

# Difficult Endotracheal Intubation In Thyroid Surgery: A Retrospective Study

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## Abstract

**Objective:** determine the incidence of difficult endotracheal intubation in patients who underwent elective thyroid surgery, evaluating the predictive value of the known risk factors and specific risk factors for this population. **Material and Methods:** retrospective study of 512 patients who underwent elective thyroid surgery, based on anaesthesia medical records. **Results:** the incidence of difficult endotracheal intubation was 12.7%. All the classic risk factors for difficult endotracheal intubation were greater in the difficult endotracheal intubation group (with a positive predictive relation for Mallampati grade and reduced cervical mobility). The diagnosis of diving or compressive multinodular goiter had a positive predictive value. In 24.6% of patients with difficult airway no risk factor was found for difficult endotracheal intubation which probably corresponds to a false negative group. **Conclusions:** the presence of anatomical alterations in the airway conditioned by diving or compressive multinodular goiter are predictive factors in difficult endotracheal intubation in thyroid surgery.

## INTRODUCTION

The control of the airway is a fundamental aim for the anaesthesiologist [1]. Keeping in mind that the gland can alter the anatomy of the airway, endotracheal intubation in thyroid surgery can be difficult. The risk factors for a difficult airway have been extensively studied in the general surgical population, although the occurrence of difficult endotracheal intubation in thyroid surgery has been limited to a few studies [2], some of which validated evaluation scales like IDS (Intubation Difficulty Scale) [3]. Since failure in endotracheal intubation can cause morbidity and mortality, it is important to establish the existence of specific risk factors to difficult endotracheal intubation in patients with thyroid pathology and determine which specific preoperative tests can determine that risk.

We evaluate retrospectively, the incidence of difficult endotracheal intubation in patients who underwent elective thyroid surgery between January 2005 and June 2007, evaluating the predictive value of the known risk factors and specific risk factors for this population.

## PATIENTS AND METHODS

Retrospective, descriptive study based on medical records of 533 patients who underwent elective thyroid surgery between January 2005 and June 2007 in our hospital. The 21 patients with incomplete medical records were excluded

from the study.

From the anaesthesia clinical records a three year resident gathered the following data: demographical information, ASA grade, weight, height, body mass index and preoperative evaluation of the patient's airway: mallampati grade, cervical mobility, mobility of the temporo-mandibular joint, thyromental distance and presence of retrognathism. We also registered the diagnostic and specific surgical procedure done. The intraoperative classification of endotracheal intubation was done by an attending anaesthesiologist that performed the laryngoscopy (using a Macintosh blade sized accordingly to the patients characteristics) and intubation. The definition of difficult intubation was made if more than three attempts where necessary or there was a change in the materials used to intubate. The patient airway was classified into three groups: no difficulty, mild to moderate difficulty and impossible intubation.

Statistical analysis carried out with the 12.0 version of the SPSS programme for Windows (SPSS Inc., Chicago, IL). Data presented as mean  $\pm$  standard deviation. Comparison of the two groups with a Qui-square test. The association between variables was evaluated using the T-student test with a confidence interval of 95%.

**RESULTS**

As shown in table 1, we studied 512 patients, 448 female and 55 male, ASA I-III groups, with an average body mass index of 27.7.

Preoperative diagnosis: multinodular goiter in 64.9%, isolated thyroid nodule in 11.1%, diving or compressive multinodular goiter in 10.3% (defined has clinical signs of compression or radiographic signs of intra-thoracic goiter or tracheal compression in cervical radiogram), neoplastic multinodular goiter in 9.6% and Graves disease in 4.1% of the patients.

A total thyroidectomy was performed in 80.2% of the patients, a lobectomy in 16.8% and completion of thyroidectomy in 3.0%.

Patients were intubated orotracheally by direct laryngoscopy, except for one patient with impossible intubation with direct laryngoscopy, that was intubated with fiberoptic guidance. The incidence of difficult endotracheal intubation was 12.7%.

**Figure 1**

Table 1. Demographical characteristics, ASA grade, body mass index, diagnostic, surgery done and incidence of difficult endotracheal intubation

Variables	Patients (n=512)
Age	55.2 ± 13.4
Sex (M/F)	64/448
ASA (I/II/III)	60 (11.7)/386 (75.6)/65 (12.7)
Body Mass Index	27.8 ± 5.1
Multinodular goiter	332 (64.9)
Thyroid nodule	57 (11.1)
Diving/compressive goiter.	53 (10.3)
Neoplastic goiter	49 (9.6)
Graves disease	21 (4.1)
Total thyroidectomy	412 (80.2)
Lobectomy	85 (16.8)
Completion of thyroidectomy	15 (3.0)
Incidence of difficult endotracheal intubation	65 (12.7)

Data are mean±SD, numbers in parenthesis are percentages

To evaluate the results we divided the patients into two groups: the easy endotracheal intubation group (447 patients) and the difficult endotracheal intubation group (65 patients).

There were no differences in distribution between the two groups.

The incidence of difficult endotracheal intubation was greater in male than female patients (23.0% vs 13.4%).

All classic risk factors for difficult endotracheal intubation (Mallampati grade ≥ 3, cervical mobility < 90°, mobility of the temporomandibular joint < 5 cm, thyromental distance < 6 cm) had greater incidence in the difficult endotracheal intubation group with a positive predictive relation for mallampati grade and reduced cervical mobility.

On the two cases in which there was obstructive sleep apnoea the endotracheal intubation was very difficult. Retrognatism did not present itself as a risk factor in difficult endotracheal intubation.

**Figure 2**

Table 2. Demographical and airway characteristics of patients in the two groups

Variables	Easy endotracheal intubation (n=447)	Difficult endotracheal intubation (n=65)
Age	55.0 ± 13.5	56.8 ± 12.6
Sex (M/F)	52 / 395	12 / 53
Body Mass Index	27.8 ± 5.2	28.2 ± 5.0
Mallampati grade ≥ 3 (%)	49 (11.0)	18 (27.7)
Cervical mobility < 90° (%)	51 (11.4)	12 (18.5)
Temporomandibular joint mobility < 5 cm (%)	21 (4.7)	9 (13.8)
Thyromental distance < 6 cm (%)	14 (3.1)	4 (6.2)
Retrognatism (%)	7 (1.6)	1 (1.5)

Data are mean±SD

Concerning diagnosis, only the presence of diving and compressive multinodular goiter revealed itself as an important risk factor for difficult endotracheal intubation with a positive predictive value (p<0,05).

In 24.6% of patients (16 cases) with difficult endotracheal intubation, no difficult endotracheal intubation risk factor was detected, witch probably corresponds to a group of false negatives where intubation was unexpectedly difficult.

**DISCUSSION AND CONCLUSIONS**

Goiter is not a risk factor for difficult airway widely evaluated in literature, though it is frequently considered as such.

Our study shows an incidence of difficult endotracheal intubation in thyroid surgery of 12.7%, comparable to the 11.1% described by Amathieu [1] and superior to the 5.3% described by Bouaggad et al. [2] and the 8.5% described by Voyagis et al. [4].

As to the type of thyroid disease as a risk factor for difficult

endotracheal intubation, in our study only anatomical alterations of the airway conditioned by diving or compressive multinodular goiter revealed themselves as important factors, contrary to what was described by Bouaggad et al. [2] who identified neoplastic multinodular goiter as a risk factor for difficult intubation. In our case we believe that this variable may have been influenced by the fact that we have an Endocrinology reference centre in our hospital which may influence the realization of early diagnosis.

A limitation of this study is that the medical records were incomplete concerning the conditions of intubation (namely the use of muscle relaxants before or after the intubation). Our clinical practice is to avoid muscle relaxation in patients with predictive difficult airway or with intra-thoracic masses that can eventually obstruct the airway once the patient is relaxed (particularly in the compressive or diving multinodular goiter).

Our results are similar to those described in Gregory et al. [4], pointing to the importance of diving or compressive goiter with signs of tracheal deviation and anatomical alterations compatible in the cervical radiogram, as a risk factor for difficult endotracheal intubation, contrary to what is what is referred in [2] and [4]. All other preoperative criteria for difficult airway identified in this specific population are predictive factors recognized in general surgical population as shown by Arné [5].

We noted that 24.6% of the patients that had difficult or very difficult endotracheal intubation revealed no risk factors for

difficult airway; this implies the existence of false negatives were intubation was unexpectedly difficult. Ideally the evaluation tests would have high sensitivity and specificity, resulting in minimum false negatives and false positives. Through the consulted literature we can conclude that multivariate analyses in the form of indexes and scales have more satisfactory results in terms of the positive predictive value than independent criteria. It is important to apply scales in our departments, like the IDS [3] or other clinical models (Wilson, Arné, Naguib and modified) [6] for preoperative evaluation of the airway in thyroid surgery to avoid the morbidity and mortality associated with failed endotracheal intubation.

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