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Original article

Thyroid surgery in children and adolescents: A series of 65 cases

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ABSTRACT

Objectives: To describe the specificities and complications of thyroid surgery in children and adolescents.
Material and methods: This retrospective study was based on 64 patients under the age of 18 who underwent thyroid surgery between January 2004 and March 2012, with two operations in one case. The following data were analysed: anatomical variants of the recurrent laryngeal nerve, postoperative recurrent laryngeal nerve paralysis rate, postoperative hypoparathyroidism rate, and histological results.
Results: Two cases of right non-recurrent inferior laryngeal nerve were observed (2.2% of the 93 recurrent laryngeal nerves dissected). One case of persistent left recurrent laryngeal nerve paralysis was observed (1.1%) despite intraoperative recurrent laryngeal nerve monitoring. Eight cases of immediate postoperative hypocalcaemia were observed (23.5% of the 34 total thyroidectomies) and permanent hypocalcaemia was observed in 5 cases (14.7%) with a significantly lower immediate postoperative serum calcium than in the case of transient hypocalcaemia ($P = 0.035$). Among the 11 patients operated for familial medullary thyroid carcinoma (MTC), 36.3% presented one or more sites of C-cell carcinoma. Among the 32 patients operated for thyroid nodule, 6.3% presented papillary adenocarcinoma. Histological results were benign in all other cases.
Conclusions: Thyroid surgery in children and adolescents is part of global multidisciplinary management of thyroid disorders in children. Recurrent laryngeal nerve paralysis is a rare complication, but may occur despite the use of intraoperative recurrent laryngeal nerve monitoring. Permanent hypoparathyroidism is the most common complication and is correlated with immediate postoperative serum calcium. Systematic prophylactic total thyroidectomy in patients with a RET proto-oncogene mutation allowed early diagnosis of MTC in one-third of cases. In view of the low rate of malignant nodules in our series, the malignant thyroid nodule rates reported in children in the literature may be overestimated.

1. Introduction

Thyroid disease in children and adolescents is dominated by four main entities:

- thyroid nodule, with a higher malignancy rate compared to adults in the literature [1];
- toxic multinodular goitre (MNG);
- Graves' disease with inconstant efficacy of medical treatment [2];
- familial medullary thyroid carcinoma (MTC) due to a RET proto-oncogene mutation [3].

This disease must be managed by a multidisciplinary team composed of paediatric endocrinologists, geneticists, radiologists, otorhinolaryngologists, paediatric anaesthetists, pathologists, paediatric oncologists, and nuclear medicine physicians. Surgical indications must be defined after discussion between a paediatric endocrinologist and a surgeon specialized in thyroid surgery [4]. The surgical procedure comprises several specificities in terms of technique and postoperative complications [5,6].

The objective of this study was to describe the specificities of thyroid surgery in children according to three axes: recurrent

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laryngeal nerve complications, parathyroid complications, and histological results.

2. Materials and methods

This was a single-centre retrospective study conducted on all patients under the age of 18 years who underwent thyroid surgery in our institution from January 2004 to March 2012. Sixty-four patients were included and a total of 65 surgical procedures were performed.

The indication for surgery, after obtaining a paediatric endocrinology opinion, was the presence of an isolated thyroid nodule in 32 cases (49.2%) (with a family history of papillary thyroid carcinoma in one case), toxic multinodular goitre in 8 cases (12.3%), and Graves' disease poorly controlled by medical treatment in 14 cases (21.5%). Prophylactic thyroidectomy was performed in 11 cases (16.9%) with a family history of MTC and harbouring a RET proto-oncogene mutation, among the families regularly followed by our institution's genetics team.

The surgical procedure performed was enucleation (9.2%), lobectomy with isthmusectomy (38.5%), total thyroidectomy (44.6%), or total thyroidectomy and lymph node dissection (7.7%). The recurrent laryngeal nerve was identified by using a binocular magnifying glass and intraoperative recurrent laryngeal nerve monitoring was performed for 61.5% of patients.

Patients had a mean age of 12.5 ± 0.7 years with a female predominance (75%). The distribution according to age and disease is presented in Fig. 1. The mean age was 59.3 ± 46.7 months (range: 13 to 164) in the prophylactic thyroidectomy for MTC group, 13 ± 2.3 years (range: 8 to 15) in the MNG group, 14.3 ± 2.2 years (range: 7 to 17) in the isolated thyroid nodule group, and 15.1 ± 2.1 years (range: 10 to 17) in the Graves' disease group.

The following data were collected: intraoperative findings of anatomical variants of the recurrent laryngeal nerve, presence of recurrent laryngeal nerve paralysis postoperatively and at long-term follow-up, presence of hypocalcaemia postoperatively and at long-term follow-up, and histological results.

All patients were followed by a paediatric endocrinologist for management of hormone replacement therapy following total thyroidectomy and for treatment of any postoperative hypocalcaemia. Patients with malignant thyroid disease requiring adjuvant radioactive iodine therapy were referred to our institution's nuclear medicine department.

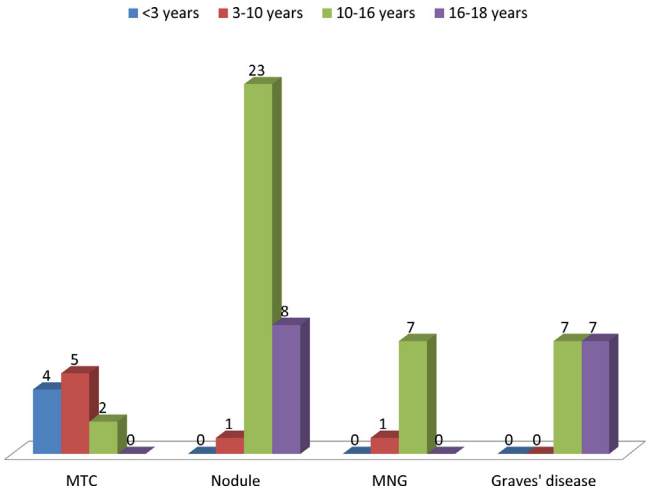

Fig. 1. Patient distribution according to age and histology. MTC: medullary thyroid carcinoma; MNG: multinodular goitre.

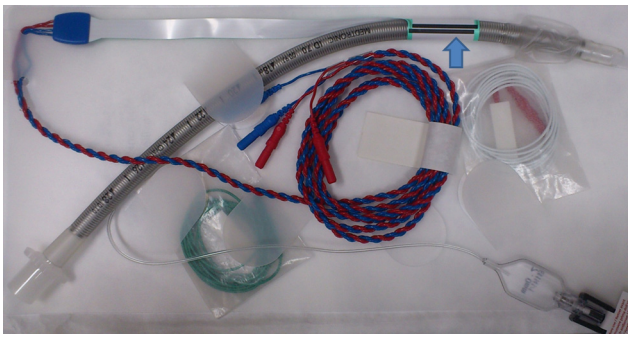

Fig. 2. Recurrent laryngeal nerve monitoring using a specific probe with integrated electrodes. Arrow showing the electrodes positioned in the glottis.

All statistical tests were performed with SAS Statview® for Windows software. Due to the small sample size, non-parametric statistical tests were used to compare quantitative data. The Mann-Whitney–Wilcoxon test was used with a limit of significance of 5% ($P < 0.05$).

3. Results

3.1. Recurrent laryngeal nerve complications

A total of 93 recurrent laryngeal nerves were dissected, with intraoperative electromyography of the thyroarytenoid muscles in 63 cases. Two cases of non-recurrent right inferior laryngeal nerve were observed (2.2%), arising from the vagus nerve at the level of the superior pole of the thyroid.

A specific endotracheal tube with integrated electrodes (Xomed NIM monitoring system, Medtronic Xomed Instrumentation, Saint-Aubin-le-Monial, France) was used in children over the age of 8 years (Fig. 2) and three monitoring techniques were used in children under the age of 8 years:

- placement of electrodes in each vocal cord by direct laryngoscopy after intubation (Fig. 3);
- placement of electrodes in the vocal cords through the thyroid cartilage after dissection of its anterior surface;
- visual monitoring by nasal endoscope introduced through a laryngeal mask (Fig. 4).

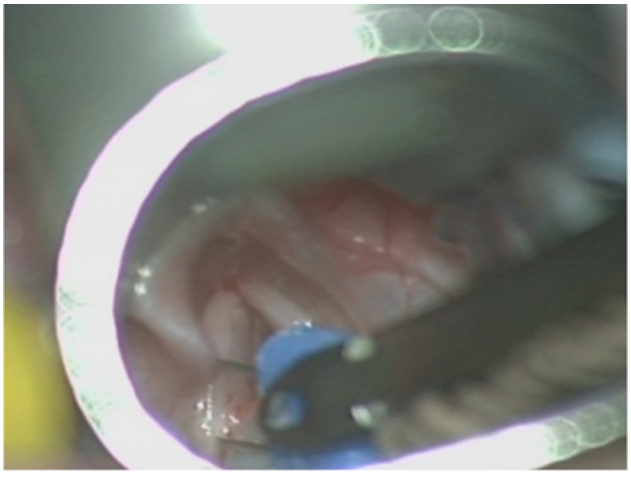

Fig. 3. Recurrent laryngeal nerve monitoring by placing electrodes in each vocal cord by direct laryngoscopy.