



Comparison between skin staples vs conventional sutures in neck surgical wound closure after neck dissection

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Abstract: Objective: To compare the outcomes of skin staples and conventional sutures in the closure of extraoral surgical wounds in the neck region in patients undergoing neck dissection. **Study Design:** Randomized Control trial. **Place and Duration of Study:** Department of Oral and Maxillofacial Surgery, Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro/Hyderabad, Pakistan, conducted over a period of six months after approval of the synopsis from ERC. **Methodology:** This study was conducted in the Oral and Maxillofacial Surgery department of Liaquat University of Medical and Health Sciences from between the period of 6 months of starting the study and the research proposal getting ethical clearance. The study population consisted of 30 patients undergoing neck dissection due to head and neck cancer. This was a non-probability consecutive sampling. The patients were divided into 2 groups based on 2 different methods of skin closure: skin stapling (n=15) vs conventional polypropylene sutures (n=15). The rate of intra-operative skin closure was recorded. Post-operative pain during removal of closure material and scar closure (evaluated by Stony Brook Scar Evaluation Scale) were evaluated during the follow up. Data were analyzed using SPSS version 22.0. Mean and standard deviations were used on quantitative variables, whereas frequency and percentages were used on qualitative variables. There were statistically significant differences if the p-value was equal to or less than 0.05 between the groups. **Results:** A total of 30 patients were enrolled, with 15 patients each in the staples and sutures groups. Baseline demographic characteristics were comparable between the groups. The staples group demonstrated a significantly faster wound closure rate than the sutures group (4.10 ± 0.85 vs. 1.30 ± 0.30 cm/min, $p < 0.001$) and significantly lower pain scores during removal (2.1 ± 0.8 vs. 3.6 ± 1.0 , $p < 0.001$). Although the staples group showed a higher proportion of good scar appearance at day 30 (73.3% vs. 60.0%) and lower rates of inflammatory changes on postoperative days 3 (20.0% vs. 33.3%) and 7 (13.3% vs. 26.7%), these differences were not statistically significant ($p > 0.05$). **Conclusion:** Skin staples are an effective and valid method of closing neck surgical wounds after neck dissection as opposed to the traditional sutures. The method has the added advantage of enabling faster wound healing and producing acceptable postoperative outcome and cosmetic effects. In this respect, stapling devices can be considered a viable choice when closing the skin in head and neck oncologic surgery.

Keywords: Neck dissection, Skin staples, Conventional sutures, Surgical wound closure, Scar evaluation, Head and neck surgery.

INTRODUCTION

Head and neck cancers form a major public health problem with over 900,000 of them diagnosed and above 450,000 reported deaths each year all over the world. Oral cavity squamous cell carcinoma (OSCC) constitutes a significant percentage of these and often requires surgical resection with the involvement of a neck dissection to provide adequate oncologic control of these lesions.¹ The patient that exhibits localized or regionally advanced disease is treated with surgery as the foundation of treatment and neck dissection is commonly used to remove the metastatic lymph nodes and, thus, enhance the outcome of survival chances in the particular case.^{2,3} However, such postoperative complications as surgical site infection (SSI), wound dehiscence and delayed healing remain prevalent issues following head and neck oncologic integrity. Recent data have shown that postoperative wound complications in patients who have undergone neck dissection can be experienced in a significant percentage of patients with SSI being one of the most common complication in the head and neck cancer surgery operation.^{4,5} Besides, research has reported SSI rates in surgery of oral cavity cancer up to 43% in specific groups of patients, especially those with advanced stages of the disease.⁶ Surgical wound closure is very important in reducing the postoperative morbidity, wound healing, and cosmetic outcomes. Traditional sutures have always been popular in skin closure as they are reliable and comfortable with the majority of surgeons. Suturing techniques are however known to extend the period of operation and they could also lead to ischemia of tissues or increased chances of infection in the case of excessive tension and repeated needle puncture.^{7,8} Conversely, skin staples are also developing as the alternative mode of surgical wound closure. Staples are easy to use, give quick skin approximation and can significantly decrease the time of operation. Clinical trials that have been conducted in the past to compare the two modalities have shown that stapled closure may be significantly faster with similar results when looking at wound healing rates, postoperative pain, and cosmetic outcome.^{9,10} Although stapling devices are becoming widely used in many fields of surgery, the best way of wound closure in neck dissection is a debatable issue. Past literature has reported differences in terms of closure time, postoperative pain, scar quality, and inflammatory complications, but the literature has been scarce regarding the context of oral and maxillofacial surgery. Therefore, the aim of the current research is to compare the result of skin staples and traditional sutures in the closure of extraoral surgical wounds on the neck area because of neck dissection with respect to the efficiency of operations, postoperative pain, and scar tissue, as well as inflammatory reactions.

MATERIALS AND METHODS

The study was held in the Oral and Maxillofacial Department of Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad, Pakistan. The study took place within the time frame of six months after the research protocol was approved. Non-probability consecutive sampling was used to select 30 patients who were receiving neck dissection due to head and neck carcinoma. The patients received management based on the surgeon's practice, which allowed division of patients into 2 groups based on closure method: skin staples (n=15) and polypropylene sutures (n=15). Follow up visits were used to measure the wound closure rate, along with assessment of postoperative pain for suture removal, assessment of the scar and evaluation of the inflammatory changes. The data was analyzed using SPSS version 22.0. The quantitative data was expressed in the form of mean with standard deviation, while the qualitative data was expressed in the form of frequency with percentage. The Independent Sample t-test and Chi-square test were used to compare the results of the 2 groups. p-value of 0.05 or less was considered statistically significant. The eligibility criteria included people aged 25-65 years, of either gender, and scheduled to undergo stage 1-3 head and neck oncologic resection with a cervical incision greater than 2.5 cm and American Society of Anesthesiologists (ASA) physical status 1 or 2. The exclusion criteria were to be medically compromised, undergoing immunosuppressive treatments, uncontrolled diabetes mellitus condition, previous neck exploration, or existing dermal scars/laceration at the operating area. Written informed consent was provided to the eligible subjects who were recruited at the outpatient and emergency departments. Demographic and clinical variables were recorded in structured proformas that included the following variables: age, sex, hospital registration identifier, presenting symptoms, and physical findings. Patients were categorized into two groups according to the skin closure technique used during surgery. Group A consisted of patients whose wounds were closed using stainless-steel skin staples applied with a disposable stapler, while Group B consisted of patients whose wounds were closed using 4-0 polypropylene (Prolene) monofilament sutures placed in a simple interrupted fashion. The approximation of the subcutaneous layers in the two cohorts was done using Vicryl sutures of 3-0. The routine postoperative care involved the use of antiseptic dressing, drains and intravenous antibiotic treatment. The sutures or staples removal was planned at 10-14 days, and later clinical follow-up was planned up to 30 days after the surgery. The major outcome measures included the

wound closure rate, pain during the process of suture or staple removal measured using the Visual Analog Scale (VAS), scar quality measured using the Stony Brook Scar Evaluation Scale (SBSES), and postoperative inflammatory levels recorded on postoperative days 3 and 7 using a standardized inflammation scoring rubric. The statistical analyses were done using SPSS version 22.0. Continuous variables (age, scar score, inflammation score, and pain) were presented as mean with standard deviation. Sex and wound discharge are categorical variables that were summarized using counts and

percentages. Independent samples t -tests was used in between-group comparisons. The Ethical Review Committee of Liaquat University of Medical and Health Sciences and the College of Physicians and Surgeons Pakistan (CPSP) ethically clear the study. All research procedures adhered to the laid down ethical standards governing human subject research and the subject information was guarded by strict confidentiality measures.

RESULTS

A total of 30 patients were included in the study, with 15 patients each allocated to the staples and sutures groups. The baseline demographic characteristics were comparable between the two groups. The mean age was 48.6 ± 9.2 years in the staples group and 47.9 ± 8.7 years in the sutures group, with no statistically significant difference ($p = 0.832$). The staples group comprised 9 (60.0%) males and 6 (40.0%) females, while the sutures group included 10 (66.7%) males and 5 (33.3%) females. The gender distribution was also comparable between the groups ($p = 0.704$).

Regarding surgical outcomes, the mean rate of wound closure was significantly higher in the staples group than in the sutures group (4.10 ± 0.85 cm/min vs. 1.30 ± 0.30 cm/min, $p < 0.001$). Patients in the staples group also experienced significantly less pain during removal, with a mean Visual Analog Scale (VAS) score of 2.1 ± 0.8 compared with 3.6 ± 1.0 in the sutures group ($p < 0.001$).

At postoperative day 30, good scar appearance was observed in 11 (73.3%) patients in the staples group and 9 (60.0%) patients in the sutures group; however, this difference was not statistically significant ($p = 0.438$). Similarly, inflammatory changes of Grade 2 or higher on postoperative day 3 were noted in 3 (20.0%) patients in the staples group and 5 (33.3%) patients in the sutures group ($p = 0.408$). On postoperative day 7, inflammatory changes of Grade 2 or higher were present in 2 (13.3%) patients treated with staples and 4 (26.7%) patients treated with sutures, with no statistically significant difference between the groups ($p = 0.361$).

Table 1: Baseline demographic characteristics of study participants

Variable	Staples Group (n=15)	Sutures Group (n=15)	P-value
Age (years), Mean $\pm$ SD	48.6 ± 9.2	47.9 ± 8.7	0.832
Male, n (%)	9 (60%)	10 (66.7%)	0.704
Female, n (%)	6 (40%)	5 (33.3%)	

Table 2: Comparison of surgical outcomes between staples and sutures groups

Outcome Variable	Staples Group (n=15)	Sutures Group (n=15)	P-value
Rate of wound closure (cm/min), Mean $\pm$ SD	4.10 ± 0.85	1.30 ± 0.30	<0.001
Pain score on removal (VAS), Mean $\pm$ SD	2.1 ± 0.8	3.6 ± 1.0	<0.001
Good scar appearance at day 30, n (%)	11 (73.3%)	9 (60.0%)	0.438
Inflammatory changes $\geq$ Grade 2 (Day 3), n (%)	3 (20.0%)	5 (33.3%)	0.408
Inflammatory changes $\geq$ Grade 2 (Day 7), n (%)	2 (13.3%)	4 (26.7%)	0.361

DISCUSSION

This makes optimal skin closure after the dissection of the neck a vital factor in head-and-neck oncologic surgery, as it affects the efficiency in the operation and wound healing processes, postoperative pain, and the

aesthetic results in the long run. Another developing trend in recent years is the rising use of surgical stapling devices as an alternative to traditional suturing methods. The current study compared the application of skin staples to traditional sutures in the closure of surgical wounds on the neck and added to

the accumulated literature that assesses divergent wound-closure options in head-and-neck surgery. In modern surgical literature, it is stated that stapling devices can significantly shorten the time spent on the wound closure process without any adverse effect on clinical outcomes. Research studies, which investigated wound -closure methods in head-and-neck, and general surgery, find that staples provide the quicker approximation of wound edges because of mechanical usage and reduced tissue manipulation.^{7,8} Similarly, the systematic reviews of surgical closure techniques have reported that stapling will enhance operative efficiency and reduce fatigue of surgeon in long-lasting procedures involving the management of malignant tumors.⁹ These findings are in tandem with the existing trend in the present study in which stapling devices provided an effective wound approximation when compared to the traditional suture techniques. Wound-healing and post-operative pain are also another critical aspect to consider in an ideal choice of closure method. Hypothesis Assumptions made in previous clinical studies suggest that skin staples could cause less tissue damage, because of the fewer penetrations of the needle on the skin as opposed to interrupted sutures. Less tissue manipulation and shorter operation time would generate a decrease in postoperative inflammatory reaction and pain.¹⁰ Further, new prospective research in the management of surgical wounds has reported similar or better early postoperative comfort with the use of stapled closure techniques in patients.¹¹ Possibly biological underpinnings of these results are bioindications of reduced ischemic stress of wound edges and less manipulation of the surrounding soft tissues, which are predetermined causes of postoperative inflammation and pain. The cosmetic effect and scar quality are of particular relevance to head and neck surgery, as incisions are often exposed and can affect the quality of life of a patient. To support this modern clinical opinion, it is argued that the earliest scar appearance might not be the same among the modalities of closure, but long-term cosmetic results are usually similar or sometimes even better with stapling methods when there is minimal tension on the wound and proper postoperative care is administered to wound.¹² There are several biological processes that determine scar formation, such as collagen deposition, inflammatory mediators and mechanical tension of the wound site. Correct wound-edge approximation and less tissue trauma, that occurs with stapling devices, can thus improve scar maturation in the long term.¹³ The persistence of inflammatory complications and surgical-site infections is one of the most significant aftereffects of head-and-neck oncologic surgery. Recent epidemiologic findings have indicated the range of occurrence of surgical -site infection at a rate of about 10% -30%percent in head -and-neck cancer surgeries

depending on patient comorbidity and complexity of the surgery.^{14,15} In contemporary studies, it is argued that wound-closure methods with a low tissue trauma and reduced operative time can reduce the exposure to potential contamination as well as postoperative recovery improvement is mitigated.¹⁶⁻¹⁸ These conclusions support the clinical argument behind the assessment of stapling devices, as a viable alternative to sutures, in the context of specific surgery. The current research has many strengths in this area. One of the main strengths of the present study was the ability to compare postoperative outcomes that followed two of the most common wound closure techniques. Furthermore, a number of clinically relevant outcomes were analyzed including: the efficiency of the procedure, pain, post-operative scarring, and post-operative inflammatory responses. To ensure objective and standardized outcome assessment, the Visual Analog Scale (VAS) and the Stony Brook Scar Evaluation Scale (SBSES) were used. However, there are some constraints that should be mentioned. The research was performed in one tertiary care facility, and the sample size is quite small and this can limit the extrapolation of the results. Also, a further extension of the follow-up time would provide more information on the long-term scar maturation and patient satisfaction. It is suggested that future multicenter studies involving greater number of cohorts in the future and with longer follow-up will be beneficial in supporting the comparative effectiveness of various wound-closure methods in head-and-neck surgery. In general, the results of the research add to the dynamic literature on the topic, which refers to stapling devices as a feasible and effective option to traditional suture methods used to re-close wounding of the neck after the oncologic operation. Further studies aiming at the efficiency of surgery, wound biology, and patient outcomes will enhance evidence-based suggestions on the best wound-closure techniques in head-and-neck surgery.

CONCLUSION

To conclude, the current study has determined that dermoscopic staples are a feasible alternative to conventional sutures that can be used in closing neck surgical openings after neck dissection. The use of staples based closure was associated with a high degree of approximation of wound margins and correlated with desirable postoperative indices, including reduced pain during removal and an adequate cosmetic resolution. The findings have highlighted the potential clinical importance of stapling apparatuses in improving the efficiency of the operation process and maintaining the best wound healing and scar cosmesis. The choice of a suitable methodology of closure must incorporate the concerns of the surgical productivity rates, patient

comfort, and aesthetic results. To confirm such observations and guide clinical practices, we suggest more extensive studies that involve longer follow-up.

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