

ORIGINAL ARTICLE

Safety and Feasibility of Sutureless total Thyroidectomy

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ABSTRACT

Keywords: Thyroid Gland, thyroidectomy, sutureless, LigaSure.

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Background: The thyroid gland is one of the highly vascular tissues in the body. Total thyroidectomy (TT) is the gold standard for the surgical treatment of many thyroid disorders. There is no change occurred in the technique of total thyroidectomy, but using Harmonic Scalpel, LigaSure, or cutting and hemostasis are new approaches to vessel ligation and division. sutureless thyroidectomy becomes a competitor for the conventional technique. **Aim and objectives:** to compare the use of the sutureless technique by LigaSure versus Conventional Suture Ligation in thyroid surgery in terms of operative time, drainage volume, complications, and duration of hospital stay. **Subjects and methods;** This was a Prospective comparative study, on 60 patients divided into 2 groups: (Group 1); patients had sutureless thyroidectomy (S group), (Group 2); patients had conventional thyroidectomy (C group). **Result:** There was an insignificant difference between both groups as regards Surgical complications. **Conclusion:** Sutureless thyroidectomy is a safe and efficient way of performing total thyroidectomy. LigaSure was significantly advantageous over conventional techniques in reducing operation time as well as perioperative and postoperative blood loss and parathyroid injury. The reduction of operative times resulted in decreased operating room occupancy costs but the overall cost of surgery was significantly higher in the LigaSure group.

INTRODUCTION

Total thyroidectomy (TT) is the commonest operation in endocrine gland surgery. It is the most convenient therapeutic choice in the treatment of many thyroid disorders through surgical interference (1). As the thyroid gland is one of the most vascularized organs it requires meticulous hemostasis during removal to preserve the parathyroid glands and recurrent laryngeal nerves (2).

Nowadays there is a trend toward time-saving techniques, with less use of conventional knot-tying or suture ligation to reduce anesthesia time. Several alternative methods, such as bipolar electrocautery, Harmonic Scalpel (HS), LigaSure (LS), and laser techniques have been tried to achieve hemostasis with promising results and less operative time (3).

In the traditional technique, the hemostasis relies on knot tying and electrocoagulation; both are the most frequently used methods to control bleeding. Whereas suture ligation is a time-consuming procedure and carries the risk of knot slipping, electrocautery implies the potential risk of injuring surrounding tissues because of heat dispersion (4)

Recently, innovative vessel sealing devices including the harmonic scalpel, and the LigaSure vessel sealing system (LVSS) have been recommended to give a valuable contribution in terms of accuracy of hemostasis, reduction of operative time, postoperative pain and safety.(5)

The Harmonic scalpel is one of the first devices for surgical simultaneous cutting and tissue coagulation which allows obtaining dissection and hemostasis by direct application of ultrasonic waves and allows minimally invasive surgical procedures with minimal lateral thermal spread and, thus, minimal adjacent tissue destruction (6).

Electrothermal bipolar vessel sealing (LigaSure) has proven to be safe and effective for "sealing" medium-sized vessels. The Ligasure instruments utilize a high current, low-voltage bipolar radiofrequency energy, in combination with a feedback-controlled response system that automatically delivers and disrupts the power according to the composition and impedance of the tissue between the jaws of the instrument (7).

AIM OF THE WORK

This work is designed to compare the use of the sutureless technique by LigaSure versus Conventional Suture Ligation in thyroid surgery in terms of operative time, drainage volume, complications (in the form of post-operative bleeding, hematoma, seroma, infection, recurrent laryngeal nerve injury, superior thyroid nerve injury, and hypoparathyroidism) and duration of hospital stay.

PATIENTS AND METHODS

Study Setting and Designs

A Prospective comparative study on Systematic random sampling was conducted in the period from September 2020 to March 2021 carried out at Aswan University Hospital, Aswan, Egypt.

Participants

This study was performed on 60 Egyptian patients. The first group: was patients who had sutureless thyroidectomy (S group) while; the Second group: was patients who had conventional thyroidectomy (C group). All patients with thyroid disease candidates for TT presented to General Surgery Department at Aswan University Hospital was included. However; the need for central or lateral compartment lymphadenectomy, previous neck irradiation, recurrent goiter and Malignant goiter, ablation with radioiodine, and hemithyroidectomy are excluded.

Sample Size

The sample size was calculated at Aswan University Hospital, Sixty patients will be included in the study, and Thirty subjects will be included in each group.

Methods

All included patients subjected to Clinical assessment; History: complete history taking: age, sex, residency, occupation, smoking or ex-smoker, presenting complaint, jaundice, itching, abdominal pain, weight loss, Goiter. History of another autoimmune disease. Family history: Family or personal hx of thyroid disease. Clinical examination: Vocal cord mobility was checked preoperatively, general examination; Respiratory rate, pulse, blood pressure and temperature Laboratory assessment: (routine and general evaluation tests): CBC, Serum creatinine, prothrombin concentration, TSH, free T4, T3, and Serum Ca ++. Imaging: Neck ultrasound and Thyroid scan.

Thyroid examination:

Inspection: Anterior Approach: The patient should be seated or standing in a comfortable position with the neck in a neutral or slightly extended position. Cross-lighting increases shadows, improving the detection of masses. To enhance visualization of the thyroid, you can: Extend the neck, which stretches overlying tissues. the patient swallow a sip of water, watching for the upward movement of the thyroid gland. **Lateral Approach:** we observed the neck from the side, the smooth, straight contour from the cricoid cartilage to the suprasternal notch and We measured any prominence beyond this imagined contour, using a ruler placed in the area of prominence.

Palpation: Anterior Approach: the patient is examined in the seated or standing position; Attempt to locate the thyroid isthmus by palpating between the cricoid cartilage and the suprasternal notch. We used one hand to slightly retract the sternocleidomastoid muscle while using the other to palpate the thyroid. The patient swallowed a sip of water as we palpated, feeling for the upward movement of the thyroid gland. **Posterior Approach:** The patient was examined in the seated or standing position, we stood behind the patient, attempting to locate the thyroid isthmus by palpating between the cricoid cartilage and the suprasternal notch. We moved hands laterally to try to feel under the sternocleidomastoid for the fullness of the thyroid. The patient swallowed a sip of water as we palpated, feeling for the upward movement of the thyroid gland.

Procedure and Devices

LigaSure vessel sealing system (LVSS) is a method of bipolar hemostasis that denatures the collagen and elastin of the vascular wall and the connecting tissue around the vessels. The tissues are then merged. This technology can coagulate vessels that have a diameter less than or equal to 7 mm (Lachance et al; 2005). The patient is positioned with the neck extended. Rolled towels are placed under the shoulders. A sponge doughnut is placed under the occiput. The head of the table is elevated to a 30° position during surgery (reverse Trendelenburg/Rose/Barking dog/Kocher's position). General anesthesia is administered through an endotracheal tube and good muscle relaxation is obtained. Each patient will be numbered either 1, 2, or 3 to allocate which technique will be used for them, patient number 1 will be treated by the CS technique, and patient number 2 will be treated by a sutureless technique using LigaSure technique, then patient number 3 will be treated by CSL technique and so on. The surgical technique required a minimally invasive Thyroidectomy approach (3-5 cm incision). CT (Conventional Thyroidectomy) requires a greater incision. After the division of the platysma muscle, the cervical linea alba was opened. Very large goiters necessitated a division of strap muscles. The lobe of the thyroid gland was progressively dissected away from strap muscles, its vascular pedicles were ligated with Vicryl 2/0 suture or coagulated and divided with HS or LS. The thyroid lobe was progressively dissected off the trachea after the recurrent laryngeal nerves and parathyroid glands were identified and dissected off the thyroid capsule. After securing hemostasis, a suction drain was routinely put in the thyroid bed as a part of the study protocol to measure the amount of blood loss during the first 24h. The cervical linea alba and platysma muscle were closed with Vicryl 3/0 and the skin was closed by an intracutaneous running suture. The duration of surgery was estimated in minutes from skin incision to skin closure. ligatures on all vessels including the superior thyroid artery were performed with these techniques. a really important step of the study was controlling the hemostasis obtained with both techniques.

Post-operative

Patients have been followed up clinically by : a manifestation of hypocalcemia. Signs of hemorrhage or hematoma Change of voice or stridor or choking, suction drainage for the 1st 24 hours , The level of Ca⁺⁺ after 24 hours, and Hospital stay. Late after six months, we will follow up: Serum Ca⁺⁺, serum parathormone, and change of voice.

Statistical analysis

Analysis of data was done using Statistical Program for Social Science version 20 (SPSS Inc., Chicago, IL, USA). Quantitative variables were described in the form of mean and standard deviation. Qualitative variables were described as numbers and percentages. To compare parametric quantitative variables between two groups, the Student t-test was performed. Qualitative variables were compared using the chi-square (X^2) test or Fisher's exact test when frequencies were below five. Pearson correlation coefficients were used to assess the association between two normally distributed variables. When a variable was not normally distributed, A P value < 0.05 is considered significant

Ethical consideration

Informed consent from all participants was taken and confidentiality of information was assured. An official written administrative permission letter was obtained from the dean of the faculty of

medicine, Aswan university hospital. The title and objectives of the study were explained to them to ensure their cooperation. Permission from the ethical committee of the Faculty of Medicine at Aswan

RESULTS

This study were carried out at Aswan University Hospital, Aswan, Egypt, 60 patients were underwent thyroidectomy divided into 2 groups: (Group 1); patients had sutureless thyroidectomy (S group), (Group 2); patients had conventional thyroidectomy (C group).

Our study revealed that; Demographic data among included groups were tabulated and statistically analyzed. In **Table (1)**: The mean of Age were represents 35.4 ± 5.2 in group S, while; represents 36.2 ± 4.8 in group C; were $T = 1.17$ as test of significance among included group with p value > 0.66 . The number of case were varied between both sex; male and female, 4 male and 36 female in group S while; 3 male and 27 female in group C. There was an insignificant difference between both groups as regard age or sex. In **Table (2)**: Anthropometric data represented that; the mean of weight in group S were represents 77.4 ± 4.2 while in group C were represents 76.2 ± 4.8 ; were $T = 1.306$ as test of significance with p value > 0.47 . Although, the mean of BMI in group S were represents 26.4 ± 2.2 while in group C were represents 26.7 ± 2.1 ; were $T = 1.097$ as test of significance with p value > 0.80 . There was an insignificant difference between both groups as regard Weight or BMI. In **Table (3)**: the test of significance in the pathology of carcinoma among groups represents $\chi^2 = 0.27$ with p value > 0.60 , in the pathology of adenoma=neoplasm among groups represents $\chi^2 = 0.13$ with p value > 0.71 , in the pathology of simple nodular goiter among groups represents $\chi^2 = 0.28$ with p value > 0.59 , in the pathology of toxic goiter among groups represents $\chi^2 = 0.13$ with p value > 0.71 and in the pathology of inflammatory among groups represents $\chi^2 = 0.35$ with p value > 0.55 . There was an insignificant difference between both groups as regards the Pathology of studied cases. In **Table (4)**: the mean of comparative preoperative data were analyzed; calcium level were represents 9.1 ± 1.0 in group S, while represents 9.2 ± 1.2 in group C, $T = 1.44$ as test of significant with p value > 0.33 , TSH level were represents 6.2 ± 0.6 in group S, while represents 6.4 ± 0.75 in group C, $T = 1.56$ as test of significant with p value > 0.23 , T3 level were represents 1.5 ± 0.3 in group S, while represents 1.4 ± 0.2 in group C, $T = 2.25$ as test of significant with p value < 0.05 , T4 level were represents 165 ± 12.5 in group S, while represents 167 ± 15.7 in group C, $T = 1.574$ as test of significant with p value < 0.22 and serum creatinine level were represents 1.05 ± 0.2 in group S, while represents 1.07 ± 0.21 in group C, $T = 1.10$ as test of significant with p value < 0.79 . There was an insignificant difference between both groups as regards preoperative data of studied cases. In **Table (5)**: the mean of postoperative data were analyzed; operative time were represents 66 ± 3.2 in group S, while represents 96 ± 4.2 in group C, $T = 1.722$ as test of significant with p value > 0.14 , the test of significance in the temporary and permanent hypocalcemia among groups represents $T = 3.6$ with p value > 0.24 and hospital stay were represents 2.95 ± 0.2 in group S, while represents 3.94 ± 0.25 in group C, $T = 1.56$ as test of significant with p value > 0.23 . There was an insignificant difference between both groups as regards operative time, hypocalcemia and hospital stay of studied cases. However; the mean of parathormone postoperative were represents 3.4 ± 0.19 in group S, while represents 2.3 ± 0.1 in group C, $T = 3.61$ as test of significant with p value $< 0.001^*$, There was a significant difference between both groups as regard Parathormone postoperative. In **Table (6)**: the test of significance in the surgical complications of haemorrhagia among groups represents $\chi^2 = 1.96$ with p value > 0.16 , in the surgical complications of seroma among groups represents $\chi^2 = 2.96$ with p value > 0.08 , in the pathology of simple nodular goiter among groups represents $\chi^2 = 0.28$ with p value > 0.59 , in the surgical complications of transient hypocalcemia among groups represents $\chi^2 = 0.35$ with p value > 0.55 and in the surgical complications of definitive hypocalcemia among groups represents $\chi^2 = 1.07$ with p value > 0.30 . There was an insignificant difference

between both groups as regards the surgical complications of haemorrhagia, seroma, transient and definitive hypocalcemia. However; there was no significant difference among both groups as regard the surgical complication of hematoma and wound infection; due to the presence of only 2 cases of each hematoma and wound infection on group C.

Table (1): Demographic data of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Age	35.4 ± 5.2	36.2 ± 4.8	T=1.17	0.66
Sex			X ² =0.067	0.79
Male	4	3		
Female	36	27		

Table (2): Anthropometric data of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Weight	77.4 ± 4.2	76.2 ± 4.8	T=1.306	0.47
BMI	26.4 ± 2.2	26.7 ± 2.1	T=1.097	0.80

T: Two-Sample Independent t Test

Table (3): Pathology of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Carcinoma	14	12	X ² =0.27	0.60
Adenoma=neoplasm	4	5	X ² =0.13	0.71
Simple nodular Goiter	12	10	X ² =0.28	0.59
Toxic goiter	5	4	X ² =0.13	0.71
Inflammatory	2	1	X ² =0.35	0.55

Table (4): Comparative preoperative data of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Preoperative calcium level (mg/dl)	9.1±1.0	9.2±1.2	T=1.44	0.33
TSH	6.2±0.6	6.4±0.75	T=1.56	0.23
T3	1.5±0.3	1.4±0.2	T=2.25	0.05
T4	165±12.5	167±15.7	T=1.574	0.22
Serum. Creatinine	1.05±0.2	1.07±0.21	T=1.10	0.79

T: Two-Sample Independent t Test

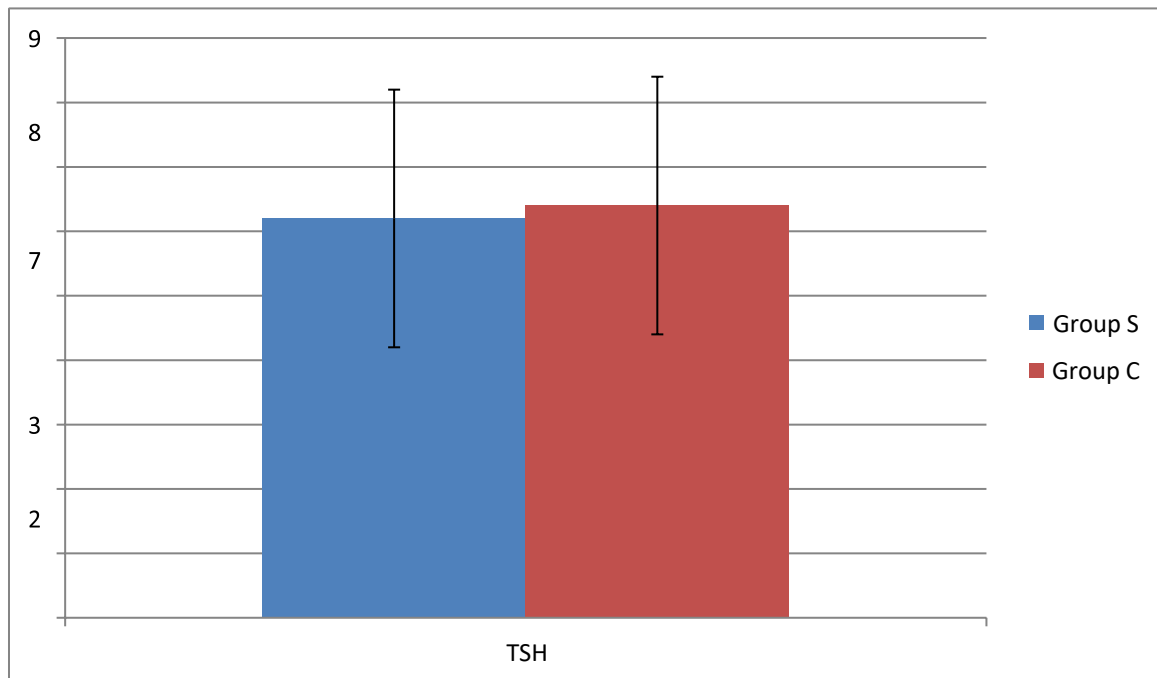


Fig. (1): TSH of both groups

Table (5): Postoperative evaluation data of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Operative time (min)	66 ± 3.2	96 ± 4.2	T=1.722	0.14
Hypocalcemia			T= 3.6	0.24
Temporary	0	5		
Permanent	0	1		
Parathormone postoperative (GR)	3.4±0.19	2.3±0.1	T=3.61	0.001*
Hospital stay (days)	2.95 ± 0.2	3.94 ± 0.25	T=1.56	0.23

T: Two-Sample Independent t Test

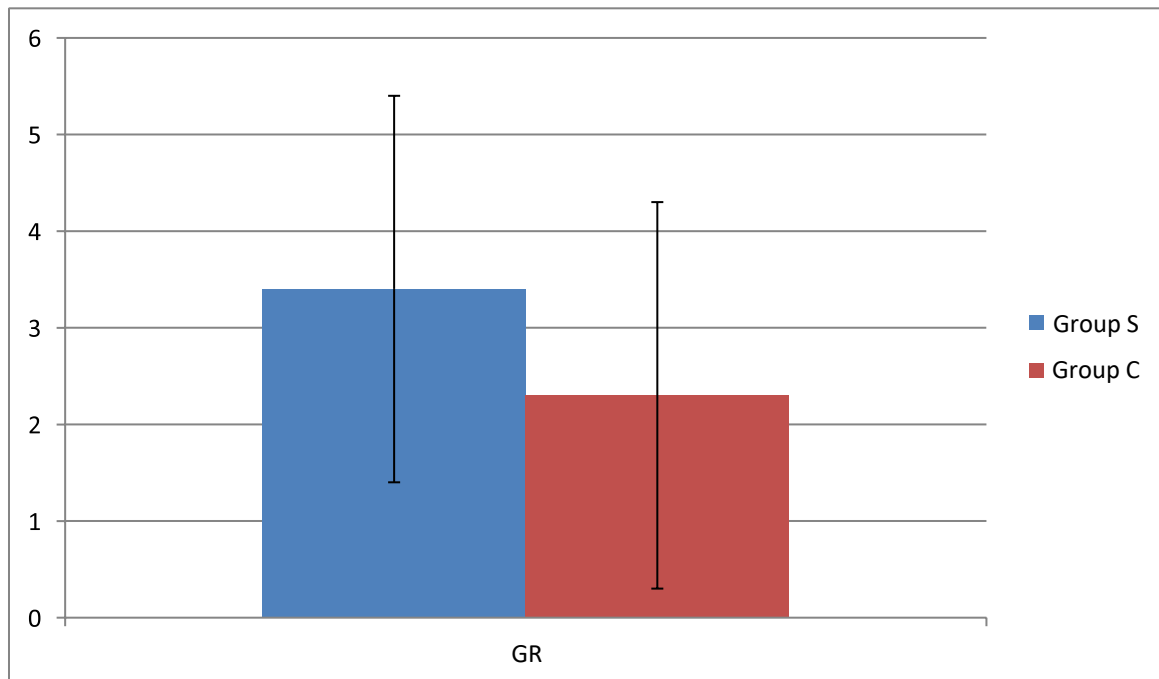


Fig (2): Parathormone postoperative of both groups

Table (6): Surgical complications of studied cases

Data	Group S (n=30)	Group C (n=30)	Test of significance	P value
Haemorrhagia	1	1	X ² =1.96	0.16
Seroma	1	5	X ² =2.96	0.08
Hematoma	0	2	-	-
Wound infection	0	2	-	-
Transient hypocalcemia	1	2	X ² =0.35	0.55
Definitive hypocalcemia	1	3	X ² =1.07	0.30

X²: Chi-Square

DISCUSSION

The thyroid gland is one of the human body's most vascularised glands. The removal requires careful hemostasis to avoid intraoperative complications and obtain good visualization of the surgical field and preserve the parathyroid glands and recurrent laryngeal nerves (8)

The study aims to compare the use of the sutureless technique by LigaSure versus Conventional Suture Ligation in thyroid surgery. This comparison will be in terms of operative time, drainage volume, complications (in the form of post-operative bleeding, hematoma, seroma, infection, recurrent laryngeal nerve injury, superior thyroid nerve injury , hypoparathyroidism and duration of hospital stay.

This study revealed that there was an insignificant difference between both groups as regard age or sex.

In a study by **Chang et al. (2021)** operated on 92 patients with thyroid disease needing surgical care and meeting our inclusion criteria patients were divided into two classes: Sutureless group total thyroidectomy and traditional group total thyroidectomies 50 patients (54.3 percent) had a sutureless overall thyroidectomy and 42 patients (45.6 percent) had a traditional overall thyroidectomy, with a mean age of (42.53±12.139) years for sutureless thyroidectomy and (45.74 ± 13.952) years for a traditional community, p = 0.166 insignificant . Within the thyroidectomy group, Sutureless 46 were female and 4 were male while 37 were female and 5 were male in the traditional community, p-value = 0.582 was insignificant (9).

This study reported that there was an insignificant difference between both groups as regards the Pathology of studied cases.

In agreement with our results, **Sitges-Serra et al. (2021)** showed that there was an insignificant difference between both groups as regard indications for surgery in both groups (10).

Zarbeczan et al. (2018) showed histology revealed a benign disease in 334 cases (multinodular goiters, Hashimoto's thyroiditis, and Basedow disease) and 76 cases of malignancy (papillary and follicular carcinoma). There were no significant differences between the two groups regarding age, sex, serum calcium values pre-and post-surgery, reoperations, weight and diameter of the thyroid specimen, and final histopathologic diagnosis. This study showed that there was an insignificant difference between both groups as regards preoperative data of studied cases (11).

Trivedi (2019) showed that the comparative preoperative data (Preoperative calcium level (mg/dl) between the two groups were the same in both groups (12).

This study reported that there was a significant difference between both groups as regard Parathormone postoperative, insignificant as regard hospital stay and operative time.

Ruggiero et al. (2021) showed that the average hospital stay was similar in group A and group B (2.3 days). Incidence of complications didnot differ significantly in each group: in Group A two patients (1%) with recurrent transient paralysis, regressed over 6e8 weeks, one patient (0.5%) reoperated for incurred bleeding during the first 6 h post-surgery; transient hypocalcemia has been observed in 36 (18%) patients of whom 18 (9% of total) asymptomatic, however, normalized in 3 months bymedical therapy with oral calcium and vitamin D. In disagreement with our results, there was insignificant difference between both groups as regard Parathormone postoperative (13).

An analysis by **Uludag et al. (2017)** showed sutureless and traditional suture ligation operating times; mean \pm SD was 55.40 \pm 7.894 minutes and 108.14 \pm 1.186 minutes respectively with a mean \pm SD of the total 81.77 \pm 9.54 P-value is 0.0001. There was a significant statistical difference (14).

Test by **Al-Dhahiry et al. (2016)** operating period of suture-free and standard suture ligation groups; mean \pm SD was 92.5 \pm 1.8 and 113 \pm 10.9 respectively. They were longer than our two groups, with a statistically meaningful difference. 3 patients (3.75%) developed wound infection; 2 patients in the conventional suture ligation group and 1 patient in the suture-free group. The P-value = 0.331 had no statistical meaning for this. They were viewed conservatively (15).

Total thyroidectomies performed with the sutureless techniques in this study had less postoperative pain. The patients in the sutureless groupconsumed NSAIDS ampoules during the first 24 hours less than in the conventional suture ligation group.

The need for more than two ampoules during the first 24 hours showed a significant reduction in the sutureless group (2,6.7%) than in the conventional suture ligation group (10,28.6%), the P-value was 0.039 (16).

CONCLUSION

Sutureless thyroidectomy is the procedure of choice for the treatment of thyroid diseases as it had a shorter operative time, overall complications rate, and good functional

results. The use of the ligasure was a rapid method for performing total thyroidectomy because it is bloodless, and the combined hemostasis and sectioning in a single instrument. Although the tools are expensive the reduction of operative time and staff cost makes it cumulatively inexpensive.

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