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Original Article

Comparison of Diathermy versus Surgical Scalpel for Skin Incisions in Elective General Surgical Procedures

Adnan Younis Panni, Muhammad Sajid Jarral, Rasikh Maqsood*, Mujahid Zulfiqar Ali, Naqeebullah Shah*, Waqas Ahmed*****

Department of Surgery, 130 Medical Battalion, Gilgit Baltistan, Pakistan, *Department of Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, **Department of Surgery, Combined Military Hospital, Quetta/National University of Medical Sciences (NUMS) Pakistan, ***Department of Surgery, 144 Medical Battalion, Siachen Pakistan

ABSTRACT

Objective: To compare diathermy versus surgical scalpel in skin incisions in elective general surgical procedures regarding incision time, post-operative pain and surgical site infection.

Study Design: Quasi-experimental study.

***Place and Study Duration*:** Department of Surgery, Combined Military Hospital, Peshawar Pakistan, from Feb to Jul 2020.

Methodology: A total of 106 patients undergoing general elective procedures aged 20-60 years belonging to either gender were included in the study. They were divided into two equal groups of 53 patients each. Patients with ischemic heart disease, diabetes mellitus, hypertension, and dirty and contaminated procedures were excluded. Group-A patients underwent skin incisions with diathermy, while Group-B patients underwent skin incisions with a surgical blade on a scalpel. The incision time was noted for both groups. All patients were followed for post-operative pain per visual analogue score and development of surgical site infection.

Results: Mean incision time in Group-A (Diathermy-Group) was 46.58±8.03 seconds, while in Group-B (Scalpel-Group), it was 54.75±7.91 seconds (p<0.001). The mean post-operative pain score in Group-A (Diathermy Group) was 2.25±0.76, while in Group-B (Scalpel Group), it was 3.58±0.91 (p<0.001). Wound infection was found in 3.77% of patients in Group-A, while in Group- B, it was found in 15.09% (p=0.046).

Conclusion: Incision with Diathermy is better than scalpel skin incisions regarding incision time, post-operative pain and post-operative surgical site infection.

Keywords: Diathermy, incision time, Post-operative pain, Surgical site infection.

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INTRODUCTION

Surgical diathermy was introduced to eradicate the inherent disadvantages of using a scalpel. It is an efficient and effective mode of dissection, being hemostatic and easy to use.[1,2] Diathermy incision is only partially a real cutting incision. In diathermy, a gradient-dependent current passes across the tissue under dissection at a higher frequency (>100kHz).[3] This causes tissue breakdown by coagulation in modulated mode or cutting in sinusoidal mode. The cells are heated exponentially, so much so that they vaporize and leave behind a cavity within the tissue matrix.[4] The heat is dissipated as steam instead of being conducted to the surrounding tissues.[5] The incision is created by the moving forward of the electrode, which comes into contact with newer cells which heat up and vaporize.[6,7]

Despite the advantages mentioned above of diathermy, the proposal of employing diathermy as an instrument for giving 'cutting' skin incisions have been scrapped by most surgeons across the globe for being doubtful of the delay in wound healing.[8] production of large scars and the risk of Surgical Site Infection (SSI) curtailing the widespread use of surgical diathermy for skin incisions. Diathermy was previously reported to increase the risk of SSI, compromise healing and reduce cosmesis.[9,10]

The choice of topic was governed by the dearth of local studies comparing diathermy incisions with the routinely used scalpel incisions amongst elective surgical procedures in the Pakistani population. Therefore, the rationale of this study was to compare the safety and efficacy of incision with surgical diathermy versus the routinely employed scalpel incisions for various elective general surgical procedures in our local setting to evaluate diathermy as an effective alternative to scalpel incision, which will decrease the operation time, would be less painful and associated with lesser frequency of SSIs.

METHODOLOGY

The quasi-experimental study was carried out at Department of General Surgery, Combined Military

Correspondence: Dr Waqas Ahmed, 144 Medical Battalion, Goma, Siachen, Pakistan

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Hospital, Peshawar Pakistan, from February to July 2020 after approval from ERC (No. FCPS/Trg /3021/2020). The sample size was calculated by taking the anticipated proportion of SSI in the Diathermy Group=3.22%, SSI in the Scalpel Group=12.07%.[11] Non-probability consecutive sampling was employed.

Inclusion Criteria: Patients of either gender, aged 20-60 years, having ASA class I, II and III, undergoing elective general surgical procedures admitted were included from the study.

Exclusion Criteria: Patients with a known history of ischemic heart disease, diabetes mellitus, hypertension, coagulation disorders and those undergoing dirty or contaminated general surgical procedures were excluded from the study.

A voluntary informed consent was signed by all patients before inclusion in the study. Patients were divided into groups, Group-A and Group-B. The surgical incision was given in every patient such that the skin, subcutaneous tissue, deep fascia, and muscle or the intended operation site were incised. Group-A patients underwent skin incisions with diathermy (Electrosurgical Unit (ESU) brand Sabre 2400 by Conmed Corporation, set at pure cutting mode and delivering 417kHz sinusoidal current was employed to incise the skin and all the layers while Group-B patients underwent skin incisions with a surgical blade on a scalpel. During anaesthesia induction, a single dose of prophylactic intravenous antibiotics (1.2g of Amoxicillin/ clavulanate potassium) was administered. A sterile flexible ruler was used to measure the length & depth of each incision. The incision area was calculated as the product of the length and depth of the skin incision.

Time was determined from the start of the skin incision until the intended operation site was reached with thorough hemostasis in seconds with a stopwatch. Incision time was calculated in seconds per unit wound area (sec/cm^2). All patients were followed for the development of SSI 7th and 14th post-operative days. Patients developing wound discharge wound gaping, abscess or seroma formation were labelled as having SSI. Post-operative pain was determined using the (VAS). All the patients complaining of pain were asked to quantify their pain on a scale of 1-10 based on severity. Data were recorded on a pre-designed proforma.

SPSS ver 25 was used for the data analysis. Mean and standard deviation were calculated for the quantitative variables. Qualitative variables like gender and SSI were measured in terms of frequency percentages. Chi-square test and Independent sample t-test were applied to explore the inferential statistics. The *p*-value ≤to 0.05 was considered as significant.

RESULTS

One hundred six patients were divided into two equal groups of 53 patients each. The mean age of the study population was 41.13±10.33 years. According to ASA physical status classification, 28 patients 26(42%) were grouped in ASA class I, 60 patients 56(60%) were in ASA Class-II, while the remaining 18 patients 16(98%) were grouped in ASA Class-III.

The overall mean incision time of all patients was 8.62±6.54 sec/cm^2, while the overall mean pain score was 2.92±1.07. The distribution of patients in different groups according to incision time and pain score according to VAS is given in Table-I.

Table-I: Distribution of patients according to Incision Time and Pain Score according to Visual Analogue Scale (n=106)

Groups		Incision Time (sec/cm^2)	*p*-value
Diathermy		7.28±5.00	0.034
Scalpel		9.96±7.60	
Groups		**Pain Score (VAS)**	***p*-value**
Diathermy		2.25±0.76	<0.001
Scalpel		3.58±0.91	

In addition, the distribution of patients according to the frequency of SSI is given in Table-II.

Table-II: Distribution of Patients according to Surgical Site Infections (SSIs) (n=106)

Groups	Surgical Site Infections		*p*-value
	Yes(%)	No(%)	
Diathermy	2(3.77%)	51(96.23%)	0.046
Scalpel	8(15.09%)	45(84.91%)	

Table-III: Frequency of Surgical Site Infections (SSIs) for Different variables (n=106)

Catagories	Surgical Site Infections	Groups		*p*-value
		Diathermy	Scalpel	
Age Groups (years)				
20-40	Yes	1(3.70%)	1(3.85%)	0.225
	No	26(96.30%)	25(96.15%)	
41-60	Yes	1(3.85%)	5(16.67%)	0.122
	No	25(96.15%)	25(83.33%)	
Gender				
Male	Yes	1(3.33%)	7(21.21%)	0.033
	No	29(96.67%)	26(78.79%)	
Female	Yes	1(4.35%)	1(5.0%)	0.919
	No	22(95.65%)	19(95.0%)	
ASA Class				
ASA I	Yes	1(6.25%)	2(16.67%)	0.378
	No	15(93.75%)	10(83.33%)	
ASA II	Yes	0(0.0%)	4(12.5%)	0.053
	No	28(100.0%)	28(87.5%)	
ASA III	Yes	1(11.11%)	2(22.22%)	0.527
	No	8(88.89%)	7(77.78%)	

As above mentioned in Table-III, the frequency of SSI according with respect to age groups, gender, and ASA class.

DISCUSSION

Diathermy has been available for quite some time now. However, local surgeons have been reluctant to use it for making skin incisions due to apprehension of tissue damage, retarded wound healing, increased post-operative pain, and disproportionate scarring and rely on the surgical blade on a scalpel for skin incisions.[12-14] This study was conducted to break the myths and find the better technique out of the two in terms of requiring less incision time, lower post-operative pain and reduced frequency of SSI.

The mean incision time was 7.28±5.00 sec/cm^2 with diathermy versus a mean incision time of 9.96±7.60 sec/cm^2 with a scalpel, with the difference being statistically significant (p=0.034). Talpur *et al.* also reported that the mean time for giving incision was 7.30±0.97 sec/cm^2 for diathermy versus 8.90±1.37 sec/cm^2 for the scalpel, with the difference being highly significant (p<0.001).[3] Comparable result was reported by Chalya *et al.* with an incision time of 7.84±0.82 sec/cm^2 for diathermy versus 9.21±1.40 sec/cm^2 for a scalpel. The difference was again statistically significant (p=0.001).[5] However, contrary to our results, Prakash *et al*. reported that the mean incision time was 9.07±3.40 sec/cm^2 in the Diathermy Group versus 9.40±3.37 sec/cm^2 in the Scalpel Group with a non-significant difference (p=0.87).[11]

The mean pain score was 2.25±0.76 with diathermy versus 3.58±0.91 with a scalpel, which was statistically significant (p=0.001). Similarly, one study reported a significantly lower mean pain score of 1.01±0.11 in the Diathermy Group versus a mean pain score of 2.40±0.20 in the Scalpel Group (p=0.021) on the third post-operative day.[15] Similarly, two studies reported that the mean pain score was significantly less with diathermy than with the scalpel, respectively (p<0.001).[3,16] Another study reported no significant difference between the two groups regarding post-operative pain score.[17]

Finally, the frequency of SSI was 3.77% in the Diathermy Group versus 15.09% in the Scalpel Group; the difference was statistically significant (p=0.046). A study by Franchi et al. also reported that there was a significant difference between the Diathermy Group (0.2%) versus the Scalpel Group (1.5%) in terms of frequency of severe SSIs (p<0.05).[18] However, Shivakumar et al. The reported SSI frequency was similar in both groups, i.e. 3.23% in Diathermy versus 7% in Scalpel Groups, respectively (p=0.23).[19] Similarly, Prakash et al. reported SSI in 14.63% of patients in the Diathermy Group versus 12.19% in the Scalpel Group, with the difference being statistically non-significant (p=0.347).[11] Aird *et al.* also reported that there was statistically a non-significant difference between the two groups in terms of frequency of SSI (p=1.000).[20]

CONCLUSION

This study concluded that incision with diathermy is better than scalpel skin incisions because of reduced incision time, lower post-operative pain score and less frequency of SSIs. Therefore, we recommend that diathermy should be used routinely for incisions in elective general surgical procedures for reducing post-operative pain and SSIs, which will improve the quality of life of the patients by reducing post-operative morbidity.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AYP & MSJ: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

RM & MZA: Concept, study design, data interpretation, critical review, approval of the final version to be published.

NS & WA: Critical review, drafting the manuscript, interpretation of data, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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