compared with the BP blade. Scalpel incisions transect blood vessels, producing immediate bleeding, whereas radiofrequency and diathermy simultaneously coagulate small vessels during tissue incision, resulting in superior hemostasis. This improves surgical visibility, reduces the need for suction, and facilitates better intraoperative field control. Our findings are consistent with previous reports. Rathofer et al. [9] observed that electrosurgery significantly reduced hemorrhage compared with scalpel incisions, although complete hemostasis was not always achieved. Similarly, bleeding was markedly reduced but not entirely eliminated in the present study. Kalia et al. [1] demonstrated significantly less intraoperative bleeding with radiosurgery than with scalpel incisions, supporting the superior hemostatic performance of radiofrequency and diathermy observed in our study. Likewise, Babaji et al. [11] reported excessive bleeding and compromised surgical visibility with scalpel incisions compared with electrosurgery, which corresponds with the higher bleeding scores recorded in the BP blade group. Overall, the present findings reinforce the established hemostatic

advantages of electrosurgical incision techniques reported in the literature.

Postoperative pain assessment demonstrated significant differences among the three groups on Day 1. The diathermy group reported the highest pain scores, followed by the radiofrequency group, whereas the BP blade group experienced the least pain. The greater early postoperative pain associated with diathermy and radiofrequency is likely attributable to thermal tissue injury, resulting in an enhanced inflammatory response. The greater lateral heat dispersion produced by diathermy may explain its comparatively higher pain scores. However, pain decreased significantly in all groups by Days 3 and 7, with no sustained intergroup differences. These findings suggest that although electrosurgical modalities may increase early postoperative discomfort, they do not adversely affect long-term pain outcomes. Kalia et al. [1] reported no significant differences in postoperative pain between radiofrequency and scalpel incisions at different follow-up intervals. In contrast, our study demonstrated significantly higher pain scores on Day 1 in the diathermy and radiofrequency groups compared with the BP blade group, with no significant differences at later time points, indicating convergence of pain perception during healing. Similarly, Coelho et al. [12] reported increased postoperative pain following electrosurgical procedures in the posterior oral region, supporting our findings of a transient early pain response associated with energy-based modalities.

Evaluation of postoperative burning sensation further reflected the thermal effects of electrosurgery. On Day 1, patients treated with diathermy and radiofrequency reported significantly greater burning sensations than those in the BP blade group. This is likely due to localized heat generation and tissue irritation during incision. However, these differences diminished by Days 3 and 7, indicating that the burning sensation was temporary and self-limiting. Therefore, although radiofrequency and diathermy may produce greater short-term discomfort, they do not result in persistent postoperative morbidity. Pant et al., [10] and other authors have also documented unpleasant odours and heat-related discomfort during electrosurgery, which is consistent with the increased burning sensation observed in the present study.

Wound healing was assessed using Landry's Healing Index. Both the diathermy and radiofrequency groups demonstrated significantly better healing scores during the early postoperative period (Days 1 and 3) than the BP blade group. Improved hemostasis and reduced postoperative bleeding achieved with electrosurgical

modalities may have contributed to these favorable early healing conditions. By Day 7, however, healing scores were comparable among all three groups. Kalia et al. [1] similarly found no significant difference in wound healing between radiosurgical and scalpel incisions during follow-up. In our study, although the energy-based groups exhibited superior early healing, the final healing outcomes were comparable, suggesting that electrosurgical modalities primarily influence the initial stages of wound repair.

Kaminer et al. [13] emphasized that electrosurgery has certain limitations that should be considered. Maness et al. [14] demonstrated a band of coagulation necrosis at the wound margin, attributed to heat generated by the electromagnetic field of the electrosurgical instrument. Likewise, Deepa et al. [15] reported delayed epithelial migration and the formation of a denatured connective tissue zone following electrosurgery, likely resulting from lateral heat generated by the active electrode.

Intragroup analysis revealed significant improvement in pain, burning sensation, and wound healing over time in all three groups. Although radiofrequency and diathermy produce thermal effects on tissues, these did not adversely influence the overall surgical outcome. By Day 7, comparable wound healing across all groups indicated that electrosurgical incisions do not compromise long-term soft tissue healing.

Among the energy-based modalities, radiofrequency appeared to offer a balanced clinical advantage over diathermy. While both provided excellent hemostasis and improved intraoperative field control, radiofrequency was associated with less postoperative pain and burning sensation than diathermy, possibly because of its higher operating frequency and reduced lateral thermal spread. Conversely, the BP blade enabled faster incision placement and produced less early postoperative discomfort but was associated with significantly greater intraoperative bleeding, which may compromise surgical visibility and operative efficiency.

The limitations of this study include the relatively small sample size, subjective assessment of clinical parameters, and a follow-up period restricted to the first postoperative week. Long-term evaluation of soft tissue healing and scar formation may provide additional insight into the comparative benefits of these incision modalities. Future studies involving larger sample sizes and longer follow-up periods are recommended to validate these findings.

The present study demonstrates that BP blade, radiofrequency, and diathermy are all effective methods

for gaining surgical access during the removal of impacted mandibular third molars. The BP blade offers faster incision placement with minimal early discomfort, whereas radiofrequency and diathermy provide superior hemostasis and improved early wound healing. Among the energy-based modalities, radiofrequency offers greater patient comfort while maintaining effective bleeding control. Therefore, the choice of incision modality should be based on surgical expertise, clinical requirements, and available resources to optimize operative efficiency and patient outcomes.

CONCLUSION

The BP blade, radiofrequency, and diathermy have all proven reliable for surgical access during impacted mandibular third molar removal. The BP blade was quicker to use and resulted in less early discomfort, although bleeding was more pronounced. Radiofrequency and diathermy achieved better bleeding control and clearer surgical fields, even though patients reported more early pain and burning sensations, particularly with diathermy. By one week postoperative, healing was similar across all groups. Overall, radiofrequency demonstrated a good balance between patient comfort and hemostasis in the surgical removal of impacted third molars.

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