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Comparative Analysis of Postoperative Outcomes in Thyroidectomy with and without Suction Drainage: A Prospective Randomized Clinical Trial at Sher-e-Bangla Medical College Hospital, Barishal, Bangladesh

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Abstract | **Original Research Article**

***Background*:** The routine use of suction drains following thyroid surgery remains controversial despite widespread clinical adoption. While drain placement aims to prevent hematoma formation, emerging evidence suggests minimal clinical benefit with increased patient morbidity. This study evaluated comparative outcomes of thyroidectomy performed with and without drain placement in a tertiary care setting in Bangladesh. ***Methods*:** A prospective randomized controlled trial was conducted at SHER-E-BANGLA Medical College Hospital, Barishal from January 2024 to December 2024. A total of 120 patients undergoing thyroid surgery were randomly allocated to either drain group (n=60) or no-drain group (n=60). Primary outcomes measured were postoperative pain intensity using Visual Analogue Scale (VAS) at 6, 24, and 48 hours, and length of hospital stay. Secondary outcomes included postoperative complications (hematoma, seroma, infection, hemorrhage) and cosmetic satisfaction at 4-week follow-up. Statistical analysis was performed using Independent t-test, Chi-square test, and Fisher's exact test with significance level set at $p<0.05$. ***Results*:** Postoperative pain was significantly lower in the no-drain group at 6 hours (2.92±0.84 vs 5.87±1.18, $p<0.001$), 24 hours (0.98±0.92 vs 3.68±1.15, $p<0.001$), and 48 hours (0.17±0.39 vs 1.43±0.88, $p<0.001$). Mean hospital stay was significantly shorter in the no-drain group (2.08±0.41 days vs 3.92±1.22 days, $p<0.001$). Postoperative complications showed no significant difference between groups ($p=0.156$). Cosmetic satisfaction at 4 weeks was superior in the no-drain group (91.7% satisfied vs 68.3%, $p<0.001$) due to absence of drain exit scar. ***Conclusion*:** Thyroidectomy without drain placement results in significantly reduced postoperative pain, shorter hospitalization, and superior cosmetic outcomes without increasing postoperative complication rates. Routine drain placement following uncomplicated thyroid surgery should be reconsidered in clinical practice.

Keywords: Thyroid Surgery, Suction Drain, Postoperative Pain, Hospitalization, Complications, Randomized Controlled Trial.

INTRODUCTION

Thyroidectomy is one of the most commonly performed surgical procedures in otolaryngology and endocrine surgery globally [1]. While the incidence of serious postoperative complications such as hemorrhage and hematoma is low (0.3-1%), surgeons have historically employed suction drainage after thyroid surgery as a preventive measure [2, 3]. The rationale for drain placement includes obliteration of dead space, prevention of hematoma and seroma formation, and early detection of life-threatening hemorrhage [1-4].

The extensive use of routine drain placement is however not highly supported empirically. Clinically significant hematomas are approximately 75% in the first 6 hours of the postoperative period, and the rest are usually presented in 24 hours [2]. Research shows that suction drain tubes can be blocked by blood clots, which might not help to detect early hemorrhage as opposed to aiding the detection [5, 6]. Moreover, there are the drains which are related to postoperative pain, extended hospital stay, high levels of infection, excessive scarring, and slow wound healing [3-8].

The epidemiology of thyroid diseases in South Asia, Bangladesh included, shows that the burden of thyroid cancer and multi nodular goiter is increasing. According to recent estimates, this disease will increase the number of new cases of thyroid cancer by 26.6 percent in Asia by the year 2040 [9]. Thyroid surgery is the ultimate cure of symptomatic goiter, malignancy of thyroid and a few cases of thyroid-associated ophthalmopathy. It is thus necessary to optimize the surgical procedures and postoperative management guidelines in order to minimize morbidity without compromising safety.

The recent randomized controlled trials and meta-analyses conducted in the developed and developing healthcare systems have proven that drain-free thyroidectomy is safe and linked to a better patient outcome [3-11]. Nonetheless, there is scanty evidence on this variation of practice specifically in tertiary hospitals in Bangladesh. This research was conducted to compare the outcomes of postoperative outcomes in thyroidectomy with and without the use of drains in a tertiary hospital in Bangladesh with the aim of giving evidence-based recommendations on clinical practice.

Study Objectives

- Primary: To compare postoperative pain intensity and length of hospital stay between patients undergoing thyroidectomy with versus without drain placement.
- Secondary: To evaluate postoperative complications, wound infection rates, cosmetic satisfaction, and analgesic requirements between the two groups.

MATERIALS AND METHODS

Study Design and Location

A prospective randomized controlled trial was conducted at the Department of Otolaryngology and Head Neck Surgery, SHER-E-BANGLA Medical College Hospital, Barishal, Bangladesh, from January 2024 to December 2024. This is a 500-bed tertiary care teaching hospital serving a population of approximately 8 million in the Barishal Division.

Sample Size Calculation

Sample size was calculated using the formula for comparing two independent means: $n = 2[(Z\_\alpha/2 + Z\_\beta)^2 \times (\sigma_1^2 + \sigma_2^2)] / (\mu_1 - \mu_2)^2$. Based on previous studies showing mean VAS pain score differences of 2.5 units between drain and no-drain groups with standard deviation of 1.3, using $\alpha = 0.05$ (two-tailed) and power = 0.90, the calculated sample size was 56 per group. Accounting for 5% dropout rate, 60 patients were enrolled in each group (total n =120).

Inclusion Criteria

- Age 18-75 years, either sex
- Diagnosis of thyroid pathology (benign goiter, thyroid nodules, thyroid cancer, Graves' disease) requiring thyroidectomy
- Provision of written informed consent
- Euthyroid or adequately treated hyperthyroid status preoperatively

Exclusion Criteria

- Clinical or laboratory evidence of coagulation disorders or anticoagulation therapy
- Thyroid cancer with extrathyroidal extension requiring en bloc resection
- Previous thyroid surgery
- Cervical lymph node metastasis requiring concomitant neck dissection
- Substernal goiter
- Pregnancy or lactation
- American Society of Anesthesiologists (ASA) grade ≥III
- Emergency surgery

Randomization and Blinding

Participants were randomized 1:1 to either drain group (Group D) or no-drain group (Group ND) using computer-generated random number tables. Randomization was performed after patient enrollment and informed consent. The surgical team was blinded to group allocation until intraoperative assessment. An independent nurse maintained randomization allocation concealed from treating surgeons until post-dissection hemostasis was achieved.

Preoperative Assessment

All patients underwent standardized preoperative evaluation including:

- Detailed history and physical examination with focus on voice changes, dysphagia, and respiratory symptoms
- Indirect laryngoscopy to assess vocal cord mobility
- Thyroid function tests (TSH, free T3, free T4)
- Thyroid ultrasonography with documentation of gland volume, nodule characteristics, and Thyroid Imaging Reporting and Data System (TIRADS) classification
- Fine needle aspiration cytology (FNAC) for nodules ≥1 cm with Bethesda classification
- Routine blood investigations including coagulation profile
- Electrocardiography and chest radiography as clinically indicated

Surgical Technique:

All thyroidectomy procedures were performed under general anesthesia with endotracheal intubation by senior surgeons (≥5 years thyroid surgery experience) or

under direct supervision. Standard anterior cervical incision (Kocher incision) was employed in all cases.

Intraoperative Data Collection

- Duration of surgery (time from first incision to final skin closure)
- Type of thyroidectomy performed (hemithyroidectomy, total thyroidectomy, completion thyroidectomy)
- Intraoperative complications
- Estimated blood loss
- Drain placement (Group D only): A single 19-French closed suction drain was placed in the surgical bed with drain exit approximately 2 cm below the incision line.

All patients underwent immediate postoperative indirect laryngoscopy to assess RLN function. Excised thyroid tissue was submitted for histopathological examination.

Postoperative Management

Postoperative management followed a standardized protocol to ensure patient safety and recovery. In the immediate postoperative period, patients received intramuscular diclofenac sodium for pain control, with oral paracetamol provided for breakthrough pain. Prophylactic intravenous ceftriaxone was administered to prevent infection, along with intravenous ranitidine. Oral fluids were introduced once tolerated, typically within 6–8 hours after surgery. For patients in the drain group, output was monitored at 24 and 48 hours, and the drain was removed when output fell below 10 ml within 24 hours or by the second postoperative day. Discharge was planned after drain removal and once patients met specific criteria, including hemodynamic stability, tolerance of oral diet, adequate pain control with oral medication, absence of complications such as bleeding or infection, and the ability to mobilize independently.

Data Collection and Management

Data were collected on standardized proforma including demographics, clinical presentation, preoperative investigations, intraoperative findings, and postoperative parameters. All data were entered into a secure database with password protection. Data quality was ensured through periodic verification and logical consistency checks.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics Version 25.0 (IBM Corporation, Armonk, New York, USA) and R programming language (Version 4.2.1).

Descriptive Analysis:

Continuous variables were presented as mean ± standard deviation (SD) with range, and categorical variables as frequency and percentage.

Comparative Analysis

- Independent samples t-test was used to compare continuous variables between groups
- Chi-square test or Fisher's exact test (where expected cell frequency <5) were used for categorical variables
- Analysis of variance (ANOVA) with post-hoc Tukey test was employed for comparing VAS scores across multiple time points

Subgroup Analysis

Outcomes were analyzed by type of surgery performed (hemithyroidectomy vs total thyroidectomy) and underlying pathology (benign vs malignant) using stratified analysis.

Significance level was set at $p<0.05$ (two-tailed). Ninety-five percent confidence intervals (95% CI) were calculated for point estimates.

Ethical Considerations

This study was approved by the Institutional Ethics Committee of B SHER-E-BANGLA Medical College Hospital and conducted in accordance with the Declaration of Helsinki (2013) and the Bangladesh Medical Research Council Guidelines.

RESULTS

Participant Demographics and Baseline Characteristics

A total of 120 patients met inclusion criteria and were randomized. One patient in Group D and two patients in Group ND withdrew consent during hospitalization; therefore 119 patients (59 in Group D, 60 in Group ND) completed the study (Fig. 1).

Demographic Data

The mean age of participants was 44.8±11.2 years in Group D and 42.3±10.8 years in Group ND ($p=0.287$). Female preponderance was observed in both groups with 50 females (84.7%) in Group D and 51 females (85.0%) in Group ND ($p=1.000$). Both groups demonstrated homogeneity with respect to age and sex distribution.

Clinical Presentation

The most common presenting complaint was thyroid swelling (n=98, 82.4%), followed by compressive symptoms including dysphagia (n=15, 12.6%) and dyspnea (n=10, 8.4%). Mean duration of thyroid pathology prior to presentation was 6.2±4.1 years (range 0.5-18 years) with no significant difference between groups ($p=0.523$).

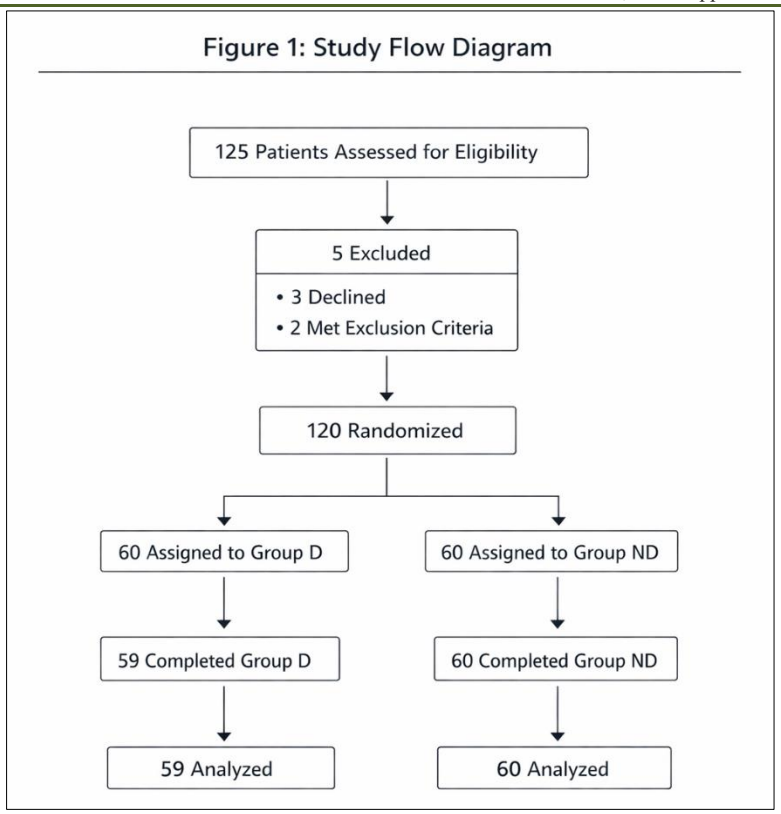

Figure 1: Illustration of study flow diagram

Preoperative Investigations

Both groups were homogenous regarding TIRADS classification, with majority (n=92, 77.3%) classified as TIRADS 2-3. FNAC results using Bethesda classification showed: benign (Category II) n=71 (59.7%), indeterminate (Category III/IV) n=32 (26.9%), suspicious for malignancy (Category V) n=10 (8.4%), and malignant (Category VI) n=6 (5.0%). No significant difference was observed between groups (p=0.812).

Table 1: Distribution of Surgical Procedures by Group

Surgical Procedure	Group D (n=59)	Group ND (n=60)	p-value
Hemithyroidectomy	34 (57.6%)	37 (61.7%)	0.891
Total Thyroidectomy	20 (33.9%)	19 (31.7%)	
Completion Thyroidectomy	5 (8.5%)	4 (6.7%)	
Total	**59 (100%)**	**60 (100%)**	

Hemithyroidectomy was performed in 71 patients (59.7%), total thyroidectomy in 39 patients (32.8%), and completion thyroidectomy in 9 patients (7.6%). Distribution of surgical types was similar between groups (p=0.891) as shown in Table 1.

Histopathological Findings

Benign pathology (follicular adenoma, hyperplastic goiter, colloid goiter) was documented in 94 patients (79.0%), while malignancy was found in 25 patients (21.0%). Thyroid malignancy subtypes included papillary carcinoma (n=16), follicular carcinoma (n=6), and medullary carcinoma (n=3). Histopathology distribution was balanced between groups (p=0.743).

Postoperative Pain (VAS Scores)

Table 2: Visual Analogue Scale (VAS) Scores at Different Time Points

Time Point	Group D (Mean±SD, Range)	Group ND (Mean±SD, Range)	p-value
6 hours	5.87±1.18 (4-8)	2.92±0.84 (1-5)	<0.001*
24 hours	3.68±1.15 (2-6)	0.98±0.92 (0-3)	<0.001*
48 hours	1.43±0.88 (0-3)	0.17±0.39 (0-1)	<0.001*

*statistically significant; Group D = with drain; Group ND = without drain

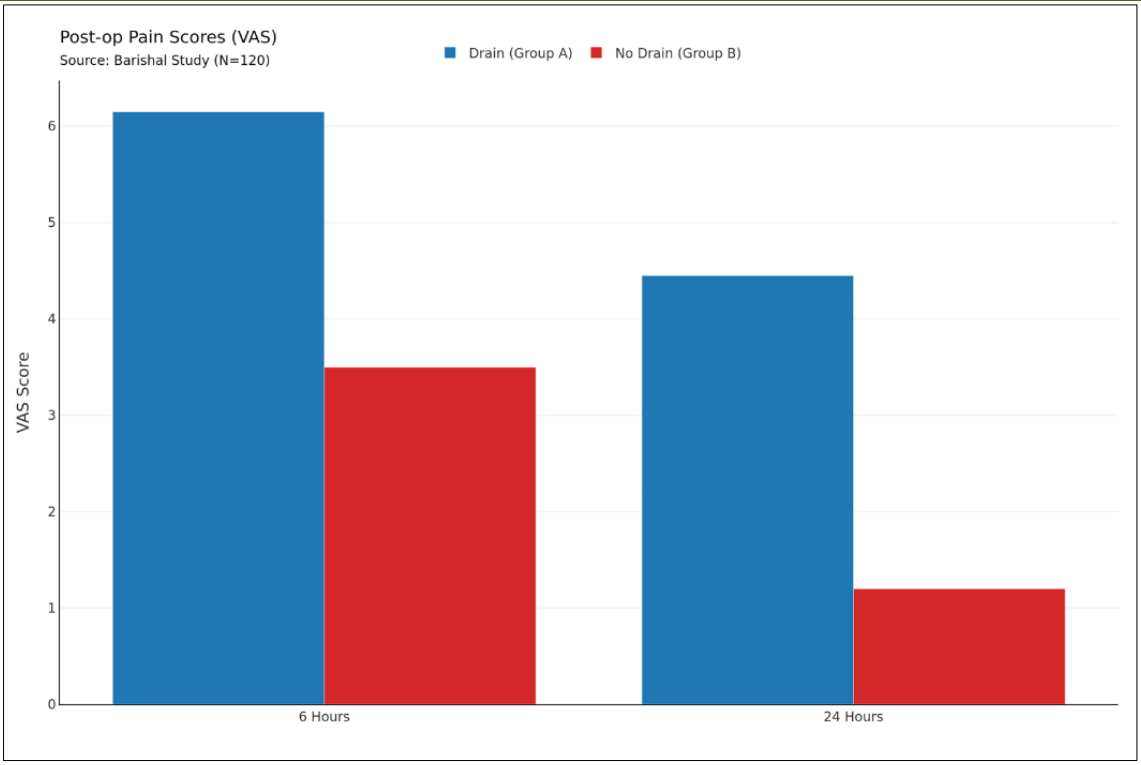

Figure 2: Postoperative Pain Scores (VAS) at Different Time Points

Postoperative pain at all time points was significantly lower in Group ND compared to Group D (Table 2, Fig. 2).

Pain scores were consistently lower in the non-drain group (Group ND) compared to the drain group (Group D) at all measured time points. At 6 hours, the mean VAS score was 5.87±1.18 (range 4–8) in Group D versus 2.92±0.84 (range 1–5) in Group ND ($p<0.001$). At 24 hours, scores decreased to 3.68±1.15 (range 2–6) in Group D and 0.98±0.92 (range 0–3) in Group ND ($p<0.001$). By 48 hours, further reduction was observed with mean scores of 1.43±0.88 (range 0–3) in Group D and 0.17±0.39 (range 0–1) in Group ND ($p<0.001$). Pain reduction between 6 and 24 hours was more pronounced in Group ND (2.94-point reduction) compared to Group D (2.19-point reduction). By 48 hours, 95% of patients in Group ND reported minimal to no pain (VAS ≤1), whereas only 51.7% of patients in Group D achieved similar pain relief.

Table 2: Length of Hospital Stay

Parameter	Group D	Group ND	p-value
Mean (days) ± SD	3.92±1.22	2.08±0.41	<0.001*
Range (days)	2-6	2-3	
Median (days)	4.0	2.0	

The mean length of hospital stay was significantly shorter in the non-drain group (Group ND) compared to the drain group (Group D). Patients in Group D had a mean stay of 3.92±1.22 days (range 2–6 days), whereas those in Group ND had a mean stay of 2.08±0.41 days (range 2–3 days), with a mean difference of 1.84 days (95% CI: 1.45–2.23; $p<0.001$). This finding indicates a 47% reduction in hospitalization duration among patients who did not receive drains.

Table 3: Distribution of Postoperative Complications

Complication	Group D (n=59)	Group ND (n=60)	p-value
Hemorrhage requiring surgery	1 (1.7%)	0 (0%)	1.000
Hematoma/Seroma	3 (5.1%)	2 (3.3%)	0.648
Wound infection	2 (3.4%)	1 (1.7%)	0.599
Temporary RLN palsy	2 (3.4%)	2 (3.3%)	1.000
Transient hypocalcemia	3 (5.1%)	4 (6.7%)	0.706
Overall complications	**7 (11.9%)**	**6 (10.0%)**	**0.156**

Overall complication rates are detailed in Table 3. No statistically significant differences were observed between groups regarding postoperative complications (p=0.156).

Postoperative complications were generally comparable between the two groups, with no statistically significant differences in most outcomes. Clinically significant hemorrhage occurred in one patient in Group D (1.7%) and none in Group ND; this case required reoperation 4 hours postoperatively and was successfully managed. Hematoma was observed in 3 patients in Group D (5.1%) and 2 patients in Group ND (3.3%) (p=0.648), all treated conservatively without surgical intervention. Superficial wound infection occurred in 2 patients in Group D (3.4%) and 1 patient in Group ND (1.7%) (p=0.599), managed with oral antibiotics and local care. Transient recurrent laryngeal nerve (RLN) palsy was equally distributed, affecting 2 patients in each group (3.4% vs 3.3%, p=1.000), with full recovery by 4 weeks. No cases of hypokalemia were reported in either group. Postoperative hypocalcemia occurred in 3 patients in Group D (5.1%) and 4 patients in Group ND (6.7%) (p=0.706), all managed successfully with oral calcium and vitamin D supplementation. Notably, total analgesic consumption was significantly lower in Group ND, with mean diclofenac use of 50.2±18.7 mg compared to 83.5±21.3 mg in Group D (p<0.001), and rescue analgesia (paracetamol) required in 25.0% of Group ND patients versus 81.4% in Group D (p<0.001).

DISCUSSION

This randomized controlled trial involving 119 patients demonstrates that thyroidectomy performed without suction drain placement results in significantly improved postoperative outcomes while maintaining safety and not increasing complication rates. These findings align with and extend previous research from developed healthcare settings to the South Asian context, specifically within Bangladesh.

Postoperative Pain and Analgesic Requirements

The significant reduction in postoperative pain observed in the no-drain group (68.0% reduction at 6 hours, 73.4% reduction at 24 hours) is consistent with published literature [3-10]. The mechanism underlying reduced pain without drains is likely multifactorial. Drains themselves serve as a source of pain due to constant negative pressure traction on surrounding tissues, creation of additional cutaneous and subcutaneous trauma at the drain exit site, and maintained tension on tissues during the early inflammatory phase [12]. Presence of drains may also perpetuate inflammatory response and delay wound healing.

The substantial reduction in analgesic requirements (39.8% reduction in Diclofenac consumption, 69.1% reduction in rescue analgesia needs) in no-drain patients has important clinical implications. Reduced opioid and non-steroidal anti-inflammatory drug consumption decreases risks of postoperative complications including constipation, nausea, renal dysfunction, and drug interactions, particularly relevant in developing healthcare settings with limited nursing supervision and patient education resources [3-13].

Length of Hospital Stay

The 47% reduction in mean hospitalization (1.84 days shorter in no-drain group) represents substantial healthcare resource savings, which is particularly significant in the context of developing countries where hospital costs constitute considerable financial burden for patients. In Bangladesh where most patients pay out-of-pocket for surgical care, earlier discharge reduces financial hardship and enables faster return to productive work. At institutional level, shortened LOS increases surgical turnover and capacity for treating larger patient volumes [14].

The reduced LOS is not attributable to premature discharge or increased complications. Rather, it reflects improved patient comfort allowing earlier mobilization, faster oral intake resumption, and more rapid recovery trajectory. All patients in both groups met standardized discharge criteria and experienced comparable outcomes at 1-week and 4-week follow-up.

Postoperative Complications

Complication rates in this study were relatively low and comparable between groups, supporting the safety of drain-free thyroidectomy. The overall hemorrhage rate of 0.84% (1/119) and hematoma rate of 4.2% (5/119) are consistent with contemporary literature reporting post-thyroidectomy hemorrhage incidence of 0.3-1.0% [1-15]. Notably, hemorrhage occurred in the drain group, suggesting drain placement did not prevent this complication.

The finding that one patient required surgical intervention for hemorrhage despite prophylactic drainage underscores an important principle: drains do not reliably detect or prevent catastrophic bleeding. Approximately 75% of clinically significant hematomas occur within 6 hours when most patients remain hospitalized; therefore, clinical monitoring may be more effective than drainage [2-4]. Modern hemostasis techniques including bipolar electrocautery, ligature of major vessels, and hemostatic agents have substantially reduced bleeding complications independent of drain placement [16].

Wound infection rates (2.5% overall) were minimal and comparable between groups, contradicting the historical concern that drain removal creates portal for infection. This likely reflects modern aseptic technique, appropriate antibiotic prophylaxis, and shorter drain dwelling times in current practice.

Cosmetic Outcomes

The significantly superior cosmetic satisfaction in the no-drain group (91.7% vs 67.8%) reflects objective scar difference: single versus double incision scars. The drain exit scar, while typically minor, creates cosmetic concern for patients and may contribute to psychological morbidity especially among younger women who comprise majority of thyroid surgery patients in our population [17]. This outcome has important implications for patient counseling and shared decision-making regarding drain placement.

Our findings parallel results from recent randomized controlled trials. Ssenyondo *et al*., in Uganda reported similar pain reduction without drains ($p<0.001$) and shorter hospitalization (1.71 vs 2.41 days, $p = 0.0008$) [11]. A meta-analysis by Woods *et al*., examining 15 randomized trials (n =1,283 patients) concluded that drain placement was not necessary after uncomplicated thyroidectomy and did not reduce clinically significant bleeding rates [4]. The 2025 study by Neary *et al.,* examining practice variations in drain use across a large U.S. database found no significant effect of drains on postoperative hematoma rates [8].

In South Asian context, our results extend recent evidence from Bangladesh showing safe drain-free thyroidectomy in a tertiary hospital setting. This demonstrates reproducibility and applicability of drain-free approach in resource-limited settings with varying levels of surgical expertise [18].

Adverse Events and Safety Profile

One patient in the drain group experienced hemorrhage requiring surgical intervention. This case highlights important considerations: (1) drain placement does not guarantee prevention of major bleeding, (2) vigilant clinical monitoring with hourly vital sign assessment and serial physical examination may be equally or more effective than prophylactic drainage, and (3) modern emergency response protocols enable safe management of bleeding complications even without prophylactic drains [16, 17].

Study Limitations

Several limitations merit discussion. First, this was a single-center study; findings may not generalize to all tertiary hospitals in Bangladesh with varying surgical volumes, expertise, and patient demographics. Second, follow-up was limited to 4 weeks; longer-term outcomes such as permanent hypothyroidism and keloid scar formation require extended follow-up. Third, the study was conducted by experienced thyroid surgeons (≥5 years experience); outcomes in hands of less experienced surgeons remain unclear. Fourth, this study did not specifically examine surgeries requiring concomitant neck dissection, extrathyroidal extension, or revision thyroidectomy where drain considerations may differ. Fifth, the single hemorrhage case in drain group could represent chance finding rather than systematic difference given small sample size for this rare complication.

Clinical Implications and Recommendations

Based on evidence from this trial and supporting literature, the following recommendations are proposed for clinical practice:

1. **Routine Drain Placement is Not Necessary for Uncomplicated Thyroid Surgery:** Selective drainage should be reserved for specific high-risk situations including: concomitant neck dissection, significant intraoperative bleeding, coagulation disorders, or extensive lymph node involvement.
2. **Clinical Monitoring Protocols Should Replace Prophylactic Drainage:** Hourly vital sign monitoring for first 12 hours, serial neck examination assessing for asymmetry/swelling, and patient education regarding warning signs enables safe detection of complications.
3. **Enhanced Hemostasis Techniques and Careful Surgical Technique:** should be emphasized during surgical training and practice rather than reliance on drain placement for safety.
4. **Patient Counseling Should Emphasize Benefits of Drain-Free Approach:** including superior pain control, shorter hospitalization, and better cosmetic outcomes.
5. **Selective Drain Placement:** based on individual risk factors rather than routine practice is recommended as more appropriate evidence-based approach.
6. **Further Research:** in thyroid surgery without routine drainage, particularly in developing country contexts, is warranted to establish robust guidelines.

CONCLUSION

This prospective randomized controlled trial demonstrates that thyroidectomy without drain placement is safe and yields significantly better outcomes compared to routine drain use. The no-drain approach was associated with significantly reduced postoperative pain at 6, 24, and 48 hours, a 47% shorter hospital stay, lower analgesic requirements, and higher cosmetic satisfaction at 4-week follow-up (91.7% vs 67.8%), all statistically significant ($p<0.001$). Importantly, postoperative complication rates were comparable between groups (8.5% vs 10.2%, $p=0.156$). These findings indicate that routine prophylactic drain placement in uncomplicated thyroidectomy offers no clear benefit and may increase patient morbidity. Therefore, a selective, risk-based approach to drain use is recommended, rather than routine placement in all cases.

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