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## Background

During last years, improved tools for diagnosis in thyroid pathologies in childhood together with a wider and more accurate use in ultrasound techniques have lead to consider minimally invasive video-assisted thyroidectomy (MIVAT) as having several advantages over conventional thyroid surgery, with a less painful post-surgery course and a better aesthetic result. In USA, MIVAT is probably the most commonly approach for minimally-invasive thyroid surgery. In general, MIVAT indications include: 1) thyroid nodules with diameter  $\leq 35$  mm, 2) papillary thyroid carcinoma with diameter  $\leq 30$  mm without ultrasound evidence of lymphnodes involvement. Although MIVAT approach in children has been already described, extensive data in pediatrics are lacking.

## Objective and hypotheses

Endpoints of our study were to evaluate technical success of MIVAT defined as completion and efficacy of the procedure and the related complications (such as transient or permanent hypoparathyroidism, transient or permanent recurrent laryngeal nerve injury, postoperative hematoma and others) in a cohort of children affected by both benign and malignant thyroid diseases during the last 10 years.

## Patients and methods

32 children (24 females, 8 males; age range: 4.37-17.7 years; mean age  $13,82 \pm 3,19$ ) were submitted to MIVAT thyroidectomy for benign (n= 21; 15 F, 6 M) and malignant (n= 11; 9 F, 2 M) thyroid disease. Among patients submitted to surgery for multinodular goiter and single nodules, the major diameter was  $18,32 \pm 10$  mm (range: 6 - 35 mm).

In the MIVAT technique patient is placed in a supine position (without neck hyperextension); the length of the incision was 2 cm (2 cm above sternal notch); a 30° 5 mm endoscope is introduced through the incision and the operation is then performed using a specifically kit (Figures 1, 2 and 3).



Fig. 1

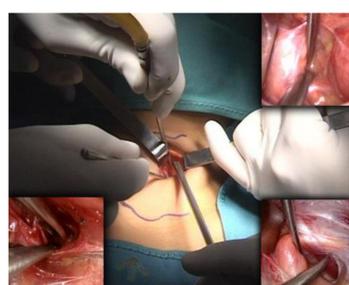


Fig. 2



Fig. 3

Surgical procedures included **Total Thyroidectomy (TT)** in 19 pts; **TT plus central neck lymphadenectomy (TT+CNL)** in 3 pts, **Hemithyroidectomy (HT)** in 10 pts. Completion thyroidectomy (CTT) needed to be performed in 3 pts initially treated by HT as definitive therapy for carcinoma (WDC).

- TT was performed for definitive therapy of hyperthyroidism (n= 7), multinodular goiters (n= 6), WDC (n= 4), prophylapsys of medullary carcinoma (MTC) in positive oncogene RET mutation (n= 1), MTC (n=1).
- TT+CNL was performed for therapy of MTC (n=1) and WDC (n= 2).
- HT was performed for single benign nodules (n= 7) and WDC (n= 3), than followed by a CTT.

Groups	TT	TT+CNL	HT*
N° patients	19	3	10
Age at surgery	13, $33 \pm 3,5$	15, $69 \pm 3,64$	14, $19 \pm 2,24$
Sex (M/F)	5/14	1/2	2/8
Multinodular goiters	6	--	--
WDC	4	2	3*
MTC	1	1	--
Hyperthyroidism	7	--	--
MTC Prophylapsys in oncogene RET mutation	1	--	--
Single benign nodules	--	--	7

Table 1: Type of surgery, age, sex, thyroid diseases.

\*= three patients required a second MIVAT procedure (completion thyroidectomy) for histological malignancy

Following variables were evaluated: hypoparathyroidism (transient or permanent), recurrent laryngeal nerve (RLN) injury (transient or permanent), postoperative bleeding and infections.

## Results

Among all pts, transient RNL injury was registered in one patient (3,1 %). Transient hypoparathyroidism occurred in 6 patients (18,7%) and permanent hypoparathyroidism in 2 patients (6,2%) affected by Graves' disease (one of them with micropapillary carcinoma). Surgical complications are listed in table 2 and 3.

Features	Total thyroidectomy, 19 (59,3 %)	Total thyroidectomy + CC, 3 (9,3 %)	Emithyroidectomy, 10 (31,2%)
Complications related to parathyroid injury	36,8% (7/19)	33,3% (1/3)	0%
	Transient hypoparathyroidism 26,3% (5/19)	Transient hypoparathyroidism 33.3% (1/3)	Transient hypoparathyroidism 0%
	Permanent 10.5% (2/19)	Permanent 0%	Permanent 0%
Complications related to RLN injury	5,2%(1/19)	0%	0%
	Transient hoarseness 5,2% (1/19)	Transient hoarseness 0%	Transient hoarseness 0%
	Permanent hoarseness 0%	Permanent hoarseness 0%	Permanent hoarseness 0%
Others	0%	0%	0%

Tab. 2

Features	Benign, 21 (65,6 %)	Malignant, 11 (34,3%)
Complications related to parathyroid injury	19% (4/21)	36,3% (4/11)
	Transient hypoparathyroidism 14,2% (3/21)	Transient hypoparathyroidism 27,3% (3/11)
	Permanent 4,7% (1/21)	Permanent 9% (1/11)
Complications related to RLN injury	4,7% (1/21)	0%
	Transient hoarseness 4,7%	Transient hoarseness 0%
	Permanent hoarseness 0%	Permanent hoarseness 0%
Others	0%	0%

Tab. 3

Until now, we have not detected any residual or recurrent carcinoma in the group of pts with malignant diseases (9 WDC, 2 MTC), during a follow up period of  $23,3 \pm 19,3$  months (range: 7 - 76 months).

## Conclusions

These data show that MIVAT technique is safe and effective in the treatment of benign and malignant thyroid diseases in childhood; it can be used on a regular basis by a surgical team with a specific experience in thyroid surgery.

The percentage of peri- and post- operative complications seem to be lower than conventional thyroid surgery. Hemithyroidectomy does not show any adverse event; permanent hypocalcemia was observed only in TT. The greater number of complications related to parathyroid injury has been observed in MIVAT TT performed for malignancies.

A collaborative team (expert thyroid endocrine surgeons and endocrinologists) is necessary in order to minimize complications related to thyroid surgery in children.

## References

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