



Minimally invasive video-assisted thyroidectomy (MIVAT) is an emerging surgical technique used in thyroid surgery worldwide



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Abstract

Introduction: This study evaluates thyroidectomy in children using the MIVAT. Operating time (OT), length of hospitalization, estimated blood loss (EBL), incision length (IL), diagnosis, and complications were evaluated.

Method: Pediatric thyroidectomies between January 2008 and September 2014 were reviewed following IRB approval. MIVAT hemi (HT) or total (TT), or standard total thyroidectomy techniques were included.

Results: 20 MIVAT procedures occurred in 17 patients (13 female/4 male); 3 HT underwent completion thyroidectomy. There were 12 HT (9 female/3 male), and 5 TT (4 female/1 male). 7 patients had thyroid cancer and 10 patients had benign disease. One MIVAT patient had TT, left paratracheal and central dissection. Nine patients (8 females/1 male) had standard open total thyroidectomy with neck dissection. In the HT group, OT = 84 minutes, EBL = 12 mL, IL = 3.5cm. In the TT group, OT = 134 minutes, EBL = 35 mL, IL = 4.1 cm. 3 TT patients were admitted overnight with drains and 1 stayed overnight for hypocalcemia. 4 HT patients were hospitalized: 3 for pain control, 1 for hypoparathyroidism with hypocalcemia. Postoperatively, 2 HT patients had temporary unilateral vocal fold paresis. One HT had persistent hypoparathyroidism. With open thyroidectomy, OT = 204 minutes, EBL= 88ml. IL = 6.6 cm, 5 of 9 patients were hospitalized for 3.6 days (2-5 days).

Conclusion: Pediatric MIVAT is beneficial in both benign and malignant disease with little EBL, short operative time, small incisions and minimal postoperative complications.

Introduction

Minimally invasive video-assisted thyroidectomy (MIVAT) is an innovative technique that was initially performed in adults and has recently seen increased usage in the pediatric population. Miccoli extrapolated the endoscopic approach they first used for parathyroidectomy to thyroid surgery in 2001. Both endoscopic and conventional instruments are used to dissect and expose key structures in the surgical field. Therefore, a thyroidectomy can be performed using a relatively smaller incision, leading to improved postoperative cosmesis via a smaller scar.^{1,2} In Europe, the safety and effectiveness of pediatric MIVAT has proven to be comparable to that of conventional thyroidectomy. Furthermore, operative time and length of hospitalization was shorter for the pediatric MIVAT population.^{3,4} In the United States, there are limited studies that focus primarily on pediatric MIVAT.⁵ We present general outcomes of pediatric MIVAT performed in our teaching institution over six years. We analyzed operative time (OT), length of hospitalization, estimated blood loss (EBL), incision length (IL), and complications.

Methods and Materials

Patient Population: Between January 2008 and September 2014, patients 9-18 years of age were scheduled for MIVAT or open thyroidectomy. Patients were scheduled for open thyroidectomy if they required paratracheal or neck dissections. 26 patients were included in the study, 17 in the MIVAT group and 9 in the open thyroidectomy group. 3 patients in the MIVAT HT group went on to undergo completion thyroidectomy using MIVAT following pathology review (Table 1).

References

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Methods and Materials (cont.)

Surgical Technique: The same attending physician performed all of the surgeries with the assistance of at least a fellow or a resident. In MIVAT, a 2-5 cm incision was made, and 30 degree 4 mm endoscope was used to visualize the skeletonization of the superior pole vessels. Bilateral recurrent laryngeal nerves and parathyroid glands were identified under direct visualization. In open thyroidectomy, the incision was >5 cm and structures were directly visualized. A drain was placed if extensive dissection was undertaken.

Assessment of Complications: Serum calcium and parathyroid hormone (PTH) were checked 1 hour postoperatively in patients who underwent total or completion thyroidectomy. In patients with hypoparathyroidism, serum calcium and PTH were regularly monitored at postoperative appointments. Hypoparathyroidism was considered permanent if serum PTH <10 pg/mL at 6 months post-operatively. Vocal folds were assessed post-operatively in clinic using indirect flexible laryngoscopy or mirror exam, if patient exhibited hoarseness.

Table 1. Demographics and diagnoses of MIVAT and open thyroidectomy groups

	MIVAT		Open Thyroidectomy	
	TT	HT	TT	HT
Patients (n)	6	11	8	1
Age (y)				
Mean ± SD	16 ± 2.4	15 ± 2.8	15.5 ± 3.5	18
Range	12-18	9-18	8-18	
Sex				
Male	1 (17%)	3 (27%)	7 (88%)	0
Female	5 (83%)	8 (73%)	1 (12%)	1
Malignant lesion				
Papillary thyroid carcinoma	4 (67%)	1 (9%) ^a	7 (88%)	-
Follicular carcinoma	-	2 (17%) ^a	-	-
Benign lesion				
Follicular adenoma	2 (33%)	4 (36%)	-	1
Lymphocytic thyroiditis	-	3 (27%)	1 (12%)	-
Multinodular thyroid	-	1 (9%)	-	-

Abbreviations: MIVAT (minimally invasive video-assisted thyroidectomy); TT (total thyroidectomy); HT (hemithyroidectomy); y (years)

^a 3 patients included in the MIVAT HT group underwent hemithyroidectomy followed by completion thyroidectomy using MIVAT at a later date following pathology review

Results

Table 2. Surgical features of MIVAT and open thyroidectomy groups.

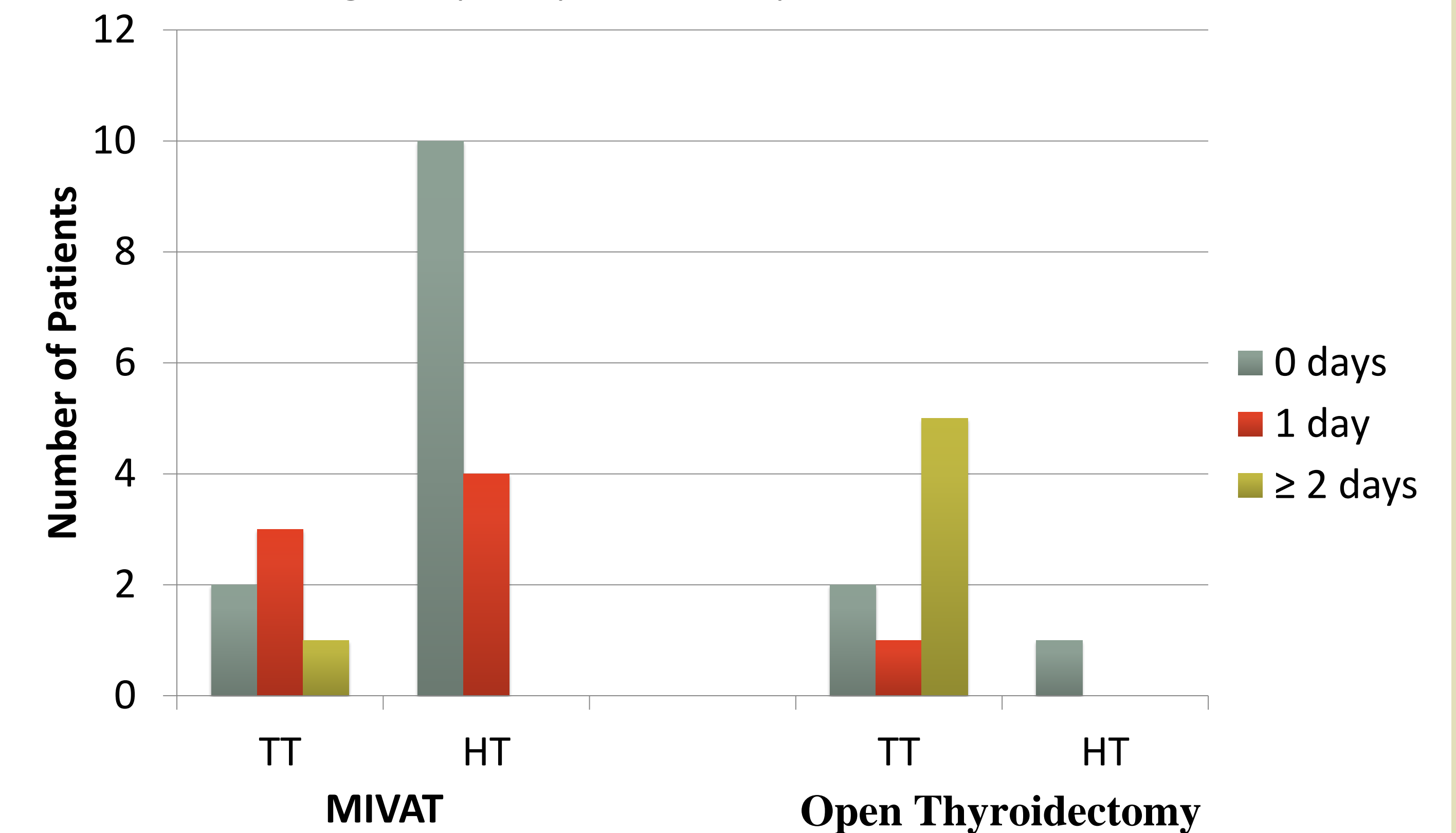
	MIVAT		Open Thyroidectomy	
	TT	HT	TT	HT
Cases (n)	6	14	8	1
EBL (mL)				
Mean ± SD	32 ± 1.2	12 ± 10	96 ± 66	25
Range	5-75	5-35	20-200	-
Incision size (cm)				
Mean ± SD	3.9 ± 1.2	3.6 ± 0.7	6.2 ± 1.2 ^a	8
Range	2-5	3-5	5-8 ^a	-
Operative time (hr:min)				
Mean ± SD	2:10 ± 0:25	1:22 ± 0:15	3:13 ± 2:08	1:40 ± 1:00
Range	1:50-2:55	1:00-1:52	1:46-6:24	-

Abbreviations: MIVAT (minimally invasive video-assisted thyroidectomy); TT (total thyroidectomy); HT (hemithyroidectomy); EBL (estimated blood loss)

^a An apron incision was used for 3 patients in this group, and these data points were not included.

Discussion

Chart 1. Length of postoperative hospitalization



There were 4 postoperative admissions in the MIVAT TT group. These patients were admitted for drain care, pain control, or serum calcium monitoring for hypoparathyroidism. In the MIVAT HT group, 4 patients were admitted for either pain control or hypoparathyroidism following completion HT. 4 patients were admitted for drain care and/or hypoparathyroidism in the open thyroidectomy TT group.

Table 3. Complications of MIVAT and open thyroidectomy groups

	MIVAT		Open Thyroidectomy	
	TT	HT	TT	HT
Cases (n)	6	14	8	1
Hypoparathyroidism				
Permanent	-	1 (7.1%) ^a	3 (33%)	-
Transitory	1 (17%)	2 (14%)	2 (22%)	-
Transitory RLNP	-	3 (21%) ^a	-	-
Dysphagia/Dysphonia	1 (17%)	-	-	-

Abbreviations: MIVAT (minimally invasive video-assisted thyroidectomy); TT (total thyroidectomy); HT (hemithyroidectomy); RLNP (recurrent laryngeal nerve palsy)
^aFollowing MIVAT HT, one patient had RLNP that resolved. This patient subsequently underwent completion MIVAT HT and had permanent hypoparathyroidism.

Conclusions

Pediatric MIVAT is a useful and safe technique that can be used in the surgical management of benign and malignant thyroid disease. Our patients had minimal blood loss, a relatively small incision, and decreased operative time and length of hospitalization. Furthermore, long-lasting complications were rare. More patients in the MIVAT group experienced transitory RLNP, possibly due to the more restricted visualization associated with a smaller incision. We included open thyroidectomy data for general comparison rather than as a control. Patients underwent planned open thyroidectomies if extensive nodal dissection was anticipated, requiring a larger incision and longer operative time. There were no MIVAT patients that required conversion to open.

MIVAT was first presented in Europe and has since gained popularity in the United States and internationally. It is already widely utilized in adults and is seeing a similar trend in the pediatric population. The attraction to MIVAT lies in its ability to produce comparable disease-free results as its open counterpart while improving patients' post-surgical recovery.⁶⁻⁷