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Original research

Minimal-access video-assisted thyroidectomy for benign disease: A retrospective analysis of risk factors for postoperative complications

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HIGHLIGHTS

- MIVAT is a widespread technique in the treatment of thyroid disease.
- No studies systematically investigate risk factors for postoperative complications.
- We overcome this problem using bivariate and multivariate logistic regression analyses.
- Independent risk factors for complications are hyperthyroidism and thyroiditis.
- Surgeons operating on these patients should be aware of these results.

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ABSTRACT

Background: Minimal-access video-assisted thyroidectomy (MIVAT) has now become a widespread technique in the treatment of benign thyroid disease. No studies systematically investigate risk factors for postoperative complications. The aim of our study was to investigate possible risk factors for postoperative complications in MIVAT in patients with benign disease. **Methods**: One-hundred eighty-nine patients who underwent MIVAT for benign disease were retrospectively identified in a prospectively-maintained institutional register of thyroid surgery. Exclusion criteria were: (1) thyroid volume>45 mL; (2) malignant disease; (3) prior neck surgery; (4) prior neck irradiation; (5) nodule size>3 cm; (6) intrathoracic component; (7) follow-up<1 year. Age, sex, comorbidities, body mass index, existence of symptoms, duration of disease evolution, thyroid volume, hyperthyroidism, thyroiditis, and the duration of surgery were analyzed as risk factors for complications. We applied both bivariate and multivariate logistic regression analyses in order to identify risk factors associated with postoperative complications. **Results**: Complications were presented by 28 patients (14.8%). The variables associated as independent risk factors with these complications were hyperthyroidism (OR = 4.31; $P = 0.003$) and thyroiditis (OR = 3.59; $P = 0.035$). Age, sex and thyroid volume up to 45 mL do not seem to be independent risk factors. **Conclusions**: In endocrine surgery units, two independent risk factors for postoperative complications could be identified in MIVAT patients: hyperthyroidism and thyroiditis. Surgeons operating on patients presenting these factors should be aware of the potential augmented risk in order to correctly adapt intraoperative and postoperative care.

1. Introduction

Endoscopic neck surgery was first described for parathyroidectomy by Gagner in 1996 [1] and subsequently proposed for thyroid surgery. Six techniques are currently performed: four complete endoscopic techniques (cervical, axillar, axillo breast bilateral, and retroauricular access) and two video-assisted

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techniques (one medial technique and a lateral endoscopic-assisted technique called MIVAT for minimally-invasive video-assisted thyroidectomy). Among these techniques, MIVAT has now become widespread [2–4] and has been described as indicated in selected patients (e.g. thyroid volume <20–30 mL) [5]. Since Ruggiery et al. [6], Lai et al. [7], and Fan et al. [8] demonstrated that this technique can also be performed in patients with a thyroid volume up to 50 mL and thyroiditis, we extended our inclusion criteria to patients with a thyroid volume up to 45 mL and thyroiditis. The advantages of MIVAT are well-documented in several studies for both benign and malignant disease [4,9–15]. Absolute contraindications are previous neck surgery, large goiter, local advanced cancer, and lymph node metastases. Relative contraindications are hyperthyroidism, thyroiditis [5]. Recently, indications for MIVAT were extended to include thyroiditis [16]. Minimal-access thyroid surgery is known to have few therapy-relevant or definitive complications (eg. injuries to the laryngeal nerve, hematoma, seroma, hypocalcemia) [9,10,15]. This might be the reason why patients are concerned about operative complications and the postoperative cosmetic result [17].

In open procedures, authors have systematically investigated and described different independent risk factors for postoperative complications. However, the risk factors for postoperative complications in minimal-access thyroid surgery and especially MIVAT have not been systematically investigated. The aims of this study are to investigate and discuss the independent risk factors associated with minimal-access thyroidectomy, performed for benign disease, with special attention to thyroid volume, hyperthyroidism and thyroiditis.

2. Patients and methods

2.1. Patients

This retrospective study included 189 consecutive patients identified in a prospectively-maintained institutional register of thyroid surgery and surgically treated (with MIVAT) for benign thyroid disease between June 2010 and April 2012 in our unit for endocrine surgery. The exclusion criteria were: (1) thyroid volume > 45 mL; (2) malignant disease; (3) prior neck surgery; (4) prior neck irradiation; (5) nodule size > 3 cm; (6) intrathoracic component; (7) follow-up < 1 year.

All patients underwent complete basic blood test and thyroid hormone activity study, simple chest radiology, and a thyroid sonography (Hitachi, Vision), performed by the same ultrasonographer. Sonography informed in all cases of an eventual intrathoracic component, and thyroid gland volume data [18–20]. Fine needle aspiration (FNA) was done if needed (suspicion of malignant disease, German Guidelines: *Leitlinien der Arbeitsgemeinschaft Wissenschaftlichen Medizinischen Fachgesellschaften* and *Leitlinien der Chirurgischen Arbeitsgemeinschaft Endokrinologie*) and enabled exclusion of patients with suspicious cytology. Laryngoscopy was preoperatively performed in all patients included.

The operations were performed by 4 surgeons with experience in endocrine surgery (i.e. they had previously performed more than 30 MIVAT procedures with the Micolli technique) [2].

2.2. Surgical technique

In summary, a 25–35 mm incision is performed 2 cm above the sternal notch, the cervical linea alba is divided longitudinally in the Micolli technique. A small retractor is used to retract the strap muscles. The upper vessels are selectively ligated by clips and cut after identification of the external branch of the superior laryngeal nerve. Inferior vessels are also clipped and cut. After lifting the thyroid lobe, the recurrent laryngeal nerve and the parathyroid glands are dissected from the thyroid. All four parathyroid glands were not always found. Our policy was to identify at least two glands in each patient. Well-vascularized glands were left in place, and devascularized glands were autotransplanted in the musculus sterno-cleido-mastoideus. The ligament of Berry is then ligated and cut. The laryngeal recurrent nerve is then checked before division of the isthmus. This was done using the Dr. Langer Avalanche neuromonitoring system in every patient and on each side.

During the immediate postoperative period, we performed routine determination of calcemia 24 and 48 h after the operation. A laryngoscopy was performed by an experienced endoscopist in the first postoperative week. Hypoparathyroidism was considered when the calcium readings were below 7.5 mg/dL or less than 8.5 mg/dL if there were symptoms due to hypocalcemia. Serum calcium levels remaining below 8.5 mg/dL at 1 year were labeled as permanent hypocalcemia. We did not order a routine calcium replacement regime; calcium was administered only if patients became symptomatic (eg. paresthesia). RLN injury was considered to be a postoperative alteration in the tone, timbre, or intensity of the voice, with confirmation of vocal cord alteration by laryngoscopy; it was definitive if it persisted more than 12 months.

All patients were reviewed at 1 week, 3 and 6 months and annually thereafter and were treated with substitutive hormone therapy if necessary (Levothyroxine). In patients with hypoparathyroidism and/or dysphonia, the review was done monthly until the calcemia returned to normal without medication or the dysphonia resolved. The patients with RLN injury underwent laryngoscopic control at 6 months, and at 1 year if involvement of the vocal cord persisted. When findings were normal in either examination, the patients returned to standard follow-up.

The variables analyzed to detect risk factors were: (1) age; (2) sex; (3) comorbidity; (4) body mass index; (5) existence of symptoms; (6) duration of evolution; (7) thyroid volume; (8) hyperthyroidism; (9) thyroiditis; (10) duration of surgery.

All data were checked for accuracy and analyzed using STATA 12.1 statistical software (StataCorp LP, College Station, TX, USA.) For statistical analysis, we used a bivariate analysis with a Student *t*-test for continuous variables and χ^2 test for categorial variables; to

Table 1
Variables associated with postoperative complications; bivariate analysis.

Variable	Complications ($n = 28$)	No complications ($n = 161$)	*P* Value
Age, years[a]	38.71 ± 8.98	39.27 ± 7.79	0.732
Sex			0.242
Male ($n = 27$)	2	25	
Female ($n = 162$)	26	136	
Time of evolution, months[a,b]	52.07 ± 19.85	50.04 ± 21.64	0.644
Symptomatic, *n* (%)			0.153
No ($n = 119$)	21 (75.0)	98 (60.9)	
Yes ($n = 70$)	7 (25.0)	63 (39.1)	
Compressive syndromes, *n* (%)			0.261
No ($n = 182$)	28 (100.0)	154 (95.7)	
Yes ($n = 7$)	0 (0.0)	7 (4.3)	
Thyroid volume, mL[a]	34.03 ± 6.22	34.44 ± 7.08	0.753
Hyperthyroidism, *n* (%)			**0.005**
No ($n = 161$)	19 (67.9)	142 (88.2)	
Yes ($n = 28$)	9 (32.1)	19 (11.8)	
Associated thyroiditis, *n* (%)			**0.013**
No ($n = 172$)	22 (78.6)	150 (93.2)	
Yes ($n = 17$)	6 (21.4)	11 (6.8)	
Extent of Surgery, *n* (%)			**0.451**
Hemithyroidectomy	20 (71.4)	105 (65.2)	
Thyroidectomy	8 (28.6)	56 (34.8)	
Duration of surgery, min[a]	87.71 ± 22.56	96.96 ± 22.21	**0.045**

Bold: statistically significant *P* Value.
[a] Data expressed as Mean ± SD.
[b] Time from diagnosis to operative therapy.