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# Video-assisted transaxillary thyroidectomy

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**Abstract**

Thyroidectomy is a frequent surgical treatment with a low rate of complications when carried out by well-trained surgical teams. There have been a number of advancements in minimally invasive thyroid surgery procedures during the last decade, with the main goal of improving the aesthetic outcome. These include whole endoscopic procedures with continual gas insufflation, video-assisted gasless techniques, and minimally invasive nonendoscopic thyroidectomies conducted by a minimum incision.. In the past, individuals who needed a thyroidectomy had an open procedure. MIVAT (minimally invasive video-assisted thyroidectomy) is one kind of endoscopic thyroidectomy, while others include the axillary and anterior chest approaches, as well as the axillary and bilateral axillo-breast approaches (BABA). MIVAT may be used safely in certain situations. Video aided trans axillary thyroidectomy was the primary goal of this investigation. A prospective randomised controlled trial was undertaken at the National Institute of Diabetes and Endocrinology Surgery Department and the Surgery Department at the Faculty of Medicine at Benha University. There were 30 patients in the research. All of the patients gave their permission to participate in the study. In each instance, the specifics of the surgical procedure were documented and recorded. The operational team handled all of the cases. From March 2016 to March 2020, researchers worked on this project. Results: Age in group varied from 20 to 57 years and the mean SD was 37.60 11.59 years, MBI ranged from 20 to 37 years and the mean SD was 29.17 4.62 kg/m2. There were 12 patients with hypertension (40 percent) and 9 individuals with diabetes (30 percent). Patient data show that 9 (30% of patients) had left hemithyroidectomy and 21(70% of patients) had right hemithyroidectomy, with an average operating time of 56 to 180 minutes and an SD of 83.8025.00, while blood loss was between 14 and 25 ml and an SD of 18.93 2.33, with an incision size of 4.86 0.47 cm on the average. 14 (46.7%) of the patients had multi-nodular goitre, compared to 16 (53.3%) of the patients who had solitary thyroid nodules, and the surgical margin was negative in all patients. The hospital stay varied from 1 to 2 days, and the mean SD was 1.28 0.43 days, with a standard deviation of 0.43 days. One patient (3.3 percent) experienced recurrent laryngeal nerve palsy, three patients (10 percent) had a transitory voice change, and no major organs were injured, converted, bled or required ICU care in the 26 (86.7 percent) instances where problems arose postoperatively. It is concluded that MIVAT is a safe approach when used in appropriate circumstances. If a tight adherence to the indication was followed, it should be used at mean-high-volume surgical facilities.

**Key words:** Video, assisted transaxillary, thyroidectomy.

## 1. Introduction

Over the past three decades, minimally invasive surgical procedures have become established. At first, only abdominal and gynaecological procedures used minimal access procedures, but they have since been used in a wide range of subspecialties. In addition to thyroidectomy, these less invasive methods can be used to treat a thyroid tumour. ET can be performed in a variety of ways, including fully endoscopic, video-assisted and transaxillary as well as through the chest wall [1].

Thyroid surgery frequently makes use of an anterior lower neck transverse incision. The thyroid gland can be safely dissected openly for the majority of surgical procedures. Surgery on the neck, which is one of the most visible parts of the body, has proven to be effective and safe when performed by experienced surgeons. Anxiety, embarrassment, and discomfort are all common reactions to such a scar. It is a permanent deformity in terms of appearance [2].

For example, in other parts of the body, the advantages of minimally invasive surgery have been extensively proven [3, 4].

Due in part to better cosmetics and improved vision via video magnification, endoscopy has become an increasingly popular procedure for thyroid and parathyroid gland access in the neck. The two subcategories of endoscopic neck treatments are purely endoscopic methods and endoscopic aided procedures. Pure endoscopic treatments can be further divided into direct and indirect approaches.

The direct endoscopic procedure uses as little tissue disruption as possible in order to reach the gland's target location. Direct viewing, like the open method, also reveals anatomical details in a comparable manner.

Even yet, the axillary approach provides an expert thyroid surgeon a rare view of the side of the anatomy, whereas the indirect treatment employs a remote place, such as the axilla or chest wall, to get to the target area. To get to the central neck region, the indirect technique needs a significant amount of damage to tissues. As a result, this method might be categorised as minimum access.

The aim of this study is to evaluate the new technique of video assisted trans axillary thyroidectomy and its safety.

## 2. Patients and Methods

This was a prospective randomized controlled study conducted in national institute of diabetes and endocrinology, Surgery department, and department

of surgery, faculty of medicine, Benha university. The study included 30 cases. Informed consent was obtained from all the patients. The details of operative technique were documented and recorded in all the cases. All the cases were performed by the operative team.

This study was conducted from march 2016 until march 2020.

**Inclusion criteria**

Only cases with benign solitary thyroid nodules will be included with euthyroid function.

**Exclusion criteria:**

cases with diffuse toxic goiter's (Graves' disease), thyroid cancer, recurrent goiters and patients with shoulder joint pathology.

All patients were subjected to:

**Demographic data**

- Age, sex
- BMI (body mass index)

**Body Mass Index (BMI):**

- Calculated by dividing weight in kgs by height in meters squared
- BMI less than 18.5: suggest the person was underweight
- BMI between 18.5 to 25: suggest optimal weight

**Investigations**

1. Routine preoperative investigations:
   - CBC
   - Liver enzymes (ALT, AST)
   - Renal function tests (urea, creatinine)
   - ECG
2. Investigations for thyroid gland:
   - Thyroid function tests (TSH, free T3, freeT4)
   - Thyroid ultrasound
   - Preoperative fine needle aspiration (FNA) of thyroid nodule to exclude malignant cases.

**Ethical consideration**

An informed consent was obtained from each participant after discussion prior to the procedure and its possible complications and approved to medical photography.

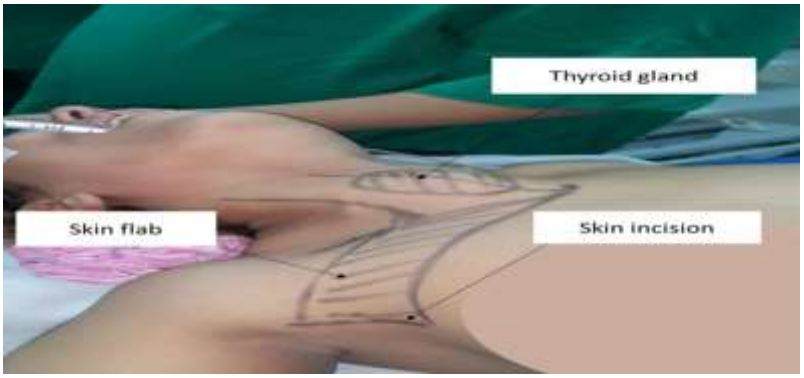
**Preparation**

A thorough discussion with a patient prior to the procedure includes the following:

- A detailed explanation of the procedure
- The expected level of discomfort
- Option for local anesthesia
- History of bleeding disorders or anticoagulant use
- Prior medical conditions that might affect the procedure
- Potential diagnoses resulting from the procedure
- Potential complications of the procedure

**surgical technique**

In all the patients, procedure was performed under General inhalational anesthesia. Patient was placed with neck extended. The ipsilateral arm was abducted to 90 degree and elbow flexed such that hand stays besides the head. The arm was padded and strapped in this position. The surface markings of relevant anatomical landmarks such as clavicle, anterior axillary line (AAL), sternocleidomastoid (SCM) and jugular notch were made.




A 4-5 cm long skin incision was used 1 cm posterior and parallel to AAL. Skin incision was deepened up to pectoral fascia. Pectoral fascia was incised in the same line and sub- fascial dissection was performed by blunt digital and sharp instrumental dissection to create operative space. Subfascial dissection was continued in subplatysmal plane above the clavicle. After initial dissection, subsequent dissection was done under telescopic guidance placed through the same incision and held by camera assistant (CA).

Thus, dissection for operative space was done both under synergistic view of naked eye and monitor.

The operating surgeon (OS) and assistant surgeon (AS) stand on ipsilateral side of goiter to visualize the operative field through the axillary incision. Thyroid bed was entered through the distal avascular area between the two heads of SCM. The sternal head of SCM and strap muscles are retracted by AS to the opposite side. While managing the clavicular head of SCM, OS retracts carotid sheath and superior vascular pedicle is sealed with ligature or clipping individual vessels. Further medial mobilization of helps in visualizing and securing the Recurrent Laryngeal Nerve (RLN) and superior Parathyroid Gland (PTG). The inferior thyroid veins were clipped individually. Inferior parathyroid gland is secured during this step in most of the cases. Finally, ipsilateral goitre was resected after incising the isthmus, which was sealed with ligasure. The resected specimen was delivered through axilla. A 14 Fr suction catheter is placed into thyroid bed and operative space through a separate stab wound in axilla. It was retained in situ till the drain output was less than 20 ml on two consecutive days.

- **For Post operative complications we detected:**
  - Pain
  - Voice changes
- **Statistical Analysis**

Data were checked, entered and analyzed using SPSS version 23 for data processing. The following statistical methods were used for analysis of results of the present study.

Data were expressed as number and percentage for qualitative variables and mean + standard deviation (SD) for quantitative one.

## 3. Results

**Table (1)** Pre-operative demographic data of patients' group.

| | | Patients' group (n = 30) | |
|---|---|---|---|
| | | **No.** | **%** |
| **Gender** | **Male** | 3 | 10.0% |
| | **Female** | 27 | 90.0% |
| **Age (years)** | **(Min. – Max.)** | (20 –57) | |
| | **Mean ± SD.** | 37.60 ± 11.59 | |
| **BMI (kg/m$^2$)** | **(Min. – Max.)** | (20 –37) | |
| | **Mean ± SD.** | 29.17 ± 4.62 | |
| **Hypertension** | **Yes** | 12 | 40.0% |
| | **No** | 18 | 60.0% |
| **Diabetes mellitus** | **Yes** | 9 | 30.0% |
| | **No** | 21 | 70.0% |

This table shows that the gender was distributed as 3(10%) males, 27(90%) females, where females were more predominant

The age in group ranged from 20 to 57 years and the mean ± SD was 37.60 ± 11.59 years,

The table shows also that the age in group ranged from 20 to 57 years and the mean ± SD was 37.60 ± 11.59 years, and BMI ranged from 20 to 37 years and the mean ± SD was 29.17 ± 4.62 kg/m2

There were 12(40%) patients who had hypertension and 9 (30%) who had diabetes.

**Table (2)** Operative data.

| | | Patients' group (n = 30) | |
|---|---|---|---|
| | | **No.** | **%** |
| **Procedure** | **LT Hemithyroidectomy** | 9 | 30.0% |
| | **RT Hemithyroidectomy** | 21 | 70.0% |
| **Operative time (mins)** | **(Min. – Max.)** | (56 –180) | |
| | **Mean ± SD.** | 83.80 ± 25.00 | |
| **Blood loss (ml)** | **(Min. – Max.)** | (14 – 25) | |
| | **Mean ± SD.** | 18.93 ± 2.33 | |
| **Incision size (cm)** | **(Min. – Max.)** | (4.2 –6) | |
| | **Mean ± SD.** | 4.86 ± 0.47 | |

This table shows that the operative data of patients where 9(30%) of patients had left hemithyroidectomy and 21(70%) had right hemithyroidectomy, the operative time ranged from 56 to 180 minutes and the mean ± SD was 83.80 ± 25.00, while blood loss ranged from 14 to 25 ml and the mean ± SD was 18.93 ± 2.33, and incision size ranged from 4.2 to 6 cm and the mean ± SD was 4.86 ± 0.47.

**Table (3)** Postoperative data.

| | | Patients' group (n = 30) | |
|---|---|---|---|
| | | **No.** | **%** |
| **Thyroid pathology** | **Multi-nodular goiter** | 14 | 46.7% |
| | **Solitary thyroid nodules** | 16 | 53.3% |
| **Surgical margin** | **Positive** | 0 | 0.0% |
| | **Negative** | 30 | 100% |
| **Hospital stay (days)** | **(Min. – Max.)** | (1–2) | |
| | **Mean ± SD.** | 1.28 ± 0.43 | |

The table shows postoperative findings where thyroid pathology was multi-nodular goiter in 14(46.7%) patients in comparison to solitary thyroid nodules in 16(53.3%) patients and surgical margin was negative in all patients, and hospital stay ranged from 1 to 2 days and the mean ± SD was 1.28 ± 0.43.

**Table (4)** Postoperative complications.

| **Postoperative complications** | **N** | **%** |
|---|---|---|
| **No** | 26 | 86.7% |
| **RLN palsy** | 1 | 3.3% |
| **Transient voice change** | 3 | 10.0% |
| **Major organ injury** | 0 | 0.0% |
| **Conversion** | 0 | 0.0% |
| **Bleeding** | 0 | 0.0% |
| **Need for ICU** | 0 | 0.0% |
| **Total** | 30 | 100.0% |

The table shows postoperative complications where 26(86.7%) cases had no complications, in 1(3.3%) patient there was recurrent laryngeal nerve palsy and 3(10%) cases there was transient voice change, and there was no major organ injury, conversion, bleeding or need for ICU.

## 4. Discussion

In terms of preoperative demographics, the gender distribution of the patients' group was 3 men (ten percent) and 27 women (ninety percent), with women predominating.

The participants' ages ranged from 20 to 57 years, with a mean age of 37.60 11.59 years and a mean BMI of 29.17 4.62 kg/m2 (standard deviation: 4.62 kg/m2).

Solitary thyroid nodules are common in women of childbearing age, according to a study by Gure et al., [5]. According to Lakshmi et al., [6] the majority of single thyroid nodules are harmless. 10-20% of all cancer cases are malignant, with the incidence being highest in women 35 and older.

Solitary thyroid nodules are more common in women than in men (41.25 percent for women, 32.50 percent for men) in the study of Tian et al. [7], which looked at the prevalence of thyroid nodules in women and men. With increasing age came an increase in the prevalence of TNs (2 trend = 49.80, P 0.001). This is also in line with the findings of this study.

Though the study of Jena [8] found that the majority of the 162 patients studied had solitary thyroid nodules, most of them male, 58 of them were malignant.

On the other hand, the operative data for the 9 (30 percent) patients who had left hemithyroidectomy and 21 (70 percent) who had right hemithyroidectomy are consistent with the findings of Gure et al., [5] and Lakshmi et al[6]. Solitary nodules on the right side of the thyroid were more common than those on the left, according to Khadilkar et al., [9].

The mean operative time in this study was 83.80 25.00 minutes, with a range of 56 to 180 minutes.

Hemithyroidectomy surgery took an average of 91 minutes and total thyroidectomy took an average of 215 minutes, according to Lai et al. [10] in an evaluation of minimally invasive video-assisted thyroidectomy.

Two patients with benign histology, one with Graves' disease and the other with Hashimoto's thyroiditis, necessitated longer operative times due to their complexity. A total thyroidectomy and an endoscopic central compartment dissection took 215 minutes in another case. Even though these challenging situations prolonged the surgery, the MIVAT method was still used and the original incision was not lengthened because of it.

Miccoli et al. [11] chose 579 participants for a five-year trial and had them undergo MIVAT. In 312 individuals, a complete thyroidectomy was performed, and in 267, a lobectomy was performed. Lobectomy took 41 minutes (range, 15-120 minutes) and complete thyroidectomy took 51.6 minutes (range, 30-140 minutes).

Minimally invasive video aided thyroidectomy: reflections after more than 2400 cases was explored by Miccoli et al. [12]. More than 2400 video-assisted thyroidectomies were conducted at this facility between 1998 and 2014. The average procedure time was (41 14 SD) minutes long. It is possible that this research's shorter mean operative time compared to our study is due to a longer study period and a larger number of patients in this study.

According to various controlled studies, MIVAT is more time-consuming than the normal open approach or the minimally invasive nonendoscopic thyroidectomy, although the benefits of MIVAT are virtually always documented in favour of the procedure [13].

In the early stages of MIVAT experience, when a sufficient learning curve has not yet been achieved, lengthier operation times may be necessary [14]. In several of these investigations, such as Fk et al. [15], less than 70 MIVAT were done throughout a four-year period, which may be the case. Our unit's regular open technique operating time is 42 minutes (SD, 10) minutes, which is in line with MIVAT's (41 min). The operational time difference between MIVAT and a more traditional, open approach has also been shown in other investigations to be non-significant.

The level of expertise of the operator has a significant impact on the amount of time an operation takes. MIVAT may be conducted at a cost equivalent to that of CT and with no substantial increased operational time thanks to an appropriate learning curve and the utilisation of re-usable equipment [16].

Although it has been stated that MIVAT takes longer to execute than conventional thyroidectomy, the experience with the technique has shown that it is comparable in operating time to conventional thyroidectomy. Learning curves at a large volume centre, strict selection criteria, and the usage of modern energy gadgets are all cited as contributors in this. The incorporation of energy devices resulted in a significant decrease in operating time (by more than half) [15].

The incisions varied in size from 4.2 to 6 cm, with a mean and standard deviation of 4.86 0.47 cm.

In keeping with our findings, Lai et al. [10] discovered that initial incisions of 2.0 cm were used to remove all thyroid specimens. The incision was expanded intraoperatively in three instances by 0.5 cm in order to deliver the thyroid lobe in each case.

In the MIVAT group, incisions were smaller on average by 2.7 cm compared to the Conventional group (p 0.001).

Blood loss varied from 14 to 25 ml, and the mean SD was 18.93 2.33.

Patients in the MIVAT group had reduced estimated blood loss than those in the Conventional group (19.5 15.0 mL vs. 39.0 65.9 mL, p = 0.002).

There was minimal blood loss in all cases, and we were able to identify critical structures, such as the recurrent laryngeal nerve and parathyroid glands, in accordance with our study. There was no need to switch to an open thyroidectomy.

Minimally invasive thyroid surgery, according to Henry and his colleagues [18], is preferred because it requires less dissection space than conventional surgery. Minimally-invasive surgery may also reduce postoperative blood loss, according to a recent study.

In terms of postoperative data, 14 (46.7 percent) patients had thyroid pathology that was macrofollicular adenoma, while 16 (53.3 percent) had solitary thyroid nodules, and surgical margin was negative in all of the patients who had the procedure.

Following well-differentiated carcinomas and toxic goitres in their study, Fk et al. [15] found that MIVAT was most commonly used to treat benign follicular neoplasm.

Patient satisfaction with MIVAT has been high, according to Lai et al. [10] who found that surgical margins were always negative. It was possible to avoid a second incision site or partial closure by using a small incision (2 cm or less) and placing significantly fewer suction drains (48/51; 94.1%).

Solitary thyroid nodules have been shown to be 75.4 percent cancerous and 34.4% malignant in a retrospective investigation by Ke et al.

Most research confine MIVAT to benign nodules, and their results are similar to those of those studies [20]. Most likely, the explanation for this is that single surgeons have a more negative view of the need of doing a central compartment lymphadenectomy and

thyroidectomy in patients with low-risk cancer, even if these procedures are difficult and time consuming. The VIth level clearance during MIVAT has been proved to be feasible by [21] and others, although some surgeons' hesitation to approach malignancies using video-assisted surgery may be warranted.

The average hospital stay was 1.28 days with a standard deviation of 0.43 days in this research.

We discovered the average duration of stay was one day shorter and postoperative hospital admission rates were 52.4 percent higher in the MIVAT group than the Conventional group, in accordance with Miccoli et al. [21].

In comparison to open thyroidectomy, Pons et al. [22] found that the duration of stay was either the same or shorter.

Of the 26 (86.7%) patients who had surgery, only one (3.3%) experienced recurrent laryngeal nerve palsy, and three [10] had transitory voice changes; no significant organ injuries, conversions, bleeding or requirement for ICU were found in these patients. In certain circumstances, this treatment is as safe as the previously reported complication rates in MIVAT or even the usual open technique.

Scerrino et al., concurred with these findings [23]. This study's inclusion criteria indicate that MIVAT may be a suitable option for thyroidectomies in the presence of tiny glands that meet standard standards, since it provides comparable benefits to traditional procedures.

MIVAT's benefits are generally agreed upon, especially in terms of improved aesthetics and less postoperative discomfort [23].

Lee et al. [24], on the other hand, studied Single-Incision Endoscopic Thyroidectomy via the Axillary Approach and reported that, All patients were female and had successfully undergone SIET surgery. It took an average of 160 minutes to do the surgery on a patient who was on the older side of 35 years old (with a range of 19 to 43 years old). Cosmetically, all of the patients were thrilled with their outcomes, and no one experienced any issues.

In contrast to the findings of this study, Miccoli et al. [12] found a greater incidence of adverse events. Total thyroidectomy was done on 1788 patients (74.1 percent), whereas hemithyroidectomy was performed on 564 individuals (10.1 percent) (23.4 percent ). There were 41 patients (1.7 percent) who required conversion to a standard open thyroidectomy due to bleeding from the upper pedicle, unanticipated posterior tracheal invasion, involvement of lymph nodes that were not evident on echography, esophageal infiltration, infiltration of strap muscles, and finally due to serious thyroiditis that had escaped ultrasonographic evaluation. A postoperative hematoma necessitated a reoperation in three individuals (0.012%). There was a mean hospital stay of 1.5 days after surgery. Complication rates in that research were higher due to the inclusion of more participants and the fact that the majority of those individuals had complete thyroidectomy surgery.

## 5. Conclusion

In specific circumstances, a minimally invasive video-assisted thyroidectomy is safe. If a tight adherence to the indication was followed, it should be used at mean-high-volume surgical facilities.

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