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Comparison of Incision Given with Electrocautery Versus Stainless Steel Scalpel for Neck Dissection in Oral Cancer Patients

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ABSTRACT

Both scalpels and electrocautery are frequently used for incisions during surgery, and each has an impact on postoperative scarring, bleeding, and operating efficiency. Objective examination of neck scars is clinically significant since visible scars may affect quality of life. **Objectives:** To evaluate the differences between scalpel and electrocautery incisions in neck dissection about of scar quality, surgical time, and blood loss as determined by the Manchester Scar Scale (MSS). **Methods:** In a prospective comparative cross-sectional study, a total of 76 patients who were having neck dissections at Sharif Medical and Dental College were included and divided into two equal groups (n=38 for scalpels and another 38 for electrocautery). The Mann-Whitney U test was used to examine intraoperative blood loss and surgical duration. Thirty days after surgery, the MSS was used to evaluate the scar's colour, gloss, contour, and distortion. The results were compared using the Chi-square test. **Results:** Both surgical time (33 vs. 42 minutes, p<0.001) and blood loss (123 mL vs. 240 mL, p<0.001) were dramatically decreased by electrocautery. There were no significant differences in scar colour (p=0.341), contour (p=0.359), or distortion (p=0.364) between the groups; however, glossy scars were more common with electrocautery (34.2% vs. 15.8%, p=0.022). **Conclusions:** Except for a higher frequency of shiny scars, electrocautery gives comparable scar results to knife incisions, but with a shorter operating time and less blood loss. When choosing a technique, aesthetic considerations are still crucial.

INTRODUCTION

In head and neck oncology, surgeons have historically dissected the neck using a stainless steel blade and electrocautery. For addressing head and neck carcinoma, neck dissection is crucial. Numerous methods have been developed to protect important structures while doing surgery. [1] The second most frequent carcinoma in Pakistan for both genders was lip and mouth cancer. The cervical lymphatic system of the neck may be affected by cancer of the oral cavity that originates in the tongue, cheek mucosa, floor of the oral cavity, or alveoli. The lymphatic drainage network of the mouth cavity is first divided into local before splitting into deeper cervical lymph nodes. The main known risk factors consist of consuming the betel nut, drinking alcohol, and cigarette smoking. Although diagnosis and treatment options for people with oral cancer have greatly improved in recent years, the death rate (about 50%) continues to be significant [2]. In order to accurately analyze surgical scar outcomes, a number of scar assessment techniques have been developed and laid out in research. The Vancouver Scar Scale (VSS), that emphasizes vascularity, pigmentation, pliability, and height, and the Patient and Observer Scar Assessment Scale (POSAS) are two of those that are most popular. These types of scales have been

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utilized for neck and head and skin procedures in the past to guarantee uniform evaluation of scar excellence [3]. The scarring, as well as cervicofacial impairments, have been found to significantly impact the overall standard of life for patients with cancers of the head and neck. The surgical techniques employed or the direct progression of cancer may result in facial deformity. It has been acknowledged as a persistent danger to self-esteem in addition to being the most stressed part of the neck and head region. In reality, individuals with cancer of the head and neck may have a significant incidence of anxiety and sadness due to facial disfigurement [4, 5]. Steel scalpels and electrocautery were regularly used in head and neck surgeries. The steel scalpel's primary benefits are precision, simplicity of usage, and low impact on nearby tissue [6, 7]. Nevertheless, it can cause serious bleeding from the incision and cause collateral harm to surgical helpers when it gets passed to the scrubbed nurses. By blocking blood arteries before being cut, electro-surgical tools reduce hemorrhage. They break down proteins using heat energy, causing vascular blockage and ultimately blood clotting. Despite its benefits in terms of blood loss, the use of thermal electricity in wound healing may have a certain disadvantage. Thermal dispersion into the tissue around it might result in higher postoperative pain from sensory injury to nerves and additional harm to important tissues [8]. Numerous studies contrast the harmonic blade with either electrocautery or ultrasonic, or conventional scalpel and scissors. There are right now only a few investigations evaluating the two types of scalpels used for neck surgical incisions: electrocautery as well as stainless steel [1].

This study aims to compare neck dissection using an electrocautery device as well as a stainless steel blade about the development of scars, bleeding, and incision duration.

METHODS

This prospective comparative cross-sectional study analysis involved 76 individuals; the sample size was determined using the WHO sample size calculation program, using a transoral technique yielding a 95% confidence level, taking the proportion of the population with neck dissection done as 73.3% at 0.10 absolute precision [1]. Patients who visited the Oral and Maxillofacial OPD between October 2023 to September 2024 were the subjects of the research project. The Sharif Medical Research Center (SMRC) granted ethical approval for the study's implementation (Ref. number SMDC/SMRC/315-23). Following informed consent, participants were divided into two groups of 38 each, designated group A and group B, employing a non-probability convenience sampling method. Patients were allocated alternately into Group A (scalpel) and Group B (electrocautery) as they presented, until each group reached the required sample size. Patients aged 25 years and above, requiring unilateral neck dissection as part of the management of oral cancer, were included in this study. On the other hand, patients who required bilateral neck dissection, terminally ill patients with co-morbidities, patients who previously underwent neck dissection or radiotherapy, and patients with any bleeding or coagulation disorders were excluded from this study. Each patient received a thorough pre-operative examination that involved laboratory testing, radiographic assessment, and clinical examination. Every case underwent a comprehensive clinical evaluation that included a general physical examination, a maxillofacial examination, and a CT scan for radiological assessment. Gentian violet was used to outline the incision site after general anesthesia was induced and aseptic measures were completed. A modified Schobinger incision was made, with two limbs: a vertical part placed at a minimum of 2cm posterior to the area of palpable carotid pulse, creating a lazy "S," and a horizontal part placed 2 cm beneath the jaw. A stainless-steel scalpel was used to make the incision in patients in Group A, while monopolar cauterization was used in patients in Group B. From the first skin incision to its conclusion, the incision duration was measured using a timer and entered in the data collection profoma. Gauze weight was used to determine blood loss during surgery. The initial weight of each piece of dry gauze was determined before surgery, and the weight of the gauze soaked with blood was calculated again following use in the incision. Considering that 1 gram of blood lost was equal to 1 mm of blood, the weight differences were measured [9]. A portable precision scale calibrated with a precision of ± 0.1 g was used to weigh each piece of gauze. To reduce evaporation error, each gauze was weighed both before and after it was taken out of the surgery field. This guarantees accurate blood loss calculation [10]. The Manchester Scar Scale (MSS) [11] was used to evaluate scars 30 days after surgery. The continuous variables included intraoperative blood loss (milliliters) as well as surgical time (minutes). These variables were examined employing the Mann-Whitney U test after the Shapiro-Wilk test, which evaluated the normality of the data, revealed a distribution that was not normal. The Chi-square test was used to assess postoperative scar characteristics (colour, gloss, shape, and distortion) between groups. Fisher's exact test was used to verify validity for categories with anticipated frequencies less than five.

RESULTS

The scalpel group had significantly higher blood loss (239.5 mL, IQR 44) compared to the electrocautery group (123.0 mL, IQR 18; Mann–Whitney U = 37.000, $p<0.001$). Similarly,

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surgical time was significantly longer with a scalpel (42.0 min, IQR 5) than with electrocautery (33.0 min, IQR 3; Mann–Whitney U = 73.500, p<0.001)(Table 1).

Table 1: Comparison of Blood Loss and Surgical Time between Scalpel and Electrocautery Groups

Variables	Group A (Scalpel) Median (IQR)	Group B (Electrocautery) Median (IQR)	Mann–Whitney U	p-Value
Blood Loss (mL)	239.5 (44)	123.0 (18)	37.000	<0.001
Surgical Time (min)	42.0 (5)	33.0 (3)	73.500	<0.001

There was no statistically significant difference in the scar colour distribution between the electrocautery and scalpel groups (χ^2=3.346, p=0.341). Likewise, there were no discernible variations in the distortion (χ^2=2.021, p=0.364) or scar contour (χ^2=3.220, p=0.359). Scar shine, however, showed a significant difference, with glossy scars more common in the electrocautery group than in the scalpels group(χ^2=5.216, p=0.022)(Table 2).

Table 2: Comparison of Manchester Scar Scale (MSS) in Both Groups

Variables		Group A (Scalpel) (n=38)	Group B (Electrocautery) (n=38)	χ^2 (df)	p-Value
Colour	Perfect	21 (55.3%)	17 (44.7%)	3.346 (3)	0.341
	Slightly Mismatch	15 (39.5%)	17 (44.7%)		
	Others	2 (5.2%)	4 (10.6%)		
Shine	Matte	32 (84.2%)	25 (65.8%)	5.216 (1)	0.022*
	Shin	6 (15.8%)	13 (34.2%)		
Contour	Flush	22 (57.9%)	19 (50.0%)	3.220 (3)	0.359
	Slightly Proud	13 (34.2%)	13 (34.2%)		
	Others	3 (7.9%)	6 (15.8%)		
Distortion	None	24 (63.2%)	19 (50.0%)	2.021 (2)	0.364
	Mild/Moderate	14 (36.8%)	19 (50.0%)		

*Note: p<0.05 is considered statistically significant. Only Shine showed a significant difference between groups

DISCUSSION

To avoid the built-in drawbacks of the steel scalpel, such as (1) indistinguishable tissues planes, (2) insufficient hemostasis which results in undesirable bleeding, (3) raised working time, (4) use of foreign substance (ligature) in the wounds, which increases the risk of spread of infection, (5) the likelihood of unintentional damage in the operating room, and (6) chances for tumor dissemination through lymph nodes, surgical electrocautery was developed in the early years of the twentieth century [12]. Instant hemostasis, quicker dissection, and less cumulative surgical bleeding have made this procedure quite popular since the development of contemporary electrosurgical machines that can produce pure sinusoidal voltage [13]. Current results, which show a distinct benefit of monopolar electrocautery over conventional instruments, are comparable to those of research on tonsillectomy [14], neck dissection [15], as well as thyroid surgery [16] in terms of intraoperative bleeding and shortened surgical times. The electrocautery probably coagulates minor bleedings instantly additionally is likely the reason for the shortened duration of surgery. Reduced surgery duration may impact the hospital stay and the patient's standard of living after surgery, as well as reduce the chance of postoperative delirium [17]. According to Hasegawa et al. postoperatively, delirium, an extended stay in the hospital, and longer postoperative care in the ICU may result from older age, complicated surgical treatments, protracted operations, significant hemorrhage and blood transfusions [18]. This suggests that individuals with electrocautery might experience a higher quality of life and a decreased chance of postoperative delirium after the operation. For scar assessment, we used the Manchester Scar Scale (MSS) and concluded that there was no statistically significant difference in the two groups in terms of colour, distortion, or contour on the healed incisions. Although the shine was superior in the scalpel group, this could be due to the possibility that the electrocautery causes an increase in temperature, leading to the generation of extra electrical trauma and carbonization of the surrounding tissue, which may result in more postoperative discomfort and healing of tissue issues [19]. Current results are in consistent with the results of another study, in which the scar was assessment was done using MSS and they concluded that despite the intraoperative benefits of cautery incisions, such as decreased bleeding and quicker cutting, systematic reviews and randomized trials employing confirmed scar scales, such as the Manchester Scar Scale, have had shown no discernible difference among electrocautery along with scalpel incision approaches in regards of long-term scar quality [20]. Since the temperature of the tissue while on electrocautery application was not objectively quantified in our investigation, it was not possible to establish an association with healing results or scar shine. But according to earlier research, electrocautery produces greater local tissue temperature than scalpel incisions. This could lead to delayed wound healing and protein denaturation, which could alter the look of scars. Objective associations among electrocautery-induced temperature effects as well as scar outcomes may be established with the aid of future research that uses thermal scanning or histological analyses.

CONCLUSIONS

Compared to using a knife for neck dissection, electrocautery shortened the operating time and decreased blood loss. Although bright scars were more common with electrocautery, scar results were generally comparable. Consequently, scalpel incisions may yield

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superior cosmetic results, while electrocautery gives more surgical efficiency. Efficiency and aesthetics should be balanced when choosing an approach.

Authors Contribution

Conceptualization: IT
Methodology: IT, KA, MK, MR
Formal analysis: KA
Writing review and editing: IT, UBA, MK, ST

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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