Original Research Article

Feasibility of using minimal incision in thyroidectomy operation

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ABSTRACT

Background: The conventional technique of thyroidectomy requires long skin incision, not satisfying patient and surgeon in terms of cosmesis and endoscopic thyroid surgery requires expertise. The aim of this study was to compare the clinical outcomes of patients undergoing minimal-incision thyroidectomy with those undergoing conventional thyroidectomy for benign thyroid diseases.
Methods: Prospective randomized study that was carried on 50 patients who were undergone thyroidectomy at the department of surgery-Menoufia University from June 2018 to June 2019. The patients were divided into two groups. Group A included 25 patients who were operated upon using minimal incision thyroidectomy technique and group B included 25 patients who were undergone traditional thyroidectomy incision.
Results: The length of skin incision was significantly shorter in the minimal-incision thyroidectomy than that in the conventional thyroidectomy group. Operative time was shorter in minimal incision technique. The incidence of postoperative complications was higher in conventional thyroidectomy group but didn't reach to significant level. Patients undergone minimal-incision thyroidectomy experienced significantly less postoperative pain and were more satisfied with the cosmetic result than patients who underwent conventional thyroidectomy.
Conclusions: Thyroid surgery can safely be performed as a minimally invasive procedure. Minimal access thyroid surgery is therefore a feasible and safe option for selected patients with excellent cosmetic outcome, with minimal learning curve.

Keywords: Minimal incision thyroidectomy, Benign thyroid disease, Numerical score system

INTRODUCTION

Thyroid surgery is one of the most common surgical interventions in surgical practice since it's one of the most important modality in the treatment of thyroid diseases.[1] Minimally invasive surgical techniques have attracted interest in all surgical specialties including abdominal, thoracic, and most recently head and neck surgery.[2] There is continuous evolution in surgical management of thyroid diseases.[3] Several teams of surgeons around the world led the search for a less invasive and more cosmetically appealing approach to a thyroidectomy.[4] As the anterior neck is a prominent, constantly exposed part of the body, and thyroid gland pathology is commonly a benign entity, surgeons have been seeking to perform operations with better cosmesis without any compromise in safety or complication rate. With these goals in mind, there has been considerable refinement in the size of the so-called standard thyroidectomy incision. Recent authors have suggested that incisions for total thyroidectomy and lobectomy are standardized at approximately 5.5 cm and 4.6 cm,

respectively, and are significantly affected by thyroid specimen volume and patient body mass index as well as the experience level of the assisting resident.[5]

Thyroid surgery like endoscopic thyroid surgery and minimal incision video assisted thyroid surgery (MIVAT) require special instrumentation and training. Whereas minimal incision non-endoscopic thyroid surgery uses conventional instruments with retraction.[1]

Objective of the study

This aim of this study was to compare the clinical outcome of conventional thyroidectomy and minimal incision thyroidectomy in benign thyroid disease.

METHODS

50 patients admitted to the Department of Surgery, Menoufia University from June 2018 to June 2019. The patients were randomly divided into two groups using random function in Excel program. Group A included 25 patients who were operated upon using minimal incision thyroidectomy technique and group B included 25 patients who were undergone traditional thyroidectomy incision.

Inclusion criteria

Inclusion criteria were patients with benign thyroid swelling that will undergo thyroidectomy (total or hemi).

Exclusion criteria

Exclusion criteria were malignant goiter, recurrent goiter, retro sternal goiter, goiter larger than 6 cm as estimated by pre-operative ultrasound.

All patients were submitted to thorough clinical history, general and local examinations. Laboratory investigation: Hemoglobin, bleeding time, clotting time and thyroid function tests. Ultrasound of neck was performed to detect size of the nodule and the gland indirect laryngoscopy for assessment of vocal cord movements. An informed written consent was taken from every patient.

Statistical analysis

Data were analysed using SPSS version 22 program. Data were expressed in the form of mean ±standard deviation (SD). Quantitative data were analysed using student's t-test, whereas qualitative data were managed by chi-square test. P value less than 0.05 was considered significant.

Menoufia faculty of medicine ethics committee approved this study.

Surgical techniques

1st group

Patients were operated upon using minimal incision thyroidectomy technique through a small (2.5 cm) lateral incision placed directly over the nodule (Figure 1).
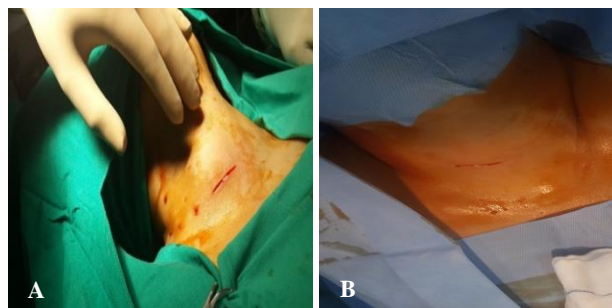

Figure 1 (A and B): Size of the wound in minimal incision thyroidectomy.

Figure 2: Lateral dissection and exposure of recurrent laryngeal nerve.

The exact site of the incision depends upon the location of the nodule to be removed. The midline of neck, suprasternal notch, medial margins of the sternomastoid muscles, and a curvilinear line at the site of a standard collar incision, A subplatysmal space is developed to allow the skin incision to be moved around the neck and over the relevant area of dissection. The anterior border of the sternomastoid muscle is dissected to expose the lateral margin of the strap muscles. The strap muscles are retracted medially and the middle thyroid vein is divided. Dissection down to the prevertebral plane is performed. Once the strap muscles are dissected from the thyroid lobe by retracting them medially, the lateral surface of the thyroid gland is in full view. The tracheal surface is identified above and below the isthmus, which is then divided to maximize the mobility of the lobe to be

resected. The skin incision is then moved in a cephalad direction and attention directed to the upper pole, which is retracted laterally to open up the avascular plane. The upper pole vessels are then divided. Mobilization of the lower pole is undertaken by careful capsular dissection with preservation of the inferior parathyroid gland on its vascular pedicle. Capsular dissection is continued until the RLN is encountered (Figure 2).

Figure 3: Site of scar after one month post-operative.

The nerve is then preserved by continuing the mobilization of the gland superiorly and the superior parathyroid is gently dissected away from the thyroid capsule on its vascular pedicle. The ligament of Berry is divided and the thyroid lobe is removed through the small incision. The skin incision is closed by using subcuticular absorbable sutures (Figure 3).

2nd group

Patients were operated upon using conventional thyroidectomy technique performed through a 4.5 to 8 cm transverse cervical incision. Subplatysmal flaps are extended to the level of the hyoid bone and inferiorly to the sternal notch. After separating and laterally retracting the strap muscles, the gland is removed in a fashion similar to that reported for minimal-incision thyroidectomy. Drains were placed in both groups.

After the closure of the wound, the length of the incision is measured with the help of a measuring tape. The size of the excised thyroid tissue in the greatest diameter is measured with the help of measuring tape in centimeters.

At the end of the procedure, all the patients received a single 75 mg diclofenac sodium intramuscular injection. In the post-operative period, the analgesia given to the patient was limited to an intramuscular injection of 50 mg of diclofenac sodium administered on and when required with a minimal interval of 6 hours between two consecutive doses. The total number of doses till time of discharge is recorded.

The patient was also asked to take a visual analog scale (VAS) test for pain assessment 6 hours post-surgery, before administration of any analgesic. The results were recorded as a score ranging from 0 to 100, in increasing order of intensity of pain. 0=no pain, 100=worst pain imaginable.

The duration of post-operative hospital stay was recorded in days. Any complication was noted and the patient was explained and asked to grade the appearance of the cervical scar on a numerical score system (NSS) of 0 to 10 in increasing order of satisfaction of the cosmetic outcome, with 0=worst scar and 10=best cosmetic outcome.

RESULTS

All 50 patients in both groups underwent thyroidectomy, results of which were as given below.

The mean age in 1st group was 38.6200 ± 6.9337 years and in the 2nd group was 39.0400 ± 7.2771 years ($p>0.05$). 92% patients (23 out of 25) in the 1st group were females whereas 88% patients (22 out of 25) in the 2nd group were females ($p>0.05$). Both groups were comparable with respect to weight, height and BMI ($p>0.05$).

Table 1: Differences between both groups.

Characteristics	Group A Mean±SD	Group B Mean±SD	T test	P value
Skin incision	3.292±0.42 cm	7.780±0.57	31.694	<0.0001
Operative time	64.40±10.9 cm	92.12±9.87	9.358	<0.0001
Post op hospital stay	1.72±0.42	3.06±0.32	12.689	<0.0001
VAS	48.40±9.70	63.07±9.12	5.509	<0.0001
NSS	6.83±0.72	3.92±0.75	13.995	<0.0001

Skin incision in 1st group ranged from 2.5 cm to 4.5 cm, with the mean being 3.292 ± 0.42 cm. While the mean skin incision length in the 2nd group was 7.780 ± 0.57 cm ($p<0.05$). The operative time in the 1st group ranges between 40-92 minutes (mean 64.40 ± 10.9 min) and in the 2nd group ranges between 70-120 minutes (mean 92.12 ± 9.87 min) ($p<0.05$) (Table 1).

The mean size of specimen in the 1st and 2nd groups were 3.45 ± 1.04 cm and 3.74 ± 1.07 cm respectively ($p>0.05$).

The post-operative hospital stay in the 1st group ranged between 1-2 days (mean 1.72 ± 0.42 days) and in the 2nd group ranged between 2-4 days (mean$=3.06\pm0.32$ days) ($p<0.05$).

There was significant difference between both groups as regard to VAS pain score in the 1st group (mean$=48.40\pm9.70$) and in the 2nd group (mean$= 63.07\pm9.12$) ($p<0.05$). The mean number of analgesic doses required in the 1st group and 2nd group were 2.86 ± 076/day and 4.14 ± 0.88 per day respectively ($p<0.05$).

The NSS cosmetic outcome score in the 1st group ranged between 5-8 (mean$=6.83\pm0.72$) and in the 2nd group ranged between 2-5 (mean$=3.92\pm0.75$) ($p<0.05$).

Table 2: Postoperative complications in both groups.

Symptom		Group A	Group B
Neck hematoma	N	0	1
	%	0	4.00
RLN neuropraxia	N	1	1
	%	4.00	4.00
Seroma	N	2	2
	%	8.00	8.00
Total	N	3	4
	%	12.00	16.00
Chi-square	X^2	0.875	
	P value	0.6456	

In the 1st group, 3 patients out of 25 (12%) had post-operative complications, (Table 2) which included RLN neuropraxia in 1 patient (recovered spontaneously), and seroma formation in 2 patients; whereas in the 2nd group, 4 patients out of 25 (16%) developed post-operative complications, which included neck hematoma in 1 patient, RLN neuropraxia in 1 patients (recovered spontaneously) and seroma formation in 2 patients. Thus, 3 patients in the 1st group and 4 patients in the 2nd group developed post-operative complications ($p>0.05$).

DISCUSSION

Thyroid diseases primarily occur in young to middle-age women, who usually are concerned with the cosmetic results after thyroid surgery. Driven by patient demand,

surgeons had great interest to perform operation with less pain and better cosmetic results. To minimize cosmetically undesirable neck scars.[1]

Minimally invasive thyroidectomy techniques have been developed. However, there is currently no single accepted technique in minimally invasive thyroidectomy (MIT). This description includes open surgery with a midline or lateral approach, video-assisted with cervical or extra-cervical incision and endoscopic thyroidectomy techniques.[6]

The role and technique of minimally invasive thyroidectomy in nodular thyroid disease continues to evolve, and the fact that no single technique has established itself as being dominant over all others indicates that further refinement is still needed.[7]

As the incision we used is located mostly medial to sternomastoid muscle it can be extended slightly if needed for bilateral exploration with keeping its size small as it is.[8]

In our study, no statistically significant difference was observed in epidemiological parameters like age, sex, weight, height, BMI, FNAC pathology ($p>0.05$).

In our study the mean age of patients was 38.6 ± 6.7 years, in 1st group and 39.04 ± 7.2 years in 2nd group the range was 22-66 years which is coincided with the mean age reported by Ikeda, et al 40.4 ± 6.6 years.[2] Also quite similar to Park et al 43.4 ± 12.7 years who reported mean age of 42 years.[9] In contrary with our study Del Rio et al reported the mean age 57.5 years ±12.7 years, the reason for that the majority of their cases presented with thyroid carcinoma.[10]

Regarding our study female to male ratio, females had a higher incidence of benign thyroid disease than males among 50 case in 1st group 92% female and 8% male and 2nd group 88% female and 12% male. In agreement with our study, Narayanrao et al reported 92% patients in the 1st group were females whereas, 90% patients in the 2nd group were females.[1] Terris et al also reported 89% females and 11% males.[4] Park et al and Gosnell et al reported that there were 88% female and 12% male. And thus, may be explained by dominance of benign thyroid diseases in female. [9,11]

As regard the mean length of skin incision was 3.292 ± 0.42 cm, the range was 2.5-4.5 cm in 1st group and skin incision was 7.7 ± 0.57 cm, the range was 7-9.5 cm in 2nd group. As expected, the length of skin incision will be variable according to the size of the resected nodule.

These data were in agreement with study of Narayanrao et al, the 1st group had an incision size of 3.328 ± 0.36 cm as compared to 7.950 ± 0.54 cm of the 2nd group.[1] Perigli et al incision length was 31.3 ± 0.8 mm in minimal incision thyroidectomy group and 53.5 ± 2.5 mm in

conventional group.[12] Ikeda et al performed 21 operations of thyroidectomy through a 3 cm central incision.[2]

Other series used smaller skin incisions, Govednik, et al (2014)used 2.46±0.2 cm skin incision.[13] Sywak et al (2008) used a 2.4 cm skin incision with a mean of nodule size was 2.1 cm.[14] Gosnell et al used a 2.2 cm skin incision with a mean of nodule size was 2.2 cm.[11] While Terris et al used a 2.2 cm skin incision with a mean of nodule size was 1.5 cm. The reason that the length of skin incision in our study was longer than most similar studies were that the mean size of thyroid nodule in our study bigger than that in these studies.[4]

As regards the mean operative time there was significant difference between both groups 64.40±10.9 min, range 45-120 min in 1st group and 92.12±9.87 in 2nd group.

These data were in agreement with study of Narayanrao et al, the mean operative time in the 1st and 2nd group was 66.30±11.19 minutes and 89.30±9.58 minutes respectively.[1] Perigli et al reported a mean operative time of 61.6±4.6 minutes.[12] Alvarado et al reported a mean operative time of 49 minutes with a range 34-54 minutes.[7] Sywak et al reported a mean operative time of 56 minutes with a range of 51-61 minutes.[14] Govednik et al reported the mean operative time 135.4±51.1 minutes. The increase in time was most significant for a total thyroidectomy 179.1 minutes and 99.4 minutes for lobectomy.[13]

Ikeda et al reported mean operative time of total lobectomy was 94±22 minutes.[2] Terris et al reported a mean surgical time for minimally invasive hemithyroidectomy as 115.7±33.8 minutes.[15]

As regard the mean post-operative hospital stay was 1.72±0.42 day and range (1-2) in 1st group and 3.06±0.32 day with range of (2-4) in 2nd group.

In agreement with our study, study of Narayanrao et al the mean post-operative hospital stay was a 2.72±0.57 days in 1st group and in 4.04±0.73 days in the 2nd group.[1]

In the study of Park et al, the mean postoperative hospital stay was close to that in our study; 1.6±0.50 day.[9] Perigli et al reported mean postoperative hospital stay of 28.2±2 hours.[12] On the other hand, Ikeda et al reported that the patients remained hospitalized postoperatively for 4 days in their study. As regard to our results, we consider this is too long as we noticed no ill effect from the shorter postoperative hospital stay.[2]

As regard postoperative complications in our study, In the 1st group, 3 patients out of 25 (12%) had post-operative complications, which included RLN neuropraxia in 1 patient (recovered spontaneously), and seroma formation in 2 patients; whereas in the 2nd group, 4 patients out of 25 (16%) developed post-operative complications, which included neck hematoma in 1

patient, RLN neuropraxia in 1 patients (recovered spontaneously) and seroma formation in 2 patients. With no significant difference between both group

In study of Narayanrao et al, in the 1st group, 6 patients out of 50 (12%) had post-operative complications in the form of RLN neuropraxia in 2 patients (recovered spontaneously), skin edge necrosis in 1 patient and seroma formation in 3 patients and 8 patients out of 50 (16%) developed post-operative complications in 2nd group in the form of primary haemorrhage in 1 patient, RLN neuropraxia in 4 patients (recovered spontaneously) and seroma formation in 3 patients. None of the complications except one required any active intervention.[1] Park et al also reported no significant difference in the complication rate in the minimal incision surgery group as compared to conventional surgery group.[9]

In study of Rafferty, et al study of 164 patients they had 8 (4.3%) wound hematomas, 2 (1.1%) wound infections, 3 (1.6%) patients with temporary hypocalcemia, and 1 (0.5%) temporary superior laryngeal nerve palsy and RLN palsy, respectively. There was no permanent nerve injury. It can thus be said that minimally invasive thyroid surgery procedures are as safe as the conventional procedures.[16]

In our study, the mean of VAS for pain measured in postoperative day 1 was 48.40±9.70 in 1st group and 63.07±9.12 in 2nd group, the mean of number of oral analgesia taken was 2.55±0.65 doses, and 4.35±0.47 with great significant difference between both groups.

Similar to our results of Narayanrao et al mean VAS scores for 1st and 2nd group were 49.10±8.85 and 59.00±8.33 respectively, while the mean number of analgesic doses required was 2.86±0.76 and 4.14±0.88 respectively with significant difference between both groups.[1] In study of Perigli et al the mean VAS scores (0-10) was 4.3±0.6 in 1st group and 8.3±0.4 in 2nd group.[12] In the study of Sywak et al the mean VAS scores (0-10) was 2.6 in 1st group and 3.4 in 2nd group.[14]

In our study the mean satisfaction score as measured by NSS was 6.83±0.72 in 1st group and 3.92±0.75 in 2nd group with significant difference between both groups.

These data were in agreement with study of Narayanrao et al was 6.56±0.81 in 1st group and 4.82±0.85 in 2nd group.[1] And in study of Perigli et al was 8.4±0.3 in 1st group and 3.8±0.9 in 2nd group.[12]

The minimal incision thyroidectomy seems to be suitable for thyroid disease than other new modalities in minimal access thyroid surgery, since this procedure is characterized by a small skin incision in the neck and the use of conventional instruments, retractors and a surgeon's finger with no additional burden of costs on patients or required specialized instruments.

CONCLUSION

Our study, indicate that minimal-incision thyroidectomy is a feasible and reliable option for the surgical treatment of selected patients with benign thyroid diseases. It also appears its advantages over the conventional technique with respect to a shorter post-operative recovery period with significantly less pain and a great cosmetic outcome with a smaller post-operative scar provides an economic advantage in rural government surgical setup. Since the technique is an evolution of the conventional procedure, it does not have a steep learning curve and also does not require any specialized instruments and training. However, it only appends and does not replace the conventional surgical approach that is required for very large lesions of the thyroid gland.

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