Scalpel Vs Diathermy Skin Incision in Maxillo-facial Surgery, A Randomized Controlled Trial

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Abstract

Objective: To compare the outcomes of scalpel versus diathermy skin incision in maxillofacial surgery.

Material and Methods: This Study design was randomized controlled trial and place and duration of study was CMH Medical College, Lahore from 1st July to 30th December 2023. A total of 138 patients planned to undergo maxillofacial surgery were included in the study. Patients were divided randomly through paper lottery method into "scalpel group" and "diathermy group" containing equal number of patients. Post-operatively, patients in both groups were assessed at one month follow up for the wound outcomes. Data was analyzed using SPSS 20.

Results: Mean age was 52.65±17.19 years. There were 96 (69.56%) male and 42 (30.44%) female patients. Mean operative time, mean blood loss and mean pain VAS at day 3 was significantly less in diathermy group, ($p<0.001$). Frequency of wound infection at day 14 follow up in scalpel group was 6 (8.69%) while in "diathermy group" it was 4 (5.79%), ($p=0.511$). In scalpel group, frequency of patients reporting good cosmesis was significantly higher as compared to diathermy group, ($p=0.001$).

Conclusion: In maxillofacial surgeries, diathermy use is a safe and effective alternative as compared to scalpel for making skin incision.

Keywords: Diathermy, Maxillofacial surgery, Outcome, Scalpel.

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Introduction

Among many diverse healthcare problems addressed by the relatively new field of "maxillofacial surgery" are diseases related to gums & teeth, abnormalities of the face, problems with the temporomandibular joint (TMJ), injury to face secondary to trauma and malignancies of the head and neck.[1] Like any other field, medical care based on evidence depends on drawing from the latest scientific findings while also taking the preferences of patients and clinicians' experience into account when making decisions about treatment to improve patients' satisfaction.[2,3] The most important aspect of a surgery, particularly performed on the face, is the cosmetic disfigurement that can potentially occur secondary to adverse wound and scar outcome that is a major concern for these patients adding to the actual fear of the surgery imposing major impact on life quality of the patients undergoing maxillofacial surgery.[4]

One factor that has major influence on the outcome of surgery is the method used to make the incision at the operative site. With advancement in the field of surgery, conventional instruments are continuously being replaced by electro-surgical ones with the preliminary aim of improving surgical outcomes.[5] On the other hand, diathermy also has adverse effects associated with it including increased incidence of infection of the surgical wound, excessive scarring and poor tensile strength of healed wound that has somewhat curtailed its use on a larger scale.[6] In addition, due to mechanism used by diathermy involving physically burning the operative

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tissue, there is an obvious risk of getting skin burns which is a major concern,[7] particularly in maxillofacial surgeries. Major advantage, however, of diathermy is that not only it reduces the time duration of the surgery but also makes it easier to achieve hemostasis and reduce the blood loss related to the surgery.[8]

When it comes to previous literature regarding wound outcomes with scalpel versus diathermy induced skin incision, there has been quite controversial results with studies reporting no difference in the wound outcomes 8 while other reporting diathermy to provide significantly better patient outcomes compared to scalpel made skin incision.[9] Furthermore, in the field of maxillofacial surgery not much literature is available in this regard. Therefore, this study was conducted with the aim of comparing outcomes of "scalpel" versus "diathermy" skin incision in maxillofacial surgery.

Material and Methods

This randomized controlled trial was conducted at CMH Medical College, Lahore from 1st July to 30th December 2023 after obtaining approval from the ethical review board of "CMH Medical College, Lahore" (ERB#:05/ERC/CMH/LMC). IRCT registration number: IRCT20240101060587N1. Sample size was calculated using WHO sample size calculator for two means using following formula:[9]

For calculation following parameters were used:

$$n = \frac{\left\{ z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)} \right\}}{(P_1-P_2)^2}$$

- Level of significance = 10%
- Power = 80%
- Anticipated frequency of good cosmesis in scalpel group = 86.67% [11]
- Anticipated frequency of good cosmesis in diathermy group = 69.23% [11]

This gave a sample size of 138 (69 in each group). Adult patients who had the age more than eighteen years, males and females with "oral squamous cell carcinoma (OSCC)" or "pleomorphic adenoma of the parotid gland" were included in this study. Patients with any other type of malignancy, previous history of treatment for either OSCC or pleomorphic adenoma, pre-existing scar on operating site, conditions that can affect wound healing (like diabetes, immunosuppression, connective tissue diseases or steroid intake) and those undergoing chemotherapy or radiotherapy were excluded from the study.

Patients were selected through "non-probability consecutive sampling" technique. A written consent which was signed by the study participants was made an essential pre-requisite. Baseline characteristics including age (in years), gender (male/female), side of face incision was made (left/right) and indication for surgery (OSCC / pleomorphic adenoma) were documented. Patients were given explicit pre-procedural information regarding the instrument used to perform skin incision. Before making any incision, site of surgery was marked by a marker to define the field of surgery. After this, paper lottery were made with half having "scalpel" written on them while half having "diathermy" written on them. Drawing of lottery was performed by research team member blind to what had been written on the paper. Based on this patients were divided randomly into "scalpel group" or group A and "diathermy group" or group B. In group A (scalpel group), skin incision was made using a standard scalpel number 20 while in group B (diathermy group), this was done using surgical diathermy machine set on cutting mode giving 500kHz current. All the procedures were performed by same team of surgeons to minimize operator bias. In all the patients, after surgery was completed, skin was approximated using interrupted "silk" sutures 3/0. Intraoperative parameters including operative time and blood loss (measured by weighing gauze pieces with 1gram of weight equaling 1ml of blood loss) were documented. After surgery, standard post-operative care with injection co-amoxiclav (Augmentin ®) 1.2 grams eight hourly and injection metronidazole (Flagyl ®) 500mg eight hourly. Patients were kept admitted for 3 days and before discharge, pain assessment was made using "pain visual analogue scale (VAS)" scored 0-10; 0 being no pain and 10 being worst pain ever. Patients were asked to follow up at day 14 after procedure to assess for wound infection. In case of infection, extended antibiotic course was offered to the patients. Finally at 1 month follow up, cosmetic outcome was assessed based on cosmesis VAS (0-10) labelled as "good" if cosmesis VAS was ≥ 7, "satisfactory" if score was 4-6 and "bad" if < 4.

"Data was analyzed by using Statistical Package for Social Sciences (SPSS) 20. Quantitative data was represented using mean ± standard deviation (SD). Qualitative data was represented by using percentage and frequency. Operative time and blood loss were compared between

groups using Student t-test while frequency of wound infection and cosmetic outcome was compared between groups using Chi-square test. A p-value of ≤ 0.05 was considered as statistically significant".

Results

In this study, a total of 138 patients (69 in each group) were included. Mean age of study participants was 52.65±17.19 years. There were 96 (69.56%) male patients while 42(30.44%) patients were females. In 71 (51.45%) patients, skin incision was made on left side of face while in 67 (48.55%) patients it was made on right side of face. 83 (60.15%) of the patients had surgery for "OSCC" while 55 (39.85%) patients were operated for removal of "pleomorphic adenoma" of parotid gland. Comparison of baseline characteristics between groups is given below in **(Table-I)**. Mean operative time in "scalpel group" was 103.24 ± 6.78 minutes while in "diathermy group" it was 91.02±7.62 minutes, ($p < 0.001$). Mean blood loss in "scalpel group" was 286.86±24.95 ml while in "diathermy group" it was 232.63±24.38 ml, ($p<0.001$). Mean pain VAS at day 3 in "scalpel group" was 4.42 ± 1.06 while in "diathermy group", it was 2.78±1.02, ($p < 0.001$). Frequency of wound infection at day 14 follow up in "scalpel group" was 6 (8.69%) while in "diathermy group" it was 4 (5.79%), ($p= 0.511$). Cosmetic outcome and aforementioned data is given below in **(Table-2)**:

Table 1: *Comparison of baseline characteristics between groups (n = 138)*

Parameters	Scalpel group (A) (n = 69)	Diathermy group (B) (n = 69)	p-value
Mean age	53.47 ± 17.11 years	51.84 ± 17.36 years	0.578
Gender			
Male	49 (71.01%)	47 (68.12%)	0.711
Female	20 (28.99%)	22 (31.88%)	
Side of face operated			
Left	35 (50.72%)	36 (52.17%)	0.865
Right	34 (49.28%)	33 (47.83%)	
Indication of surgery			
OSCC	39 (56.52%)	44 (63.77%)	0.385
Pleomorphic adenoma	30 (43.48%)	25 (36.23%)	

Discussion

Amongst various surgical pathologies of face and oral cavity, "oral squamous cell carcinoma (OSCC)" and "pleomorphic adenoma of the parotid gland" are two most major and challenging indications necessitating maxillofacial surgery.[12,13] Maxillofacial surgery is relatively newer surgical field that is undergoing the process of evolution and one of the most important aspect of this particular field of surgery is the cosmesis since scar tissue on the face can significantly impact quality of life of the patients.[14,15] In general surgery patients, diathermy has increasingly been replacing the conventional method of giving skin incision with the use of scalpel since it has the tendency to achieve effective hemostasis while inflicting the incision thus reducing the operative blood loss.[16,17] The conventional surgery with use of scalpel results in longer operative time [23]. However, due to its tendency to cause burn injuries and ugly looking scars,[18] its use in maxillofacial surgery is not widely studied which prompted the conductance of present study.

Table 2: *Comparison of outcomes between study groups (n = 138)*

Outcomes	Scalpel group (A) (n = 69)	Diathermy group (B) (n = 69)	p-value
Mean operative time	103.24 ± 6.78 minutes	91.02 ± 7.62 minutes	< 0.001
Mean blood loss	286.86 ± 24.95 ml	232.63 ± 24.38 ml	< 0.001
Mean pain VAS at day 3	4.42 ± 1.06	2.78 ± 1.02	< 0.001
Wound infectionat day 14	6 (8.69%)	4 (5.79%)	0.511
Cosmetic outcome at day 30			
Good	47 (68.12%)	27 (39.13%)	0.001
Satisfactory	17 (24.64%)	25 (36.23%)	
Bad	5 (7.24%)	17 (24.64%)	

In present study, average age of patients was 53 years with clear male predominance which corresponds with the fact that malignancies of the oral cavity, in particular the OSCC is much more common in older men who have the age more than 40 years.[19] No statistical difference was observed between study groups in terms of baseline characteristics ($p > 0.05$). In terms of mean operative time and blood loss during operation, use of diathermy significantly reduced the duration of procedure as well as mean blood loss which was consistent with the finding of a meta-analysis in which nine studies were analyzed which showed that as compared to scalpel, use of electric diathermy resulted in significant reduction of these parameters ($p < 0.05$).[20] On the other hand, Kumar et al.[11] reported no significant difference between scalpel and diathermy groups in terms of mean operative time when used in maxillofacial surgery. In terms of mean pain score, diathermy use was associated with

significantly reduced post-op pain at day 3 which was consistent with the findings of a study conducted by Panni et al.[21] In terms of frequency of post-op wound infection, although scalpel use was associated with higher frequency of wound infection but the difference between study groups was not of statistical significance (p = 0.511). This was similar to findings of Kumar et al.[11] but was not congruent with the findings of Panni et al.[21] who found that frequency of wound infection was significantly higher with scalpel use (p = 0.046). In terms of cosmetic outcome, use of scalpel provided significantly better cosmesis with higher frequency of patients reporting good cosmesis (p = 0.001). This was not congruent with the findings of Kumar et al.[11] who found no significant difference between scalpel and diathermy made skin incision in maxillofacial surgery as well as another study done in Pakistan but on urethra.[22] Based on present study, it is evident that diathermy provides a clear advantage over the use of scalpel to make skin incision for maxillofacial surgeries in terms of reduced operative time, lesser blood loss, lower seve-rity of pain and lesser wound infection rates. However, for better cosmesis, scalpel is a better option as compared to diathermy. Due to such promising results it is reco-mmended that diathermy can safely replace use of scalpel for making skin incisions in maxillofacial surgery but special care should be taken while performing such surgeries to ensure best possible cosmetic outcomes.

Conclusion

In conclusion, diathermy inflicted skin incision in maxillofacial surgeries is better than scalpel in terms of reduced operative time, lesser blood loss, lower severity of pain and lesser wound infection rates. However, for better cosmesis, scalpel use is much better option as compared to diathermy.

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Authors Contribution

VSK, AAC: Conceptualization of Project
VSK, AAC, HJM: Data Collection
VSK, AAC, HMJM, FQ, AIU, AKM: Literature Search
VSK, AAC, FQ, AIU: Statistical Analysis
VSK, AAC, HMJM, FQ, AKM: Drafting, Revision
VSK, HMJM, AIU: Writing of Manuscript