BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 3

DOI: 10.58240/1829006X-2025.3-82

ORIGINAL ARTICLE

A STUDY ON HEMOSTASIS AND HEALING: COLORADO MICRODISSECTION NEEDLE VS SCALPEL FOR INTRAORAL INCISIONS

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Received: *Feb. 6, 2025;* ***Accepted:*** *Feb. 26, 2025;* ***Published:*** *Mar. 8, 2025*

ABSTRACT

Background: Various armamentarium used for intraoral incisions in maxillofacial surgery ranges from simple scalpel to lasers, electrosurgical tip. Few of them have disadvantages such as being non hemostatic, requiring training or which are costly and are sophisticated. The quest for a better tool for intraoral incisions has lead to the use of Colorado microdissection needle which achieves hemostasis, requires less equipment and easy to handle. **Aim:** To evaluate the effectiveness of the Colorado microdissection needle over the scalpel during intraoral incisions for impacted mandibular third molar surgery.

Methods and Materials: A total of 30 patients were randomly categorized into the Group A using Scalpel and Group B using Colorado microdissection needle for Terrance ward's Incisions. The parameters assessed were Incision time, Quantity of blood loss, Wound healing on 7th and 14th postoperative day. Statistical analysis used were a parametric independent - T test and a non-parametric test (Mann-Whitney U test). **Results:**The results showed that, apart from wound healing there was no statistically significance difference in incision time and blood loss between the groups.

Conclusion: The Colorado microdissection needle can be used as an alternative for incisions, as it appears to cause less tissue damage while providing tissue healing comparable to that of a scalpel.

Keywords: Colorado tip, third molar surgery, Wards incision, scalpel

Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

doi: 10.58240/1829006X-2025.3-82

INTRODUCTION

Third molars are the most commonly impacted teeth in the oral cavity, with 33% of the population having one tooth impacted. Surgical removal of third molars is the most commonly performed procedures in the Oral and Maxillofacial practice, to prevent and treat a variety of pathogenesis associated with impacted teeth[1]

Incision which is an integral part of third molar surgeries is often accomplished with stainless steel scalpels over the decades because of its accuracy, ease of handling, and minimal damage to the tissues, but with the incisions marked by scalpel, excessive blood flows to the operative field leading to poor visibility.

To overcome the disadvantages, Electrocautery was introduced in the early 20th century into the clinical practice, with the emergence of modern surgical diathermy units, this technique is becoming popular due to its hemostasis, faster incision, and decreased overall operative blood loss[2,3].

Though this hemostatic ability represents a major advantage, these electrocautery units are associated with certain drawbacks because of its larger tip size, thus lead to the emergence of a microdissection needle with fine electrode tips[4,5]

The Colorado microdissection needle(CMN) is one such (Stryker-Leibinger, Freiburg-im-Breisgau, Germany) (figure1) which has been introduced into the clinical practice in 1997, with the primary feature of an ultra-sharp tungsten tip that concentrates the waveform to a very small spot and allows for the use of extremely low wattage, resulting in precise cutting, cauterization, and less tissue damage and postoperative pain[5].

Because of these properties, the microdissection needle has a wide range of applications in the fields of neurosurgery, ophthalmology, and others[4,8,12]. There are limited literature available regarding the use of colorado microdissection needle for intraoral incisions. Thus, the purpose of the study is to evaluate the effectiveness of colorado microdissection needle during intraoral incisions for the mandibular third molar surgery.

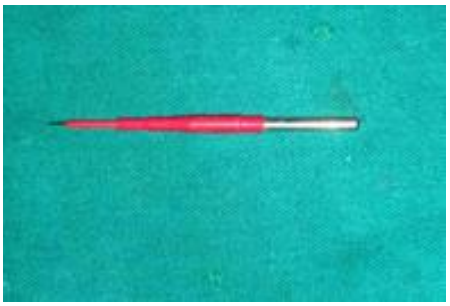

Figure 1. Colorado microdissection needle(type N 103 A)

MATERIALS AND METHODS

This prospective randomized comparative study was done in 30 patients who reported to the Department between May 2021 and June 2022 with slightly or moderately difficult impacted lower third molar according to modified pederson's index, were taken into the study. After fulfilling the inclusion criteria, the selected patients underwent surgical removal of impacted mandibular 3rd molar.The nature and design of the clinical study were explained to all the patients and informed consent was taken from them for the study. The clearance from the ethical committee was taken for this study.

Inclusion criteria:

- Healthy patients ASA I
- Age between 18-45 years
- Patients who are indicated for surgical extraction of impacted third molar teeth
- Patients who have signed the informed consent and who are willing to participate in the study

Exclusion criteria:

- Medically compromised patients
- Patient on anticoagulant and anti-platelet therapy
- Patient with bleeding disorders
- Patient on Corticosteroid therapy
- Patient with local inflammation and infections

Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

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STUDY GROUPS

Patients who visited the Department of Oral and Maxillofacial Surgery for surgical extraction of impacted mandibular third molar were randomly categorized into Group A and Group B, randomization is carried out by taking every alternate patient with the inclusion criteria into Group A and Group B. In Group A Terrance wards Incision was given using Scalpel (NO 15) and in Group B using Colorado Microdissection Needle.

EVALUATION OF STUDY OUTCOMES

SURGICAL PROCEDURE

Following the standard precautions of scrubbing and draping the patient under aseptic conditions, classical IAN, lingual, and long buccal nerve blocks were given with 2% lignocaine containing 1:80,000 epinephrine. Local infiltration was avoided in both groups. Before the start of the procedure weight of dry gauze was measured using a digital weighing device(Gravimetric method). After achieving sufficient anesthesia, in Group **A** Terrance wards incision was given with the surgical scalpel (no 15 BP blade).In Group **B** Terrance wards incision was given using a 3 cm long straight CMN (Type N103A) (figure 2) attached to an electrocautery unit (BASCO INDIA - 250 surgical diathermy) which was used at a power setting of 3 in cutting and coagulation mode and no suction for evacuation of blood was done while giving the incision. A full thickness mucoperiosteal flap was elevated using no 9 molts periosteal elevator and the weighed dry gauze were used till the entire mucoperiosteal flap was raised. The circumferential buccal bone guttering was done with no. 702 and 703 straight fissure carbide bur using motor-driven handpiece under copious saline irrigation. Extraction of the tooth was performed either by simple elevation or odontectomy according to the impacted tooth. The socket was debrided with the povidine iodine solution, the wound was approximated and sutured using a 3-0 silk suture. The blood-soaked gauze swabs were weighed, and differences between the soaked gauze and dry gauze were recorded to calculate the amount of blood loss. Post-extraction instructions and medications were given to both groups. Parameters such as Incision time and quantity of blood loss were measured intra-operatively. Wound healing was assessed using Modified Landry's scale on 7th and 14th postoperative days.

Figure 2. Terrance wards Incision with Colorado Microdissection Needle

Parameters

The Incision time was calculated in minutes/seconds using stop watch. The Time taken for incision is calculated from the start of incision to the complete elevation of the mucoperiosteal flap.

Quantity of blood loss was measured by Gravimetric method[10] (figure 3), which is based on the use of gauze swabs employed for collecting blood and weighing them after use. A standard prepacked sterile gauze of size 7.5cm X 7.5cm was taken and the weight was measured using the digital weighing device (ATOM Electronic compact scale SF-400D). Immediately after their use, the weight of used gauze pieces was measured so that evaporation doesn't become a critical factor. The difference between the two measurements was considered the total amount of blood loss. One gram of blood was regarded as the equivalent of 1ml of blood loss.

Blood loss = (total weight of wet gauze)- (total weight of dry gauze) in grams 1 gm = 1 ml of blood loss.

Figure 3. Postoperative weight of Gauze

Wound healing was assessed by Modified Landry's scale[11] on 7th and 14th postoperative days (Figure 4).

Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

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Figure 4. Wound healing on 14th postoperative day

Statistical analysis

The data were analyzed in SPSS-V28. Descriptive statistics were represented with percentages and mean with standard deviation. A parametric test independent - T test is used for the statistical analysis of incision time. A non-parametric test (Mann-Whitney U test) is used for the analysis of quantity of blood loss and wound healing.The results were averaged (mean + standard deviation) for parameters of each group. Results were considered significant if the p values were less than 0.05.

RESULTS

A total of 30 patients were taken into the study, who were randomly divided into two equal groups. Mean value of incision time in Group A is 158 sec and in Group B is 139.33 sec. There is no statistically significant difference in mean Incision time between Group A and Group B (P=0.459). The results states that, there is no difference in time taken for incision with the colorado microdissection needle to that of scalpel for giving an intraoral Terrance wards incision(table 1).

Table 1. Comparison of mean Incision time between Group A and Group B

	Groups	N	Mean	SD	t	P Value
INCISON TIME	Group A	15	158.00	73.11	0.751	0.459
	Group B	15	139.33	62.60		

Mean amount of blood loss is 1.47ml in Group A and 1.22 ml in Group B. The results shows that there is no statistically significant difference in mean rank of quantity of blood loss (P=0.443) between the Group A and Group B. From the above result it can be inferred that the amount of blood loss is almost equal when Colorado microdissection needle or scalpel is used for Terrance wards incision(table 2)

Table 2. Comparison of mean rank of quantity of blood loss between Group-A and Group-B

	Groups	Normal	Mean	SD	Median	Mean rank	P Value
QUANTITY OF BLOOD LOSS	Group-A	15	1.47	1.26	0.83	16.73	0.443
	Group-B	15	1.22	0.95	0.75	14.27	

The mean rank of wound healing on 7th day in Group A is 3.8 and in Group B is 3.73 and the mean rank on 14th day in Group A is 4.07 and in Group B is 4.2. The result shows that there is no statistically significant difference in wound healing on 7th day (P=0.671) and 14th day (P=0.355) between both the Groups. From the result it can be inferred that no difference is seen in wound healing when Colorado microdissection or scalpel is used for intraoral Terrance wards incision (table3).

Table 3. Comparison of mean rank of wound healing on 7th and 14th days between Group-A and Group-B

		N	Mean	SD	Median	Mean rank	P Value
WOUND HEALING ON 7TH DAY SCORE	Group -A	15	3.8	0.41	4	16	0.671
	Group -B	15	3.73	0.46	4	15	
WOUND HEALING ON 14TH DAY SCORE	Group -A	15	4.07	0.26	4	14.47	0.355
	Group -B	15	4.2	0.56	4	16.53	

Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88
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Table 4 shows that there is a statistically significant improvement (P=0.008) in wound healing is seen from 7th day to 14th day in Group B. From the above results, it can be inferred that wound healing in Colorado microdissection needle was better on 14th day in comparison to scalpel for intraoral Terrance wards incision.

Table 4. Pairwise comparison of rank of wound healing between 7thand14thday among GroupA and Group B

	Wound healing	Ranks	N	Mean Rank	Z	P Value
Group A	14th day- 7th day	Negative Ranks	0	0	-2	**0.046***
		Positive Ranks	4	2.5		
Group B	14th day- 7th day	Negative Ranks	0	0	-2.64	**0.008***
		Positive Ranks	7	4		

*statistical significance

DISCUSSION

Surgical removal of third molar is commonly performed procedure in Oral and Maxillofacial Surgical practice, of which incision and flap reflection are integral part for the success of the procedure. Electrosurgery refers to passage of high frequency alternating current through the tissue to obtain a predetermined surgical effect, with currents up to 500 mA can be passed safely through the patient[3]. The hemostatic ability represents a major advantage of the standard electrode tip, there are certain drawbacks includes delay in healing process and thermal injury.Studies have shown that heat produced by electrocautery unit is influenced by certain factors such as current intensity, contact duration between the tissue and electrode, and the size of electrode tip[8,14,15]. When standard electrode tip is used, there is increased use of operating power density, more latent heat production there by more damage to the tissues. Apart from these, there is decrease in wound tensile strength, increased inflammation and tissue adhesion. Thus, the concept of electrocautery instruments with fine tipped electrodes emerged. The presence of ultra sharp tungsten tip, allows precision cutting, cauterization, use of low wattage, resulting in less tissue damage. This tip ensures a constant, high intensity heat concentration which allows for clean microdissection without affecting adjacent areas[8,9,15].

In the present study the time taken for incision is less with colorado microdissection needle in comparison to scalpel, but the difference was not statistically significant.A study reported by Peneva Margarita et al[17],stated that the speed of incision was slightly more in electrosurgical microneedle but was not statistical significant. Another study reported by Milan Modi et al[12] stated that the incision time was significantly less with CMN[4]. According to the study reported by Sheik B[14] for the use of CMN in neurosurgery, the speed of incision was significantly less when using colorado microdissection needle

Bleeding during incision and surgery significantly influence accessibility of the surgical field and also the outcome of the procedure[19]. Rampalli Viswa Chandra et al[16], compared the incisions made by scalpel, electrocautery tip and colorado microdissection needle for periodontal surgeries, stated no statistical significance in quantity of blood loss among the groups. A study reported by Ali S.Al-Qabtani[18], stated that intra-operative blood loss was significantly less with the microdissection needle when compared with cold scalpel during tonsillectomy procedures. Another study done by Praveen sathish kumar et al[13], stated that the intra-operative blood loss was significantly less during incision with colorado microdissection needle compared to scalpel for neck dissections. Sheikh.B[14] reported that the approximately 4 times more blood loss is seen when scalpel is used for skin incisions in

Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

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neurosurgery.According to the study reported by Milan Modi[9]et al stated that the blood loss was significantly less in colorado microdissection needle compared to scalpel. Peneva Margarita et al[17], reported that the blood loss was significantly less in electrosurgical microneedle. In this study the results showed the blood loss is less with colorado microdissection needle clinically, but not statistically significant.

Wound healing is a normal biological process consisting of four phases: haemostasis, inflammation, proliferation and remodeling[20,21]. The results obtained, indicates that no statistical significant difference is seen in wound healing on 7th and 14th day between scalpel and colorado microdissection needle. An study reported by P. E. M. Butler et al[23] stated that the incisions marked by modified electrode heal better than the standard electrosurgical electrode, as they have a histological response close to that of steel scalpel wounds. Study reported by B.Sheik[14] for skin incisions during neurosurgery where the wound was inspected on 1,3,14 days post-operative for colour, presence of charcoaling effect,viability and dermal peeling. Stated that, no difference was seen between the skin edges of incised by the steel scalpel and micro-needle electrocautery. Study shows not much difference in wound healing on 7th and 14th postoperative days, but ironically improved healing observed on 14th day compared to 7th day in colorado microdissection needle, this can be likely due to the fineness of tip, decreased surface area and less tissue distortion.

CONCLUSION

Colorado microdissection needle and scalpel are effective for incisions in mandibular third molar surgeries , from our observations the Colorado microdissection needle offers superior incision precision and improved hemorrhage control.

DECLARATIONS

Acknowledgments

None

Funding

None

Competing and conflicting Interests

The authors declare no conflicts of interest.

Ethical approval

Ethical clearance for the present study was given by the institutional review board and the ethical committee of GITAM Dental College and Hospital.

Consent to participants

A written informed consent was obtained from the individual

Data availability

The data is available upon the considerable request to the corresponding author

Informed consent

The interns who consented to take part were enrolled after being informed of the study objectives through a participant information form.

Abbreviation

CMN- Colorado Microdissection Needle

IAN-Inferior Alveolar Nerve

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Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

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Radha Sindhuja, Kho Chai Chiang, N.V.V.Satya Bhushan, Utharavalli. Siva Kalyan, John Rejinald Sikha, CH. Pooja Sree. A Study on Hemostasis and Healing: Colorado Microdissection Needle vs Scalpel for Intraoral Incisions.Bulletin of Stomatology and Maxillofacial Surgery. 2025;21(3).82-88

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