

# Sutureless Thyroidectomy Using Electrosurgical Devices

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## ABSTRACT

**Background:** The thyroid gland being an extremely vascularized organ in nature, the surgical manipulations can lead to serious complications in terms of intraoperative bleeding to further serious complications like recurrent laryngeal nerve injury. The advancement in developing vessel sealing devices is ideally suitable for the extensive vascular network of the thyroid.

**Objective:** This study aimed to compare the various perioperative and postoperative complications in sutureless and conventional thyroidectomy procedures.

**Materials and methods:** This was a hospital-based cohort study comparing two groups, conventional and sutureless thyroidectomy performed in the Department of General and Minimal Invasive Surgery at Sher-I-Kashmir Institute of Medical Sciences, Srinagar, within a time period of 3 years. The patients were followed for outcome variables. The studied variables were type of surgery, age, gender, postoperative calcium levels, time for surgery, intraoperative bleeding, hospital stay, hematoma formation, neurovascular deficit, or any other.

**Results:** The mean age in years was 34 years for group S and 36 years for group C with female preponderance. There was a significant difference with regard to operative time, intraoperative blood loss, and hospital stay ( $p < 0.001$ ). Harmonic Scalpel shortens the operative time. Hospital stay was shorter in group S compared with group C.

**Conclusion:** Sutureless thyroidectomy using electrosurgical devices tends to be more effective and safe in terms of blood loss, operative time, and hospital stay than conventional thyroidectomy using suture ligation.

**Keywords:** Conventional, Sutureless, Thyroidectomy.

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## INTRODUCTION

The thyroid gland is extremely rich in vascularization, supplied by the superior and inferior thyroid arteries, branching from the external carotid artery and thyrocervical trunk, respectively. The vessels lie between the fibrous capsule and a loose facial sheath. The superior thyroid artery descends to the superior poles of the gland, pierces the pretracheal layer of deep cervical fascia, and divides into anterior and posterior branches supplying mainly the anterosuperior aspect of the gland. Both the superior and inferior thyroid arteries anastomose bilaterally at the gland, giving it a dual blood supply.

The thyroid gland is particularly susceptible to environmental influences and, therefore, is unique among the endocrine glands as far as direct environmental impact. The thyroid gland secretes hormones that play multifarious roles in the development of organs and also controls the prime physiological mechanisms like growth and energy outlay of the body.<sup>1</sup>

Diseases of the thyroid gland include conditions associated with excessive release of thyroid hormones, thyroid hormone deficiency, and mass lesions of the thyroid. Most medical conditions of the thyroid are managed conservatively, while conditions like goiter-causing compression symptoms and suspicious or malignant thyroid nodule need surgical manipulation. Thyroidectomy is the most-performed operation in endocrine surgery. Thyroidectomy is the most common endocrine surgery performed as the treatment of choice for various thyroid lesions. Thyroid gland being a highly vascular organ in nature, the surgical manipulations can lead to serious complications in terms of intraoperative bleeding to further serious complications like recurrent laryngeal injury (RLN). Inadvertent damage to the parathyroid glands during the procedure can lead to prolonged periods of hypocalcemia,

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which if not managed within limited time, can lead to life-threatening tetany. Hence, it can be incurred that most of the complications related to surgery of the thyroid gland are a consequence of uncontrolled hemorrhage, both intraoperatively and postoperatively. The progress in evolving vessel sealing devices for the control of vessel pedicles is taking over the use of traditional techniques used for vessel ligation in a surgical procedure diversity.<sup>2</sup> Having the extensive vascular network of the thyroid gland, thyroidectomy procedures are preferably suited for the new vessel-sealing technologies. Sutureless procedures in

thyroidectomy have gained ground in the last two decades in terms of increased surgical outcomes and decreased complication risk. The efficacy and safety of using sutureless devices like Harmonic-scalpel® and Ligasure® have been assured in innumerable research literature.<sup>3</sup> Providing good hemostasis in a highly vascular surgical field and better safety, sutureless thyroidectomy is being widely practiced.<sup>4</sup> There is an abundance of literature on the usage and outcomes of electrosurgical devices in thyroidectomy. As compared with foreign countries, India verifies a limited literature on sutureless thyroidectomy. This is the first research study on sutureless thyroidectomy from our region, Kashmir. The purpose of this study was to compare the outcome of the use of Harmonic® FOCUS and conventional suture ligation technique in a prospective comparative study of open total/hemithyroidectomy.

## MATERIALS AND METHODS

The study was done in the Department of General and Minimal Invasive Surgery at Sher-I-Kashmir Institute of Medical Sciences (Deemed University), Srinagar, Kashmir. The Institutional Medical and Ethics Committee consent was obtained before collecting the data. This was a prospective, observational, and comparative study, conducted over 3 years from June 2019. Written and informed consent was taken from all patients enrolled in the study. Preoperative investigations concentrate on thyroid hormones when indicated and serum calcium. Preoperative radiological assessment includes neck ultrasound, chest plain X-ray, and abdominal ultrasound. In addition, a vocal cord examination was routinely done. Finally, preoperative fine-needle aspiration cytology was conducted.

### Inclusion Criteria

Both male and female patients with an age of  $\geq 20$  years were enrolled in the study. Patients who underwent hemithyroidectomy or total thyroidectomy for benign or malignant disease in the Department of General and Minimal Invasive Surgery at SKIMS were enrolled.

### Exclusion Criteria

We excluded patients  $< 20$  years, patients with retrosternal extension, patients with previous neck irradiation, patients with vocal cord dysfunction, patients with hypocalcemia, patients with recurrent goiter, patients received hemithyroidectomy or subtotal thyroidectomy or total thyroidectomy for malignant disease with extra thyroid extension, and patients with coagulopathies.

### Study Samples and Surgical Techniques

This was a hospital-based cohort study comparing two groups, conventional and sutureless thyroidectomy. The patients were followed for outcome variables. The studied variables were type of surgery, age, gender, postoperative calcium levels, time for surgery, intraoperative bleeding, hospital stay, hematoma formation, neurovascular deficit, or any other.

For sutureless thyroidectomy, first, the cricothyroid space was dissected, then the external laryngeal nerve was dissected and identified. If the nerve is not identified even after 10 minutes of searching, then we go for the next step, which involves skeletonization and identification of its individual branches, thereafter RLN is to be identified. Parathyroid with its blood supply was safeguarded. All vessels were diathermized with bipolar diathermy/other electrosurgical devices flush to the surface of thyroid (capsular) (hand harmonic).

The patients were divided into two groups: Group S using sutureless technique, bipolar cautery, and ultrasonic scalpel/ligasure, and Group C using conventional methods. The duration of surgery was estimated from skin incision to closure. The decision on drain placement was taken intraoperatively. The patients were discharged later and observed for follow-up.

### Statistical Analysis

We used Statistical Package for Social Sciences (SPSS Inc., version 16, Chicago, US), for statistical analysis. Data were summarized as the mean  $\pm$  standard deviation (SD) for numerical variables and number (percentage) for non-parametric variables. Student's *t*-test and Chi-square test were used to compare variables. The cutoff for significance of all used statistical analyses was rated as  $p \leq 0.05$ ,  $p = 0.001$  was rated as highly significant, and  $p > 0.05$  was rated as not significant.

## RESULTS

Out of 130 procedures done in the Department of General and Minimal Invasive Surgery, 39% ( $n = 51/130$ ) were sutureless procedures, and 61% ( $n = 79/130$ ) were conventional procedures. The mean age for sutureless thyroidectomy (group S) was 34 years and for conventional thyroidectomy (group C) was 36 years ( $p$ -value  $< 0.19$ ), which was statistically unsatisfactory.

In sutureless procedures (group S), 31% ( $n = 16/51$ ) were males, and 69% ( $n = 35/51$ ) were females, while as in conventional procedures (group C), 18% ( $n = 14/79$ ) were males, and 82% ( $n = 65/79$ ) were females.

Out of 51 sutureless procedures (group S), 72.5% ( $n = 37/51$ ) were hypothyroid, and 27.3% ( $n = 14/51$ ) were euthyroid. Out of 79 conventional procedures (group C), 86% ( $n = 68/79$ ) were hypothyroid, and 14% ( $n = 11/79$ ) were euthyroid.

Out of 51 sutureless procedures (group S), 31.4% ( $n = 16/51$ ) were benign, and 68.6% ( $n = 35/51$ ) were malignant. Out of 79 conventional procedures (group C), 10% ( $n = 8/79$ ) were benign, and 90% ( $n = 71/79$ ) were malignant.

Out of 51 sutureless procedures (group S), 41% ( $n = 21/51$ ) underwent total thyroidectomy, and 59% ( $n = 30/51$ ) underwent hemithyroidectomy. Out of 79 conventional procedures (group C), 30% ( $n = 24/79$ ) underwent total thyroidectomy, and 90% ( $n = 71/79$ ) underwent hemithyroidectomy.

In our study, the mean operative time in sutureless thyroidectomy (group S) was 64 minutes, and conventional thyroidectomy (group C) was 107 minutes. The mean intraoperative bleeding in sutureless thyroidectomy was 32.3 mL, and in conventional thyroidectomy was 49.5 mL.

In this present study, where we had 51 sutureless procedures and 79 conventional procedures, none of the patients had hematoma formation.

Out of 130 patients, 4.6% ( $n = 6/130$ ) of patients developed temporary/transient hypocalcemia, which included 5% ( $n = 2/51$ ) of group S and 5% ( $n = 4/79$ ) of group C.

Out of 51 patients in group S, 3.9% ( $n = 2/51$ ) patients presented with immediate postoperative HOV, and among 79 patients in group C, 6.4% ( $n = 5/79$ ) shown in Table 1.

## DISCUSSION

The efficacy and safety of using sutureless devices like Harmonic-scalpel® and Ligasure® have been assured in innumerable research literature. Providing good hemostasis in a highly vascular surgical

**Table 1:** Comparison of sutureless thyroidectomy (group S) and conventional thyroidectomy (group C)

| Variables                          | Group S (n = 51) | Group C (n = 79) | p-value |
|------------------------------------|------------------|------------------|---------|
| Age in years                       | 34               | 36               | –       |
| Gender (Male:Female)               | 16:35            | 14:65            | –       |
| Hypothyroid (M:F)                  | 2:35             | 13:55            | –       |
| Disease pattern (Benign:Malignant) | 18:33            | 8:71             | –       |
| HT/TT                              | 21:30            | 24:55            | –       |
| Duration of surgery (minutes)      | 64               | 107              | ≤0.0001 |
| Intraoperative bleeding (mL)       | 32.37            | 49.56            | ≤0.0001 |
| Hematoma formation                 | None             | None             | –       |
| Hypocalcemia (temporary/permanent) | 2:0              | 4:0              | –       |
| HOV                                | 2/51             | 5/79             | –       |

Group C, conventional thyroidectomy; Group S, sutureless thyroidectomy; HOV, hoarseness of voice; HT/TT, hemithyroidectomy procedures/total thyroidectomy procedures; M:F, male:female

field and better safety, sutureless thyroidectomy is being widely practiced. Dissection, ligation, and separation from main vessels in a thyroidectomy usually take a longer time. In our study, the mean operative time in group S was 63.63 minutes (SD ± 19.4), whereas in group C, it was 106.61 minutes (SD ± 35.1), which shows that sutureless thyroidectomy shortened the operative time. The difference between two groups was 43 minutes, *p*-value 0.001, statistically significant. This was similar to Ferri et al., who observed that the mean operative time was shorter in the HS group (44.9 ± 8.3 minutes) compared with the CH group (69.5 ± 107 minutes) and the study of Ali MNM et al., Aziz W et al., Chang et al., and Luo et al.<sup>4-8</sup>

In our study, the mean amount of intraoperative bleeding in group S was 32.37 mL (SD ± 10.19), and in conventional group C, it was 49.56 mL (SD ± 11.09), *p*-value 0.0001, statistically significant. The results were in accordance with the study of Ali MNM et al., Aziz W et al., and Mohamed WBA et al.<sup>4,6,9</sup>

In our study, we did not find the complication of postoperative hematoma formation in any of the patients, either in the sutureless nor in the conventional group.

In our study, the mean duration of hospital stay was shorter in group S (2.6 ± 1 days) than group C (2.7 ± 0.6 days), *p*-value 0.599, statistically insignificant. The hospital stay of the patients results from postoperative complications in the operated patients. In our study, the overall complication rate was very low in both the group S and group C, the results were in accordance with the study of Mohamed WBA et al., Mohamed SS et al., and Amer I et al.<sup>9-11</sup>

In our study, 2/51 patients developed temporary/transient hypocalcemia in group S and 4/79 in group C. None among the 130 patients developed permanent hypocalcemia, which can be explained possibly because of the following reasons: (i) complete preservation of parathyroid gland with vascular supply, (ii) autotransplantation in selected patients, and (iii) patients with a history of irradiation neck, redo surgery, and neck dissection were not enrolled in the study. The results were in accordance with the study of Ali MNM et al., Chang et al., Garas et al., Saneen et al.<sup>4,7,12,13</sup>

In our study, 3.9% (*n* = 2/51) patients in group S and 6.3% (*n* = 5/79) in group C developed hoarseness of voice in the immediate postoperative period. On follow-up of 6 months, all 7/130 patients recovered with time. None of the patients developed permanent hoarseness of voice in our study. Similar results were found in the study of Ferri E et al., Ali MNM et al., Chang et al., and Uludag et al.<sup>4,5,7,14</sup>

In our study, we analyzed 130 patients of thyroidectomy, and none of the patients had complications of surgical-site infection or wound infection. There are various studies, Al-Dhahiry et al. and Ruggiero R et al., who had complications of wound-site infection but usually in a small number of patients.<sup>15,16</sup>

## CONCLUSION

Considering the electrosurgical devices, we found that it is effective in terms of both hemostasis and duration of the procedure. We also observed shorter hospital stay in sutureless thyroidectomy as compared with conventional technique thyroidectomy.

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