

# Effect of Stapler versus Subcuticular Closure on Pain and Cosmetic Outcomes in Thyroidectomy: A Prospective Interventional Study

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## ABSTRACT

**Introduction:** Wound closure following thyroidectomy significantly influences postoperative outcomes, including pain, complications and scar appearance. Stapler closure offers speed and consistency, while subcuticular sutures are often preferred for superior cosmetic results.

**Aim:** To compare stapler and subcuticular suture techniques for wound closure in thyroidectomy with respect to operative time, postoperative pain, wound complications and cosmetic outcomes.

**Materials and Methods:** This prospective interventional study was conducted in the Department of General Surgery at Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapur, Karnataka, India, from January 2023 to December 2023. A total of 100 patients undergoing elective thyroidectomy were randomised into two groups: Group A (stapler closure, n=50) and Group B (subcuticular suture closure, n=50). Sociodemographic and clinical data were recorded. Wound closure time, total operative time, postoperative pain at 24 and 48 hours, wound

complications and cosmetic satisfaction at 14 days and one month were compared. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 25.0, with t-tests and Chi-square tests applied as appropriate.

**Results:** The mean age and gender distribution for both groups were recorded as follows: Group A (42.3 years, 18M/32F) and Group B (43.7 years, 20M/30F). Stapler closure significantly reduced wound closure time ( $5.2 \pm 1.1$  min vs.  $12.6 \pm 1.7$  min,  $p < 0.0001$ ) and operative duration ( $p = 0.0372$ ). Postoperative pain was significantly lower in the stapler group at both 24 hours ( $p = 0.0456$ ) and 48 hours ( $p = 0.0182$ ). Complication rates were slightly lower in the stapler group, but the difference was not statistically significant. Cosmetic satisfaction was significantly higher in the suture group at both time points ( $p = 0.0034, 0.0012$ ).

**Conclusion:** Stapler closure enhances surgical efficiency and provides early pain relief, whereas subcuticular sutures yield better cosmetic outcomes. Both techniques are safe and effective; the choice should be tailored to the surgical setting and patient preference.

**Keywords:** Postoperative pain, Subcuticular sutures, Surgical staplers, Wound healing

## INTRODUCTION

Thyroidectomy, a commonly performed surgical procedure for various benign and malignant thyroid conditions, has evolved significantly with advancements in surgical techniques and postoperative care [1]. While the primary focus has traditionally been on the extent of thyroid resection and the prevention of major complications such as hypocalcaemia and recurrent laryngeal nerve injury, increasing attention is now directed toward optimising wound closure methods to enhance cosmesis, reduce postoperative pain and minimise complications such as infection or dehiscence [2-4].

Among the most commonly utilised techniques for skin closure in thyroid surgery are stapler devices and subcuticular sutures. Stapler closure offers advantages such as rapid application, consistent approximation of wound edges and reduced operative time. These benefits are particularly relevant in high-volume surgical settings where time efficiency is critical. Conversely, subcuticular suturing is a well-established method widely preferred for its superior aesthetic outcomes, lower risk of tissue reactivity and adaptability to varying skin thickness and wound tension [4-8].

Despite the prevalence of both closure methods, comparative studies focusing specifically on their outcomes in thyroidectomy are limited and yield variable conclusions. Some investigations report that staplers offer quicker closure but may slightly increase the risks of visible scarring or wound edge eversion [5]. In contrast, others

favour subcuticular sutures for their long-term cosmetic benefits and comparable safety profile [6-10]. Given the rising emphasis on patient-centred care, especially regarding cosmetic results in neck surgeries, it is crucial to evaluate closure techniques through a comprehensive comparative framework.

The present study was therefore designed as a prospective interventional investigation to assess and compare stapler devices versus subcuticular suturing in thyroidectomy, focusing on key outcome parameters such as closure time, incidence of wound complications (infection, dehiscence, haematoma), postoperative pain and cosmetic satisfaction. By systematically analysing both objective clinical outcomes and patient-reported measures, the findings of the present study aimed to inform evidence-based surgical decision-making, align practices with patient preferences and improve overall perioperative care in thyroid surgery.

## MATERIALS AND METHODS

A prospective interventional study was conducted in the Department of General Surgery at Shri B.M. Patil Medical College, Hospital and Research Centre, Karnataka, India, from January 2023 to December 2023. The study was approved by the Institutional Ethics Committee (IEC No.: BLDE (DU)/IEC-SBMPC/117/2022; Date: 09/12/2022). Patients undergoing elective thyroidectomy for benign or malignant thyroid conditions were recruited after obtaining written informed consent.

**Inclusion and Exclusion criteria:** Adults aged 18-65 years undergoing hemithyroidectomy or total thyroidectomy and consenting to participate were included. Patients with previous neck surgery or radiation, a tendency to develop keloids, uncontrolled diabetes, coagulopathies, or those using anticoagulants or immunosuppressants were excluded.

Participants were selected using convenience sampling, with 50 in the stapler group and 50 in the suture group, totaling 100. Patients were randomly allocated into two groups: Group A (stapler closure) and Group B (subcuticular suture closure) using a computer-generated random number table.

**Study Procedure**

Sociodemographic and clinical data, including age, gender, type of thyroidectomy and surgical indication, were recorded. All thyroidectomies were performed by the same surgical team.

After achieving haemostasis, closure was performed with either skin staplers (Group A) or subcuticular sutures using absorbable monofilament (3-0 Monocryl) (Group B). A closed suction drain was placed in all cases and removed once drainage was less than 30 mL in 24 hours.

**Outcomes:** The primary outcomes were wound closure time, total operative time, postoperative pain (measured using the visual analogue scale at 24 and 48 hours) and wound complications (infection, haematoma, seroma, dehiscence). Cosmetic satisfaction was assessed on postoperative day 14 and one month later using a standardised scar assessment questionnaire, the Patient and Observer Scar Assessment Scale (POSAS). Cosmetic satisfaction was assessed using the POSAS, a validated tool that evaluates both subjective and objective aspects of scar quality. The scale comprises two components: an observer scale, completed by the clinician and a patient scale, completed by the participant. In this study, only the patient scale was assessed [11].

**STATISTICAL ANALYSIS**

Data were entered into Excel and analysed using SPSS version 25.0. Continuous variables were compared using independent t-tests, while categorical variables were analysed using the Chi-square or Fisher's-exact test. A p-value of <0.05 was considered statistically significant.

**RESULTS**

The mean age, gender distribution, type of thyroidectomy and surgical indications showed no significant differences between the groups [Table/Fig-1]. The wound closure time was significantly shorter in the stapler group (mean ≈ 5.2 minutes) compared to the suture group (mean ≈ 12.6 minutes). In contrast, intraoperative blood loss was comparable between the groups, with similar means (≈ 110-113 mL) [Table/Fig-2]. At 24 hours, the stapler group reported a lower pain score, with a statistically significant difference (p=0.0456) [Table/Fig-3].

Variables	Group A (n=50)	Group B (n=50)	p-value
Age (years) (mean±SD)	42.3±10.2	43.7±9.8	0.482#
Gender (M/F)	18/32	20/30	0.684*
Type of thyroidectomy (Total/Hemi)	30/20	28/22	0.702*
Indication for surgery (Benign/Malignant)	35/15	34/16	0.831*

[Table/Fig-1]: Baseline demographic and clinical characteristics. #: Student's t-test; \*: Chi-square test

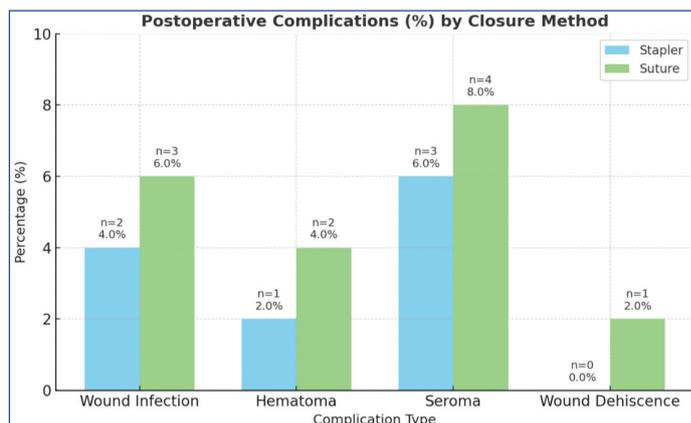
Parameters	Group A	Group B	p-value
Wound closure time (min)	5.2±1.1	12.6±1.7	<0.0001
Total operative time (min)	72.4±10.5	78.3±11.3	0.0372
Intraoperative blood loss (mL)	110.2±25.6	113.5±23.8	0.5621

[Table/Fig-2]: Intraoperative parameters. Student's t-test

Time point	Group A (Mean±SD)	Group B (Mean±SD)	p-value
24 hours	3.4±1.2	4.0±1.4	0.0456
48 hours	2.1±0.9	2.7±1.1	0.0182

[Table/Fig-3]: Postoperative pain scores.

Wound infection occurred in 6.0% of suture cases versus 4.0% in the stapler group. While the differences are not large, the overall trend suggests a marginally lower complication rate with stapler closure [Table/Fig-4]. On day 14, the suture group reported a significantly higher satisfaction score compared to the stapler group. At one month, the suture group continued to show better cosmetic satisfaction compared to the stapler group, which was statistically significant (p=0.0012) [Table/Fig-5].



[Table/Fig-4]: Postoperative complications.

Assessment time	Group A (Mean±SD)	Group B (Mean±SD)	p-value
Day 14	7.8±1.1	8.6±1.0	0.0034
1 month	8.4±0.9	9.2±0.7	0.0012

[Table/Fig-5]: Cosmetic outcome and patient satisfaction scores. Student's t-test

**DISCUSSION**

Both groups were comparable in baseline characteristics, ensuring internal validity and minimising bias. The mean wound closure time was significantly shorter in the stapler group (5.2±1.1 minutes) than in the suture group (12.6±1.7 minutes, p <0.0001), confirming the efficiency advantage of mechanical stapling. Similar findings were reported by Lee K et al., who demonstrated that mechanical closure methods consistently shorten operative duration without increasing wound morbidity [4]. O'Leary DP et al., likewise observed faster closure with adhesive strips compared to subcuticular sutures in thyroid and parathyroid surgery [5].

Postoperative pain intensity at 24 and 48 hours was significantly lower in the stapler group, consistent with the results of Rao VV et al., who observed less pain with tissue adhesive closure than with subcuticular sutures [10]. Reduced dermal manipulation, even wound tension and minimal inflammatory trauma likely explain this benefit. Yang YL et al., confirmed that both adhesives and staples reduce postoperative discomfort compared to conventional sutures [12]. The median skin closure time and postoperative pain were significantly lower in the tissue adhesive group compared to the suture group (p <0.01) [13]. Collectively, most contemporary data indicate that minimally invasive closure methods decrease nociceptive stimulation and early pain without affecting wound integrity [14].

Postoperative complications- including infection, haematoma and seroma- were marginally lower in the stapler group (12%) than in the suture group (20%), though the difference was not statistically significant. Similar results were demonstrated by Davey MG et al., who conducted a network meta-analysis showing no significant difference in wound complication rates among staples, sutures and adhesives [7]. Perivoliotis K et al., corroborated these

findings, emphasising that the type of closure exerts less influence on infection risk than surgical asepsis and haemostasis [8]. The present outcomes also echo earlier experimental work by Sönmez K et al., which demonstrated that the biological reactivity of the suture material, rather than the technique, primarily determines local wound inflammation [9].

Cosmetic satisfaction, assessed using the POSAS, was significantly higher in the subcuticular suture group at both day 14 and one month ( $p < 0.01$ ). This observation parallels the findings of Mahalingam S et al., who concluded that fine subcuticular sutures yield superior cosmetic results for cervical scars [2] and Custis T et al., who demonstrated enhanced aesthetic outcomes when subdermal approximation was optimised [3]. Alicandri-Ciuffelli M et al., also reported smoother scar contours and greater patient satisfaction with sutures compared to synthetic glue [6]. Similar trends were described by Teoh LY et al., who found significantly better short-term cosmesis in subcuticular closure after thyroidectomy [13].

The present findings therefore align with the broader literature: staplers enhance operative efficiency and reduce early pain, whereas subcuticular sutures deliver superior early cosmesis.

### Limitation(s)

Firstly, the sample size, while adequate for detecting primary outcome differences, may be underpowered for rare complications. Secondly, cosmetic outcomes were evaluated only up to one month and longer follow-up would provide insights into scar maturation. Thirdly, subjective outcomes such as pain and satisfaction are inherently influenced by patient expectations. Lastly, a cost analysis- an important factor in many settings- was not included and warrants future exploration.

### CONCLUSION(S)

Stapler closure offers significant advantages in terms of operative efficiency and early postoperative pain relief, making it a suitable option in high-volume or time-sensitive surgical environments. Both methods were associated with low complication rates and were found to be safe and effective for skin closure in thyroidectomy. Therefore, the choice between these techniques should be individualised based on clinical context, surgeon experience, patient preferences and resource availability.

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