

OUTCOMES OF THE VESSEL SEALING DEVICE VERSUS THE CONVENTIONAL TECHNIQUE IN THYROIDECTOMY

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ABSTRACT

Background: Total thyroidectomy is regarded as the preferred treatment for thyroid malignancies and also for benign thyroid disorders that need surgery. Total thyroidectomy is still considered a challenging procedure to do because it has more complications than other types of surgery. This study compares vessel sealing device (VSD) and conventional knot tying, evaluating their effectiveness in clinical outcomes, focusing on hemostasis, surgery time, bleeding, and postoperative recovery in thyroid disease patients.

Methods: This prospective cohort, non-randomized study enrolled 100 patients diagnosed with thyroid gland disorders and assigned to one of two surgical techniques. Sixty patients underwent surgery using the VSD, while 40 received the conventional suture ligation technique in the Kurdistan Region, Iraq, in 2025. Outcomes were compared both intraoperatively and postoperatively.

Results: Patients were similar in age, gender, goiter type, symptoms, thyroid status, imaging findings, surgery type (mostly total thyroidectomy), disease duration, and preoperative diagnostics (Thyroid Imaging Reporting and Data System (TIRADS) / Fine Needle Aspiration Cytology (FNAC) preoperatively. VSD significantly reduced surgery duration (59.25 vs. 95.63 min; $p < 0.0001$), with 40% requiring no sutures versus 0% in the conventional group ($p < 0.0001$). Drainage was less frequent with VSD (76.67% vs. 100%; $p = 0.0006$) with similar hospital stay. Postoperative pain was milder with VSD (80% mild vs. 30% in conventional; $p < 0.0001$). Moderate pain was higher in the conventional group (57.5% vs. 20%; $p < 0.0001$). Intraoperative bleeding was higher with VSD (33.33% vs. 12.50%; $p = 0.0200$), but postoperative bleeding and seroma were absent in both. Complications like tingling, voice changes, and infection were low and comparable.

Conclusion: VSD reduces surgery time and pain, improves comfort, and offers similar safety to conventional thyroidectomy, despite more intraoperative bleeding, making it a valuable surgical alternative.

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Keywords: Thyroid cancer, complications, thyroidectomy

Thyroidectomy is one of the most frequently performed procedures in general and endocrine surgery, serving as the definitive treatment for a wide range of benign and malignant thyroid diseases^[1,2]. The thyroid gland has a rich vascular supply, receiving one of the highest amounts of blood per gram of tissue compared to all other organs. Consequently, achieving meticulous and secure hemostasis is a cornerstone of safe

thyroid surgery^[3]. Intraoperative or postoperative hemorrhage can lead to the formation of a neck hematoma, a rare but potentially fatal complication that can cause airway compression and asphyxia^[4]. Furthermore, the gland's intimate anatomical relationship with delicate structures, such as the recurrent laryngeal nerves (RLNs) and the parathyroid glands, demands precise dissection to prevent

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debilitating complications like vocal cord paralysis and hypocalcemia^[5].

For over a century, since the pioneering work of Theodor Kocher, the gold standard for hemostasis in thyroidectomy has been the conventional "clamp-and-tie" technique. This method involves the careful isolation, clamping, cutting, and subsequent ligation of vessels with suture material, often supplemented by electrocautery for smaller vessels. While proven effective, this traditional approach has several inherent limitations. It is a time-consuming process that can significantly prolong the operative duration, thereby increasing anesthesia exposure and operating room costs^[6,7]. Additionally, it relies on the security of knots, which carry a risk of slipping, and leaves behind foreign material (sutures and clips) that may increase the risk of fibrosis or wound infection [8]. The associated use of electrocautery also poses a risk of lateral thermal spread, which can inadvertently damage the adjacent RLNs and the fragile blood supply of the parathyroid glands^[7].

In the last two decades, significant technological advancements have led to the development and widespread adoption of energy-based devices (EBDs) for surgical dissection and hemostasis^[9]. Among these, the LigaSure™ Vessel Sealing System has become a prominent tool in thyroid surgery^[3]. This bipolar electrosurgical device combines pressure and radiofrequency energy to denature the collagen and elastin within vessel walls, creating a permanent, autologous fusion seal on vessels up to 7 mm in diameter^[10,11]. A key feature of the LigaSure™ system is its minimal lateral thermal spread, typically less than 2 mm, which is intended to reduce the risk of collateral damage to nearby critical structures^[12,11]. By allowing surgeons to seal, coagulate, and, with newer models, divide tissue with a single instrument, the device aims to minimize instrument exchange and streamline the surgical workflow^[13].

The introduction of the LigaSure™ has prompted numerous clinical trials comparing its efficacy and safety against the conventional suture-tie technique. A consistent finding across much of the literature is a significant reduction in operative time, with studies reporting time savings ranging from approximately 12 to 36 minutes^[6,2]. However, the data regarding intraoperative blood loss are more conflicted; some studies demonstrate a significant reduction in bleeding with the LigaSure™^[9], whereas others, including a major meta-analysis, found no statistically significant difference between the two methods^[2]. Similarly, while most large-scale studies conclude that the rates of major complications such as RLN injury and hypoparathyroidism are comparable between the two techniques^[14], the potential for thermal injury remains a critical point of evaluation, especially in a local context like Duhok, where such technologies are being adopted^[15].

This work aimed to compare the outcomes of using conventional knot tying vs. the LigaSure™ Vessel Sealing System in patients undergoing thyroid surgery in terms of surgical time, hospitalization, blood loss, and postoperative complications.

METHODS

Study Design, Setting, and Participants

This prospective cohort, not a randomized study, was conducted in the Department of General Surgery at Azadi Teaching Hospital in Duhok and Alzahrawi Private Hospital in Mosul, Iraq, from January 2025 to October 2025. In this study, 100 patients who were diagnosed with thyroid gland disease were included in two study groups. In this regard, 60 patients were treated with a vessel sealing device (VSD), and 40 patients were treated with a conventional knot. We included 60 and 40 patients in this study based on the time limitation, eligibility, and availability of the cases in the mentioned medical settings. The

patients received the relevant surgery techniques based on the selection of the surgeon. We included those cases in this study that met the eligibility criteria. Since the included medical settings were public settings, we had no control over the techniques used for the patients. To apply the group blinding, we selected the conventional and VSD from different cities. We recruited the patients from three different cities because Duhok and Zakho do practice conventional technique. Therefore, we had to include the patients from a city that was practicing the VSD. This is why we selected a group from Mosul. The surgery has been performed by some surgeons with more than 10 years' experience in surgery. We did not have any control over the flow of the patients and surgeons.

Sample size

We expected to include 45 patients in each study group based on the studies conducted in the literature. However, the number of cases was not under our control due to several technical challenges. In addition, the training duration did not allow us to wait for the cases more than this time.

Patients

Patients from both genders aged 18 years and above who had been diagnosed with thyroid gland disease requiring thyroidectomy were included in this study. The patients had malignant nodules, including biopsy-proven by fine-needle aspiration, nodules suspicious of thyroid cancer, symptomatic thyroid masses or goiters (compressive symptoms including dysphagia, dyspnea, shortness of breath, and hoarseness), medically refractory Graves' disease, aesthetic concerns due to a goiter, etc. In contrast, patients with recurrent goiter, previous thyroid surgery, or vocal cord paralysis were not included in the experiment. The patients in the VSD received the LigaSure diathermic device, and the patients in the conventional technique (control group) received conventional clamp-and-tie surgery.

Goiter diagnosis

Goiter vs. Thyroid Nodule: A goiter is usually an enlargement of the whole thyroid gland, while a nodule is a specific lump or growth within the gland. A nodular goiter (or multinodular goiter) means that the enlarged thyroid has one or more of these lumpy nodules, which makes it feel uneven instead of smooth. Nodules can be solid or have fluid in them (cysts). They can be harmless overgrowths or growths that could be cancerous, but most of them are not.

Preoperative data collection

Before surgery, patients with thyroid illness who were part of this study were interviewed to obtain a thorough medical history, focusing on the symptoms and thyroid gland condition. Additionally, lab testing for thyroid function was used to evaluate the patients. To evaluate the Thyroid Imaging Reporting and Data System (TIRADS) of the condition, patients had radiological evaluation using ultrasonography. The kind of nodules (benign or malignant) was determined based on the cytopathological diagnosis made by Fine Needle Aspiration Cytology (FNAC).

Surgical procedure

All patients had a routine preoperative workup. They received the same anesthetic and hospital care regardless of the method of hemostasis. Patients underwent lobectomy, subtotal, or total thyroidectomy. The surgical technique included elevation of subplatysmal flaps, separation of the strap muscles at the midline, and medial reflection of the thyroid gland. The inferior, middle, and superior thyroid vessels were then divided with the LigaSure or with conventional knot tying. Every effort was made to identify and protect the recurrent laryngeal nerves and parathyroid glands. The same steps were repeated for the contralateral lobe. Finally, after irrigation of the wound, the strap muscles and the platysmal layer were approximated using 2-0 polyglactin suture in an interrupted manner. Small-sized closed-suction

drainage was inserted in the deep cervical plane for 24 hr., and finally, the skin was closed using subcuticular 3-0 nylon sutures. Outcome measures

The operating time was calculated in minutes from starting at the time of skin incision to the end of surgery when closure of the skin was finished. The number of suture materials used in the conventional technique and VSD was also calculated. Intraoperative blood loss was calculated using a graduated small suction device and by calculating the amount of blood absorbed by the sponges at the end of the operation. Postoperative pain was assessed after the operation using the visual analogue scale (VAS). Every patient learned how to mark the level of his pain on a chart given to him. The chart was graded from 0 to 10, marked at one end as no pain and at the other end as the worst pain imaginable. Pain severity categories were defined. Patients with scores of 3 or less were defined as having mild pain, those with a score of 7 or more were considered to have severe pain, and those from 3.1 to 6.9 had moderate pain. Furthermore, the types and amounts of analgesics needed to relieve pain were assessed. The duration of hospitalization was also assessed. Postoperative hemorrhage was defined as a hematoma that required wound re-exploration. Postoperatively, serum calcium levels were measured before discharge, especially if there was clinical hypocalcemia. RLN (recurrent laryngeal nerve) injury was assessed clinically by change of voice and by indirect laryngoscopy.

Statistical Analysis

The normality of the continuous variables was confirmed using Q-Q norm and drawing a histogram. In this regard, the parametric tests were performed for statistical tests. The general and medical characteristics of patients with thyroid gland disease in the conventional technique group and the vessel sealing device group were compared using either an independent

t-test (for continuous variables) or Pearson's chi-squared test (for categorical variables), as appropriate. The effects of the conventional technique versus the vessel sealing device on clinical outcomes were similarly assessed using these tests. Effect sizes were quantified as mean differences (with 95% confidence intervals) for continuous outcomes and relative risks (RR) (with 95% CIs) for categorical outcomes. Statistical significance was defined as $P < 0.05$. All analyses were performed using JMP® 18 Pro. JMP Statistical Discovery LLC, Cary, NC.

Ethical approval

The study proposal was approved by the Iraqi Board of Medical Specializations/General Surgery Council in number 5 on 12/1/2025. We obtained the written consent forms from all patients before including them in the study. We protected the confidentiality of the patient's personal information throughout the study steps, according to the Modified Declaration of Helsinki.

RESULTS

The vessel sealing device (LigaSure) and conventional technique (suture ligation or conventional suture tie) groups were comparable across key baseline characteristics. There were no statistically significant differences in mean age (42.27 vs. 46.43 years; $p = 0.0961$) or gender distribution ($p = 0.8140$). Goiter type was similar between groups, with nodular goiter present in 81.67% vs. 87.50% of patients ($p = 0.5802$). Symptom profiles—including pain (60.0% vs. 27.50%), dyspnea/dysphagia (51.67% vs. 55.0%), and palpitations (3.33% vs. 7.50%)—also showed no significant difference (overall $p = 0.7063$).

Thyroid functional status was similarly distributed: euthyroid (66.67% vs. 85.0%), hypothyroid (10.0% vs. 5.0%), and hyperthyroid (23.33% vs. 10.0%; $p = 0.1218$). Radiographic findings on chest X-ray—specifically retrosternal extension

(RSE) and tracheal deviation (TD)—were comparable (18.33% vs. 12.50%; $p = 0.5802$).

The majority of patients in both groups underwent total thyroidectomy (91.67% vs. 97.50%; $p = 0.4523$). Disease duration was also similar across categories, ranging from less than 1 year to over 10 years, with the most common duration being 1–3 years (45.0% vs. 37.50%; $p = 0.1592$) (Table 1). Patients in the vessel sealing device and conventional technique groups demonstrated similar disease classifications according to both TIRADS ($p = 0.7246$) and FNAC ($p = 0.2156$). Regarding

TIRADS categories, the majority of patients in both groups were classified as “probably benign” (51.67% vs. 57.50%), followed by “suspicious for malignancy” (25.0% vs. 27.5%; overall $p = 0.7246$). The mean TIRADS score did not differ significantly between groups (3.35 vs. 3.46; $p = 0.5437$). Based on FNAC classification, the most common diagnosis in both groups was “suspicious for malignancy” (55.0% vs. 40.0%), followed by “benign/nodular goiter” (23.33% vs. 22.50%; overall $p = 0.2156$). The mean FNAC score was also comparable between groups (3.43 vs. 3.07; $p = 0.2276$) (Table 1).

Table 1: General and medical characteristics of the conventional technique and vessel sealing device study groups in patients with thyroid gland disease

General and medical characteristics	Surgical technique no. (%)		p
	conventional technique (n=40)	Vessel sealing device (n=60)	
Age			
mean (SD)	46.43 (12.08)	42.27 (12.15)	0.0961
Min-Max	22-71	17-75	
Age groups			
<45 yrs.	16 (40.00)	33 (55.00)	0.1416
≥ 45 yrs.	24 (60.00)	27 (45.00)	
Sex			
male	6 (15.00)	8 (13.33)	0.8140
female	34 (85.00)	52 (86.67)	
Residency			
Duhok	0 (0.00)	49 (81.67)	<0.0001
Mosul	40 (100)	0 (0.00)	
Sinjar	0 (0.00)	1 (1.67)	
Zakho	0 (0.00)	10 (16.67)	
Goiter			
nodular	35 (87.50)	49 (81.67)	0.5802
nodule	5 (12.50)	11 (18.33)	
Symptoms			
pain	11 (27.50)	18 (30.00)	0.7063
dyspnea and dysphagia	22 (55.00)	31 (51.67)	
palpitation	3 (7.50)	2 (3.33)	
more than one symptom	4 (10.00)	9 (15.00)	
thyroid status			
euthyroid	34 (85.00)	40 (66.67)	0.1218
hypo	2 (5.00)	6 (10.00)	
hyper	4 (10.00)	14 (23.33)	
Chest x-ray			
RSE and TD	5 (12.50)	11 (18.33)	0.5802
absent both RSE and TD	35 (87.50)	49 (81.67)	
Surgery type			
lobectomy	1 (2.50)	4 (6.67)	0.4523
subtotal	0 (0.00)	1 (1.67)	
total thyroidectomy	39 (97.50)	55 (91.67)	
Disease duration			0.1592

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General and medical characteristics	Surgical technique no. (%)		p
	conventional technique (n=40)	Vessel sealing device (n=60)	
<1 yr.	0 (0.00)	6 (10.00)	
1-3 yrs.	15 (37.50)	27 (45.00)	
4-5 yrs.	10 (25.00)	11 (18.33)	
6-10 yrs.	9 (22.50)	7 (11.67)	
>10 yrs.	6 (15.00)	9 (15.00)	
TIRADS category			
Normal thyroid gland	0 (0.00)	1 (1.67)	
Benign lesion	2 (5.00)	7 (11.67)	0.7246
Probably benign lesion	23 (57.50)	31 (51.67)	
Suspicious of malignancy	11 (27.50)	15 (25.00)	
Probably malignant	4 (10.00)	6 (10.00)	
TIRADS mean (SD)	3.46 (0.77)	3.35 (0.93)	0.5437
FNAC category			
Benign (nodular goiter)	9 (22.50)	14 (23.33)	
Atypia of unknown significance	12 (30.00)	8 (13.33)	0.2156
Suspicious of neoplasm (follicular)	3 (7.50)	5 (8.33)	
Suspicious of malignancy	16 (40.00)	33 (55.00)	
FNAC mean (SD)	3.07 (1.02)	3.43 (1.28)	0.2276
RSE: Retrosternal Extension			
TD: Tracheal Deviation			

The study demonstrated that patients undergoing thyroid surgery with the vessel sealing device had significantly shorter operative durations compared to those treated with the conventional technique (59.25 vs. 95.63 minutes; $p < 0.0001$). Most procedures in both groups lasted between 1 and 2 hours (70.0% vs. 90.0%); however, a significantly higher proportion of surgeries in the vessel sealing device group were completed in less than 1 hour (40.0% vs. 0.0%; $p < 0.0001$). Additionally, 40.0% of patients in the vessel sealing device group required no sutures, compared to 0.0% in the conventional group ($p < 0.0001$). Drainage was placed in 76.67% of vessel sealing device cases, compared to 100% in the conventional group ($p = 0.0006$). Among patients who received drainage, the duration was 24 hours in both groups. Similarly, hospital length of stay was uniformly 1 day across both cohorts (Table 2).

Patients in the vessel sealing device group experienced significantly milder postoperative pain compared to those in the conventional technique group: 80.0%

reported mild pain versus 30.0% in the conventional group ($p < 0.0001$). Conversely, moderate pain was less frequent in the vessel sealing device group (20.0% vs. 57.50%; $p < 0.0001$). Intraoperative bleeding occurred more frequently in the vessel sealing device group (33.33% vs. 12.50%; $p = 0.0200$). Notably, postoperative bleeding and seroma formation were not documented in either group. The incidence of transient neurological symptoms—including tingling/numbness (18.33% vs. 12.50%; $p = 0.5802$) and voice changes (16.67% vs. 15.0%; $p = 0.8238$)—as well as surgical site infection (3.33% vs. 2.50%; $p = 1.000$), was low and comparable between groups. Regarding postoperative analgesia, all patients in the vessel sealing device group received paracetamol (100%), whereas 12.50% of patients in the conventional group received a combination of paracetamol and tramadol ($p = 0.0087$) (Table 2).

Table 2: Effects of conventional technique vs. Vessel sealing device on clinical outcomes in patients with thyroid gland disease

Outcomes	Surgical technique no. (%)		p	Relative risk (95% CI) Mean diff (95% CI)*
	conventional technique (n=40)	Vessel sealing device (n=60)		
Surgery duration Mean (SD)	95.63 (27.44)	59.25 (15.21)	<0.0001	-36.38 (-44.86 to -27.89)
Min-max				
Surgery duration <1 hr.	0 (0.00)	18 (30.00)	<0.0001	Ref
1-2 hrs.	36 (90.00)	42 (70.00)		1.86 (1.51-2.28)
>2 hrs.	4 (10.00)	0 (0.00)		Na.
no. of suture material				
none	0 (0.00)	24 (40.00)	<0.0001	Ref
1-3 sutures	10 (25.00)	36 (60.00)		Na.
≥4 sutures	30 (75.00)	0 (0.00)		Na.
Drain				
no	0 (0.00)	14 (23.33)	0.0006	Na.
yes	40 (100)	46 (76.67)		
duration of drain (hr.)				
24 hrs.	40 (100)	46 (100)	Na.	Na.
Hospital Stay in Days				
1 day.	40 (100)	46 (100)	Na.	Na.
pain level				
mild	12 (30.00)	48 (80.00)	<0.0001	Ref
moderate	23 (57.50)	12 (20.00)		2.33 (1.45-3.75)
severe	5 (12.50)	0 (0.00)		Na.
bleeding during surgery				
no	35 (87.50)	40 (66.67)	0.0200	Ref
yes	5 (12.50)	20 (33.33)		0.67 (0.50-0.89)
bleeding after surgery				
no	40 (100)	60 (100)	Na.	Na.
Seroma				
no	40 (100)	60 (100)	Na.	Na.
tingling and numbness				
no	35 (87.50)	49 (81.67)	0.5802	Ref
yes	5 (12.50)	11 (18.33)		0.85 (0.58-1.24)
change of voice				
no	34 (85.00)	50 (83.33)	0.8238	Ref
yes	6 (15.00)	10 (16.67)		0.95 (0.63-1.45)
Infection				
no	39 (97.50)	58 (96.67)	1.0000	Ref
yes	1 (2.50)	2 (3.33)		0.90 (0.40-2.03)
type of analgesia				
paracetol	35 (87.50)	60 (100)	0.0087	Ref
both paracetol and tramal	5 (12.50)	0 (0.00)		Na.

* The Relative risk (95% CI) Mean diff (95% CI) were performed for numerical and nominal variables, respectively.

DISCUSSION

Thyroidectomy is one of the most frequently performed procedures in endocrine surgery, and meticulous hemostasis is paramount to its success and safety, given the thyroid gland's rich

vascularity and its proximity to vital structures like the RLN and parathyroid glands^[16,11]. The evolution of surgical technology has introduced energy-based devices, such as the LigaSure™ VSD, as alternatives to the conventional suture-tie technique^[17,18]. Our study, conducted in

Duhok, aimed to compare the outcomes of VSD-assisted thyroidectomy against the conventional method, contributing valuable regional data to this ongoing clinical evaluation. Our findings demonstrate that while both techniques are safe, the VSD offers significant advantages in operative efficiency and postoperative patient comfort, though it presented an unexpected result regarding intraoperative bleeding.

Operative Time and Surgical Efficiency

The most consistent and significant finding in our study was the substantial reduction in operative time with the use of the VSD (59.25 minutes) compared to the conventional technique (95.63 minutes). This represents an average time saving of over 36 minutes per procedure. This result aligns powerfully with the overwhelming consensus in the existing literature. A comprehensive meta-analysis by Yao et al., which reviewed nine prospective trials, confirmed that LigaSure thyroidectomy was a mean of 11.97 minutes shorter than conventional methods, with even greater time savings observed in total and subtotal thyroidectomies^[5,19,21]. Individual studies from various global settings corroborate this finding, reporting time reductions ranging from 20 to 45 minutes. For instance, a study from Iraq by Ibrahim and Mahmood noted a 20-minute reduction^[5], while Lepner et al. in Estonia reported an average saving of 25.8 minutes^[11].

The efficiency of the VSD stems from its ability to seal, coagulate, and, in some models, divide tissue simultaneously, thereby minimizing the need for instrument exchange and the time-consuming process of suture ligation^[6,20]. Our data supports this, with results showing that 40% of our VSD cases were performed entirely without sutures. This reduction in operative time is not merely a matter of convenience; it directly translates to less anesthesia exposure for the patient and enhanced operating room turnover, which has significant economic implications,

particularly for high-volume surgical centers^[17,19].

Intraoperative and Postoperative Bleeding

One of the most striking findings of our investigation is the higher incidence of intraoperative bleeding with the VSD (33.33%) compared to the conventional group (12.50%). This result stands in contrast to much of the published literature. Many studies report that VSDs lead to significantly less intraoperative blood loss. For example, Youssef et al. documented a dramatic reduction from 132.72 ml in the conventional group to 65.60 ml in the LigaSure group^[11], and similar findings were reported by Anwar et al. (68.57 ml vs. 56.27ml)^[6] and Habash et al^[9]. Other high-level evidence, such as the meta-analysis by Yao et al., found no statistically significant difference in blood loss between the two techniques^[2].

The reasons for the anomalous finding in our study warrant careful consideration. It may be attributable to a "learning curve" effect, where meticulous dissection to isolate vessels for conventional ligation paradoxically results in less diffuse oozing compared to the broader application of a VSD by surgeons still mastering the device's nuances^[21]. Another possibility relates to the nature of the bleeding; VSDs are exceptionally effective at sealing discrete vessels up to 7 mm in diameter^[8,11], but bleeding in our VSD group may have represented more diffuse capillary oozing from the thyroid bed during dissection, which may be more effectively controlled by the meticulous, albeit slower, conventional approach. It is critically important to note, however, that this increased intraoperative bleeding did not translate into adverse postoperative outcomes. Our study found a complete absence of postoperative hematoma or seroma in both groups, a finding that aligns with studies demonstrating that VSDs do not increase, and may even reduce, the risk of this life-threatening complication^[22,17,9]. The reduced requirement for postoperative

drainage in our VSD group (76.67% vs. 100%) further supports the VSD's efficacy in achieving secure, lasting hemostasis.

Postoperative Complications: RLN Injury and Hypocalcemia

The safety of any thyroidectomy technique is ultimately judged by its impact on the RLN and parathyroid gland function^[23,24]. Our study found low and comparable rates of postoperative complications, including tingling (indicative of transient hypocalcemia) and voice changes (suggesting potential RLN impact), between the VSD and conventional groups. This demonstrates that, when used with appropriate technique, the VSD is as safe as the traditional method. This finding is strongly supported by extensive evidence. The meta-analysis by Yao et al. found no significant difference in the rates of transient or permanent hypocalcemia or nerve lesions^[2]. Similarly, a retrospective study of 1599 thyroidectomies by Mulita et al. showed no difference in the incidence of hypoparathyroidism or RLN palsy between LigaSure and Harmonic Scalpel groups^[25]. The primary concern with energy-based devices is the potential for lateral thermal spread causing collateral damage^[26]. Some studies have suggested a minimum safe distance of 1-3 mm from the RLN when applying the device^[27,28]. A case series by Alharbi highlighted the potential risks, reporting high rates of hypocalcemia (100%) and RLN palsy (10%) with the LigaSure Small Jaw, emphasizing the critical importance of surgical technique and awareness of thermal injury^[15]. Our favorable results suggest that our surgical team adhered to safe practices, likely identifying the RLN and parathyroid glands before device application, thereby mitigating the risk of thermal injury^[29,30]. In contrast, some studies have even suggested a protective effect, with Parmeggiani et al. reporting a statistically significant decrease in transient hypocalcemia in their LigaSure group, possibly due to the minimal thermal

spread preserving parathyroid vascularity^[20].

Postoperative Pain, Analgesia, and Hospital Stay

A clear patient-centered benefit observed in our study was the significantly lower postoperative pain experienced by the VSD group, with 80% reporting only mild pain compared to 30% in the conventional group. This directly resulted in a diminished necessity for more potent analgesics; all VSD patients were adequately managed with paracetamol alone, while a segment of the conventional group necessitated tramadol. This finding is consistent with the literature. Youssef et al. reported a significantly lower Visual Analogue Scale (VAS) score and less need for analgesics in their LigaSure cohort^[11]. The proposed mechanisms for this benefit include less tissue trauma from dissection, reduced foreign body reaction from sutures, and minimal neuromuscular excitation due to limited thermal spread^[29,30].

Despite the advantages in pain management and the reduced need for drainage, we found no significant difference in the duration of hospital stay, with most patients in both groups being discharged after one day. This is consistent with the meta-analysis by Yao et al.^[2] but contrasts with other individual studies that reported shorter hospital stays for VSD patients. This discrepancy in our setting is likely attributable to institutional protocols mandating a standard 24-hour observation period post-thyroidectomy, regardless of the surgical technique or a patient's clinical progress, rather than a reflection of the device's clinical impact.

Limitations and Future Directions

This study has several limitations inherent to its design. As a single-center, prospective study, the findings may have limited generalizability. Although the baseline characteristics of the two groups were comparable, the lack of randomization introduces a potential for selection bias. The sample size, while adequate for

assessing primary outcomes like operative time, may be insufficient to detect statistically significant differences in rarer complications. The unexpected finding of increased intraoperative bleeding with the VSD warrants further, more granular investigation in a prospective manner, perhaps quantifying blood loss more precisely and correlating it with gland size and surgeon experience. Another limitation of this study is that we included the cases from three different cities, which could lead to selection bias. Also, we did not include the actual blood loss volumes in the study. Other limitations of the study were surgery preference, not including cost analysis, and longer follow-up time.

CONCLUSIONS

In conclusion, this study from our region supports that the LigaSure™ VSD is safe and effective and could be an alternative to the conventional suture-tie technique for total thyroidectomy. The device confers clear advantages by significantly reducing operative time and minimizing postoperative pain, thereby enhancing both operating room efficiency and the patient's recovery experience. While our finding of increased intraoperative bleeding was contrary to most reports, it did not lead to an increase in postoperative complications, confirming the device's overall safety. With complication rates for RLN injury and hypocalcemia comparable to the gold-standard conventional method, the VSD stands as a valuable tool for thyroid surgeons in our region and beyond. Further large-scale, prospective randomized trials with larger sample sizes are warranted to corroborate these findings and to perform a definitive cost-effectiveness analysis in our local healthcare context.

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نه‌نجامين ناميرئ سهرزراف همبهر ته‌کنیکا كه‌فنه‌شوپي ل راكرنا گريكين ساپرويد

پوخته

پيشه‌کي و نارمانج: راكرنا ته‌مام يا ساپرويد وەکو چارەسەر يا بهەز بۆ دەرمانئ گريكين په‌نجەشيري بين ساپرويد ده‌يته بکار ئينان. هەروەسا ئەف ته‌کنیکە وەکو ته‌کنیکا سەرکي ده‌يته ناسين. لئ ئەف راكرنا ته‌مام يا ساپرويد هەندەک ئالوزي بين سەرکي بۆ نه‌خوشان دروست دکەت. لەو‌را مه‌ هەول دا کۆ ب رتيا ناميرئ سهرزراف راكرنا ساپرويد نه‌نجام به‌دين و ئالوزي بين ئەف ته‌کنیکي وەکو دەمی نه‌شته‌رگه‌ري، خوين به‌ربوون، و باش بوونا پشتي نه‌شته‌رگه‌ري تومار بکەين.

ريكين فه‌کولينئ: ل ئەف فه‌کولين پيشه‌روزي يا نه‌يا هەرمه‌کي، 100 نه‌خوشين هاتينه‌ ناسين ب رتيا ساپرويد هاتن داخل کرن. شيبست نه‌خوش ته‌کنیکا ناميرئ سهرزراف ل موسل و 40 نه‌خوشان ته‌کنیکا كه‌فنه‌شوپي ل ده‌وک و زاخو وەرگرتن. نه‌نجامين هەر دوو نه‌شته‌رگه‌ريان هاتنه‌ هه‌فەر کرن.

نه‌نجام: نه‌خوش خودان ته‌مەن، ره‌گه‌ز، جورەيا گواتر، نيشان، ره‌وشا ساپرويد، تيشک، جورەيا نه‌شته‌رگه‌ري، دەما نه‌خوشيئ، و ناسينا ساپرويد نيزۆک هه‌ف بوون. ته‌کنیکا ياميرئ سهرزراف ل ده‌مه‌کئ کورتتر (59.25 ب. 95.63 خوله‌ک) بداوی هات. لئ پيدفئ دروتنين پتر هه‌بو (40% ب. سفر)، ئاف به‌ربوون ل ناميرئ سهرزراف کيتر بۆ (76.67% ب. 100%) دگه‌ل نه‌فاندنا نيزۆک هه‌ف. ته‌کنیکا زراف ژانه‌کا کيمتر ل همبهر ته‌کنیکا كه‌فنه‌شوپي هه‌بو. لئ خوين به‌ربوونا دەم نه‌شته‌رگه‌ري ل ناميرئ سهرزراف پتر بۆ (33.33% ب. 12.5%)، لئ خوين به‌ربوونا پشتي نه‌شته‌رگه‌ري ل هەر دوو ته‌کنیکان به‌ربه‌لاف بو. ئالوزي بين وەکو ره‌و بوون، ده‌نگ گوهرتن، و چرک کيم بون و دناقبه‌را دوو ته‌کنیکان نيزۆک هه‌ف بوون.

ده‌ر نه‌نجام: فه‌کولين مه‌ نيشان دا کۆ ته‌کنیکا سهرزراف ده‌مه‌کئ کورتتر ل نه‌شته‌رگه‌ري، ژانه‌کا کيمتر، و ئه‌وله‌هه‌يەکا به‌رامبەر دگه‌ل ته‌کنیکا كه‌فنه‌شوپي هه‌بو.

نتائج جهاز إغلاق الأوعية مقابل التقنية التقليدية في استئصال الغدة الدرقية

الخلاصة

الخلفية والأهداف: يعتبر استئصال الغدة الدرقية الكلي العلاج المفضل للأورام الخبيثة في الغدة الدرقية. لقد أصبح مؤخرًا المعيار الذهبي لعلاج اضطرابات الغدة الدرقية الحميدة التي تحتاج إلى جراحة. لا يزال استئصال الغدة الدرقية الكلي يعتبر إجراءً محفوظًا بالمخاطر لأنه ينطوي على مضاعفات أكثر من أنواع الجراحة الأخرى. تُستخدم جراحة استئصال الغدة الدرقية لعلاج سرطان الغدة الدرقية، والتضخم الدرقي، وفرط نشاط الغدة الدرقية. تقارن هذه الدراسة بين جهاز إغلاق الأوعية (VSD) وربط العقد التقليدية، وتقيم فعاليتيهما في النتائج السريرية، مع التركيز على التجلط، ومدة الجراحة، والنزيف، والتعافي بعد العملية في مرضى الغدة الدرقية.

الطرق: شملت هذه الدراسة الاستباقية غير العشوائية 100 مريض تم تشخيصهم بمرض الغدة الدرقية وتم تخصيصهم لإحدى تقنيتين جراحيتين. خضع ستون مريضًا للجراحة باستخدام تقنية VSD، بينما تلقى أربعون مريضًا تقنية ربط الخياطة التقليدية في منطقة كردستان والعراق، في عام 2025. تمت مقارنة النتائج أثناء العملية وبعدها.

النتائج: كان المرضى متشابهون في العمر، الجنس، ونوع الدراق، والأعراض، حالة الغدة الدرقية، نتائج التصوير، نوع الجراحة (معظمها استئصال الغدة الدرقية الكلي)، مدة المرض، والتشخيصات قبل العملية (نظام تصوير الغدة الدرقية والتقارير والبيانات / (TIRADS) علم الخلايا بالإبرة الدقيقة (FNAC) في المرحلة السابقة للعملية. قلل VSD بشكل كبير من مدة الجراحة (59.25 مقابل 95.63 دقيقة؛ $p < 0.0001$)، حيث لم يتطلب 40% من الحالات غُررًا مقابل 0% في المجموعة التقليدية. ($p < 0.0001$) كان تصريف السوائل أقل تكرارًا مع VSD (76.67% مقابل 100%؛ $p = 0.0006$) مع مدة إقامة في المستشفى مماثلة. كان الألم بعد العملية أقل حدة مع VSD (80% خفيف مقابل 30% في المجموعة التقليدية؛ $p < 0.0001$). كان الألم المعتدل أعلى في المجموعة التقليدية (57.5% مقابل 20%؛ $p < 0.0001$). كان النزيف أثناء العملية أعلى مع VSD (33.33% مقابل 12.50%؛ $p = 0.0200$)، لكن النزيف بعد العملية والسيروما كانت غائبة في كلا المجموعتين. كانت المضاعفات مثل الوخز، وتغير الصوت، والعدوى منخفضة ومتقاربة.

الاستنتاجات: يقلل VSD من وقت الجراحة والألم، ويحسن الراحة، ويقدم سلامة مشابهة لجراحة الغدة الدرقية التقليدية، على الرغم من زيادة النزيف أثناء العملية، مما يجعله بديلًا جراحياً قيماً.