

Colorado Micro-Dissection Needle v/s Microsurgical 15c Blade For Accuracy Of Mucoperiosteal Incision In Bilateral Mandibular Impacted Third Molar Surgery: A Prospective Split-Mouth Study

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ABSTRACT

Background:

Surgical removal of impacted mandibular third molars is foremost and preliminary step of surgical procedure in oral and maxillofacial region. Mucosal incisions are made using different kind of stainless-steel scalpel; however, in today's era an electrosurgical device, the Colorado Micro-Dissection Needle have been introduced to place mucosal incision for improve of haemostasis and surgical field visibility. This split mouth study aimed to compare the effectiveness of a 15C Scalpel Blade vs Colorado micro-dissection needle in terms of incision accuracy and surgical outcomes during removal of bilateral impacted mandibular third molars in same sitting.

Materials and Methods:

A split-mouth comparative study was conducted on 20 patients requiring bilateral mandibular third molar extraction. In Group A incisions were made with a 15C scalpel blade and in Group B with Colorado micro-dissection needle. Parameters evaluated included incision duration, measurement of bleeding while placing incision, odour, clarity of surgical field and margin smoothness. Postoperative parameter assessed were pain, mouth opening, wound healing and mucosal scarring.

Results:

The Colorado micro-dissection needle showed significantly shorter incision time, less 1bleeding, and improved surgical field clarity as compared with the scalpel. However, postoperative pain was lower in the scalpel group. Margins of incision were smooth with 15 C blade. Mouth opening was better in the Colorado group on postoperative days 3 and 7. Mucosal scarring including height, colour match, and overall appearance, were generally excellent with the 15C blade.

Conclusion:

The Colorado micro-dissection needle provides better haemostasis and surgical visibility, whereas the 15C scalpel offers improved postoperative comfort and scar outcomes. The choice of technique should depend on surgeon preference and clinical priorities.

KEYWORDS- Colorado tip, Micro-surgical 15C blade, Third molar surgery, Ward's incision,

How to cite this article: Monika Gupta¹ Dr. Abhishek Rai² Dr. Utkarsh Barge³. Colorado Micro-Dissection Needle v/s Microsurgical 15c Blade For Accuracy Of Mucoperiosteal Incision In Bilateral Mandibular Impacted Third Molar Surgery: A Prospective Split-Mouth Study. Int J Drug Deliv Technol. 2026;16(82s):1410-1416. DOI: 10.25258/ijddt.16.82s.161

INTRODUCTION

Surgical removal of impacted mandibular third molars is among the most commonly performed procedures in oral and maxillofacial surgery.^[1] The primary objective of third molar surgery is the successful removal of the impacted tooth

while minimizing perioperative complications and postoperative morbidity.^[4,14] Among the postoperative sequelae, pain, swelling, and trismus significantly affect patient comfort and quality of life following surgery.^[5,14]

Various incision designs and techniques have been described for mandibular third molar surgery. Ward's incision is one of the most frequently used approaches and is typically extended from the mesial aspect of the first molar toward the ramus with lateral divergence to reduce the risk of lingual nerve injury.^[18] Conventionally, mucosal incisions are performed using stainless steel scalpel blades due to tactile control. The microsurgical 15C blade, with its elongated cutting edge and fine tip, provides enhanced precision and is particularly useful in delicate intraoral surgical procedures for example the facial artery can exist in the depths of the releasing incision and when 1 to 2 mm accuracy is desired.^[10,9]

However, conventional scalpel incisions may be associated with increased intraoperative bleeding, which can compromise surgical field visibility.^[6] Electrosurgical devices such as the Colorado Micro-Dissection Needle have been introduced as alternatives, offering improved haemostasis and potentially better operative field clarity.

Therefore, the purpose of this study was to compare the incision characteristics and clinical outcomes of a 15C scalpel blade and a Colorado micro-dissection and also to guide oral and maxillofacial surgeons in selecting more effective devices for making an incisions during surgical extraction of bilateral impacted mandibular third molars.

MATERIAL AND METHODS:

A randomized split-mouth comparative study was conducted on 20 patients requiring surgical extraction of bilateral impacted mandibular third molars resulting in a total of 40 surgical sites with ethical approval from the Institutional Ethics Committee (IEC Project No. 2960), and written informed consent was obtained before study. Out of 40 sites, 20 sites in **Group A** received mucosal incisions with a 15C Scalpel Blade, whereas in 20 sites **Group B** received incisions using a Colorado Micro-Dissection Needle Inclusion criteria was adults aged ≥ 18 years with bilateral partially or fully impacted mandibular third molars. Exclusion criteria was patients with systemic diseases (ASA III–VI), bleeding disorders, pregnancy, history of head and neck radiotherapy, allergy to local anesthetics, on anticoagulant therapy, antiplatelet, antihypertensive, or immunosuppressive therapy.

All procedures were performed under local anesthesia using 2% lignocaine with 1:200,000 adrenaline under standard aseptic conditions. A Ward's incision was placed in 20 sites with stainless 15 C blade and 20 sites with Colorado Micro-Dissection Needle according to the assigned site. Incision time was recorded from the beginning of incision until exposure of the surgical site. Intraoperative blood loss during incision was estimated by difference in weight of pre incision gauze pieces and after the incision same gauge pieces soaked with blood (1 g $\approx$ 1 mL blood loss). Mucoperiosteal flaps were elevated, and bone removal was performed using rotary instruments under copious saline irrigation. Tooth sectioning was performed if required, and the tooth was delivered using elevators or forceps. The surgical socket was irrigated with saline, and primary closure was achieved using 3-0 silk sutures

Intraoperative parameters observed were incision time, blood loss, surgical field clarity, presence of odour, incision margin characteristics and operator comfort.

Postoperative parameter assessed were on postoperative days 3, 7, and 14 were pain using visual analogue scale, Trismus index (maximum inter-incisal distance), wound healing using the Modified Landry Healing Index, and mucosal scarring.

Statistical analysis: Data were recorded in a standardized proforma and analyzed using appropriate statistical tests. A p-value < 0.05 was considered statistically significant.

RESULTS:

Majority of participants were males (65%) and females constituted 35%, showing male predominance in the study sample with a Mean age was 25.55 ± 4.71 years, ranging from 18 to 36 years.

The mean duration of incision was significantly shorter with the Colorado needle compared with the 15C blade (14.73 ± 6.05 seconds vs 22.96 ± 9.75 seconds; with $p = 0.003$ [Table 3 and Graph 3])

Mean intraoperative bleeding during incision was significantly less in the Colorado needle group (0.62 ± 0.31 mL) as compared to 15C blade group (1.53 ± 0.55 mL; with $p < 0.001$) [Table 4 and Graph 4]

Surgical field clarity was significantly better in the Colorado needle group with $p < 0.001$. [Table 9 and Graph 9]

Operator comfort reported was good in 80% of 15C blade sites as compared with 20% of Colorado needle sites with $p < 0.001$.

Intraoperative odour was present in all Colorado needle sites and absent in all 15C blade sites with $p < 0.001$. [Table 8 and Graph 8]

Precise incision margins were observed with the 15C blade (85%) as compared to Colorado needle (65%); however, this difference was not statistically significant with $p = 0.144$. [Table 10 and Graph 10]

Postoperative pain scores were significantly lower in the 15C blade group compared with the Colorado needle group on postoperative day 3 (mean 3.50 ± 1.73 vs 5.45 ± 1.70 ; $p = 0.001$), day 7 (1.95 ± 1.19 vs 3.65 ± 1.35 ; $p < 0.001$), and day 14 (0.20 ± 0.41 vs 1.15 ± 0.88 ; $p < 0.001$).

Preoperative maximum mouth opening was similar between groups ($p = 0.965$). However, postoperative mouth opening was significantly greater in the Colorado needle group on day 3 (28.90 ± 6.31 mm vs 24.65 ± 6.17 mm; $p = 0.038$) and day 7 (34.05 ± 5.64 mm vs 30.15 ± 6.17 mm; $p = 0.044$). [Table 1 and Graph 1]

Primary wound healing assessed using the modified Landry healing index showed comparable distributions of healing categories between groups on days 3, 7, and 14, with no statistically significant differences ($p > 0.05$). [Table 2 and Graph 2]. However, scar height demonstrated significant differences on day 7 ($p < 0.001$) and day 14 ($p = 0.014$), with a greater proportion of scars flush with surrounding mucosa observed in the 15C blade group. [Table 5 and Graph 5] Similarly, scar color showed significantly better color match in the 15C blade group on days 3, 7, and 14 ($p < 0.05$) [as shown in Table 6 and Graph 6].

Table 7 and Graph 7 shows a significantly higher proportion of sites with good overall appearance was in the 15C blade group on postoperative day 3 and day 7 ($p < 0.001$).

DISCUSSION:

Surgical removal of impacted mandibular third molars remains one of the most frequently

performed procedures in oral and maxillofacial surgery.^[1] Consequently, optimizing surgical techniques and instruments used during third molar surgery is important to minimize operative complications and improve clinical outcomes.

The third molar area is surrounded by loose connective tissue that is rich in lymphatics and blood vessels, thus making it prone to inflammatory complications such as pain, swelling, trismus —commonly seen in the immediate postoperative period. These complications can negatively impact a patient's quality of life and present significant challenges for surgeons.⁽³⁾

An essential step in third molar surgery is the placement of a mucoperiosteal incision that allows adequate access to the surgical site while minimizing trauma to surrounding tissues and vital structures.^[11, 16] However, scalpel incisions are often associated with pressure, increased intraoperative bleeding, which may obscure the operative field and potentially prolong surgical time.^[7,8]

Advancements in surgical technology have introduced electrosurgical instruments such as the Colorado micro-dissection needle, which combines cutting and coagulation through radiofrequency energy. The extremely fine tip of the Colorado needle concentrates electrical energy, allowing precise dissection with simultaneous hemostasis. This property may improve surgical field visibility and reduce operative bleeding^[2]. Nevertheless, concerns remain regarding possible thermal injury to surrounding tissues, which may influence postoperative pain, tissue healing, and scar formation.

Evaluation of trismus revealed significantly greater mouth opening in the Colorado needle group on postoperative days 3 and 7; however, this difference was not significant by day 14. Although the mechanism underlying this finding remains unclear, it may be related to differences in intraoperative tissue handling or duration of mouth opening during the procedure leading to muscle fatigue and further undergoing muscle spasm. Further investigations are required to better understand this observation.

In terms of wound healing, both techniques demonstrated comparable results according to the Modified Landry's Wound Healing Index, with no statistically significant differences observed during the follow-up period. **Naresh et al**^[15] in 2012 have also reported similar healing

outcomes between scalpel and electrosurgical incisions with electrosurgical group showing more transient tissue inflammation due to thermal injury having equally good healing with no statistically significant difference at 4th week post-surgery (p-value 1.000).

In the present study, the Colorado micro-dissection needle demonstrated a significantly shorter incision time and substantially reduced bleeding compared with the scalpel blade. Similar findings can be explained by **Pooja Bijarniya et al^[19]** in 2024 and **Kalia V. et al^[16]** in 2018, the electrosurgical device's ability to simultaneously cut tissue and coagulate small blood vessels, thereby improving hemostasis and enhancing visualization of the surgical field. Improved surgical field clarity may facilitate operative efficiency, particularly in procedures where bleeding can obscure anatomical landmarks.

However, in our study the use of the Colorado needle was associated with several disadvantages as all sites where incisions were given with the electrosurgical device exhibited an unpleasant odor and taste caused by vaporization of tissue during cutting and coagulation, which can be further minimized by suctioning the smoke and debris using high volume suction^{13,20}. **Kalia V. et al^[16]** in 2018 reported the similar findings.

In our research, the surgeons were asked how much easy the procedure was, and found a significantly higher proportion of good operator comfort with the 15C blade as compared to the Colorado needle. This result may be due to inadequate knowledge of surgeons about the correct technique of electrosurgical devices and accumulation of eschar on the Colorado tip as compared to scalpel, thus compromising the cutting efficacy and operator comfort, potentially influencing the overall surgical experience¹³. Also, We believe this is due to surgeons being more accustomed to using scalpels as it is a more conventional technique. **Chatchai pruksapong et al⁶** in 2023 and **Fatahi Vanani N. et al¹⁷** in 2020 reported similar findings.

Scar evaluation revealed superior cosmetic outcomes in the scalpel group with respect to scar height, color match, and overall appearance during early postoperative assessment. These findings may be related to the absence of thermal injury in scalpel incisions, which results in minimal lateral tissue damage and more predictable healing in comparison to Colorado needle incisions where formation of hypertrophic scar occurs possibly due to damage

from heat around tissue. To the best of our understanding, there is currently no appropriate index present for evaluating mucosal scarring following oral surgery. While there are indices available, that are primarily restricted to evaluate skin scars.

In this prospective split-mouth study, Type of margin was analysed and found to be more Precise with the 15C blade as compared to Colorado needle group. There are currently no similar studies in the literature. Interestingly, other studies like **chandra et al²** in 2017, **ravishankar et al¹²** in 2011 microscopically noted 0.12-0.31mm broad area of coagulative necrosis along the edge of incised wound due to lateral heat injury from the Colorado affecting the margin precision meanwhile neat and tidy with scalpel

Overall, the findings of the present study suggest that both incision techniques are clinically effective for third molar surgery but offer distinct advantages. The Colorado micro-dissection needle provides superior hemostasis, faster incision placement, and improved surgical visibility. In contrast, the microsurgical 15C scalpel blade is associated with reduced postoperative pain, improved scar characteristics, and greater operator comfort.

LIMITATIONS:

Several limitations should be acknowledged. The relatively small sample size and short follow-up period may limit the generalizability of the findings. Additionally, subjective parameters such as operator comfort and surgical field clarity may introduce observational bias. Future studies with larger sample sizes, longer follow-up periods, and objective measurement techniques are recommended to further evaluate the clinical benefits and limitations of electrosurgical incision methods in oral surgery.

CONCLUSION:

The results of our present study concluded that Colorado microdissection needle technique had certain advantages over 15C scalpel, like reduced time for placing an incision, minimal trismus after extraction, controlled bleeding with clear surgical field and reduced overall operative time. However, post-operative pain was observed more in case of Colorado group than in the 15C scalpel group.

Because Colorado is technique-sensitive, the operator was not used to it at first, but with time they became used to it and felt comfortable with it. With advances in instrumentation, the

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microneedle has demonstrated tremendous growth potential for accurate dissection due to its super sharp tungsten tip that concentrates the electro-surgery generator's energy into a tiny spot. Hence, it does not drag or deform tissue. Also low wattage, which leads to less tissue damage, less cauterization, more precise cuts and thereby promoting faster recovery. Despite of its advantages, Colorado cannot completely replace the 15C surgical scalpel because it is not adequately explored by the surgeons, build-up of eschar affecting the performance of Colorado tip and also the emergence of lasers in dentistry.

Comparative Analysis of Intra-op and Post-op outcome of 15C Blade and Colorado Needle

		Duration of incision (sec)			
		15C Blade	Colorado Needle	t statistic	P Value
Time	Duration	22.95	14.72	3.206	0.003*
		Bleeding during incision (ml)			
		15C Blade	Colorado Needle	t statistic	
	Bleeding	1.53	0.616	6.49	<0.001*
		Odour			
		15C Blade	Colorado Needle	Chi square Test	P Value
Absent	Present	Absent	Present	40	<0.001*
100%	0%	0%	100%		
		Clarity of surgical field			
		15C Blade	Colorado Needle	Chi square Test	P Value
Unclear	Clear	Unclear	Clear	21.53	<0.001*
70%	30%	0%	100%		
		Type of margin in incision			
		15C Blade	Colorado Needle	Chi square Test	P Value
Slightly ragged	Precise	Slightly ragged	Precise	2.13	0.144
15%	85%	35%	65%		

Comparative Analysis of Intra-op and Post-op outcome of 15C Blade and Colorado Needle

Maximum Mouth opening							Statistics Tests	P Value	
Parameter	15C Blade			Colorado Needle			1 statistic		
	Trismus (mm)			Trismus (mm)					
	Pre-op			Pre-op					
	3 rd Day	39.80	24.65	39.90	28.90		-0.045	0.965	
	7 th Day	30.15		34.05			-2.155	0.038 *	
1 st Day	35.55		37.80			-2.085	0.044 *		
1 st Day						-1.371	0.179		
Primary Wound Healing									
Period	15C Blade			Colorado Needle			Chi square value	P Value	
	Poor	Good	Excellent	Poor	Good	Excellent			
	3 rd Day	40%	55%	5%	50%	50%	0%	1.27	0.53
	7 th Day	40%	55%	5%	50%	50%	0%	2.87	0.53
	1 st Day	40%	55%	5%	50%	50%	0%	4.42	0.53
Height of mucosal scarring									
Period	15C Blade			Colorado Needle			Chi square value	P Value	
	Flush with surrounding mucosa	Slightly hypertrophic or invaginated	Hypertrophic or invaginated	Flush with surrounding mucosa	Slightly hypertrophic or invaginated	Hypertrophic or invaginated			
	3 rd Day	80%	20%	0%	45%	45%	10%	5.88	0.053
	7 th Day	100%	0%	0%	30%	70%	0%	21.53	<0.001 *
	1 st Day	15%	25%	0%	35%	40%	25%	8.601	0.014 *
Colour of mucosal scarring									
Period	15C Blade			Colorado Needle			Chi square Test	P Value	
	Perfect	Slight mismatch	Obvious mismatch	Perfect	Slight mismatch	Obvious mismatch			
	3 rd Day	5%	85%	10%	0%	30%	70%	15.26	<0.001 *
	7 th Day	50%	50%	0%	5%	90%	5%	10.64	<0.001 *
	1 st Day	85%	15%	0%	30%	70%	0%	12.37	<0.001 *
Overall appearance									
Period	15C Blade			Colorado Needle			Chi square Test	P Value	
	Good	Acceptable	Poor	Good	Acceptable	Poor			
	3 rd Day	50%	50%	0%	0%	70%	30%	16.67	<0.001 *
	7 th Day	75%	25%	0%	10%	90%	0%	17.258	<0.001 *

Figure 1: pre-operative orthopantomogram showing bilateral impacted mandibular 3rd molar

Therefore, more studies with a decent sample size; need to be conducted in this area to draw a definite conclusion.



Figure 2: Colorado needle incision placement on Site B



Figure 3: incision with 15C blade showing smooth margin with blood in surgical field



Figure 4: incision with colorado showing ragged margin having bloodless surgical field

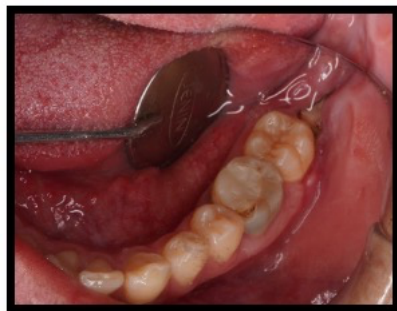
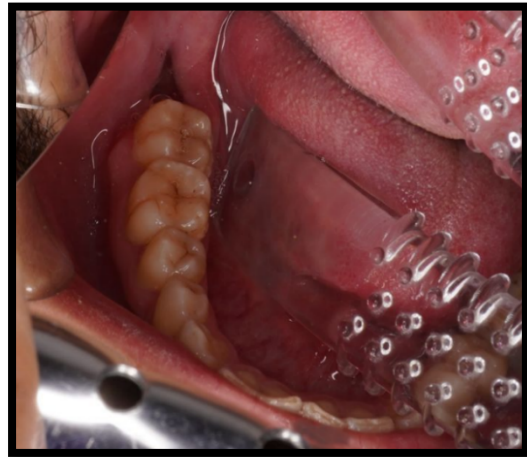


Figure 5: Duration of incision placement with 15C blade



Figure 6: Duration of incision placement with Colorado needle



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