

Thyroid surgery in 103 children in a single institution from 2000-2014

Osama Ibrahim Almosallam,^a Ali Aseeri,^b Ahmed Alhumaid,^a Ali S. AlZahrani,^c Saif Alsobhi,^b Saud AlShanafey^b

From the ^aDepartment of Surgery, College of Medicine, Qassim University, Buraidah, Al Qassim, Saudi Arabia; ^bDepartment of Surgery, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia; ^cDepartment of Medicine, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

Correspondence: Dr. Osama Ibrahim Almosallam, Department of Surgery, College of Medicine, Qassim University, PO Box 7341, Buraidah, Al Qassim, 3147-13313 Saudi Arabia osama_iaa@hotmail.com ORCID: <https://orcid.org/0000-0002-9036-7564>

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BACKGROUND: Data on thyroid surgery in children are scarce.

OBJECTIVE: Analyze outcome data on thyroid surgery in a pediatric population.

DESIGN: Medical record review.

SETTING: Tertiary health care institution.

PATIENTS AND METHODS: We collected demographic and clinical data on patients 18 years or younger who had thyroid surgery in the period 2000 to 2014. Descriptive data are presented.

MAIN OUTCOME MEASURES: Indications for thyroidectomy, thyroid pathology, complications, length of stay, and radioactive iodine treatment and recurrences.

SAMPLE SIZE: 103.

RESULTS: Of 103 patients who underwent 112 thyroidectomy procedures, 80 (78%) were females and the mean age at operation was 13.2 years. and 17 (16%) were associated with multiple endocrine neoplasia type 2. There was no history of radiation exposure. Eighty-one patients (78%) had fine needle aspiration (FNA) which correlated with the final histopathology in 94% of cases. Sixty-six patients (64%) had malignant cancer (61 papillary), 44 (74.6%) of 59 patients who had neck dissection had lymph node metastasis and 7 (11%) had distant metastases to the lung. Procedures included total thyroidectomy (50%), hemithyroidectomy (17%), completion (31%), and subtotal thyroidectomy (2%). Twenty-three patients (22%) developed hypocalcemia (3 permanent) and 6 (5.8%) had unilateral recurrent laryngeal nerve injury (3 permanent). Patients were followed up for a mean duration of 71.7 months (median 60 months). Of 66 patients with thyroid cancer, 43 (65%) received radioactive iodine, and 10 (15%) had recurrence.

CONCLUSION: Malignancy is the commonest indication for thyroid surgery in children and FNA is highly diagnostic. Hypocalcemia and recurrent laryngeal nerve injury are significant complications. The recurrence rate in thyroid cancer is 15%.

LIMITATIONS: Retrospective.

CONFLICT OF INTEREST: None.

Thyroid diseases requiring surgery are relatively uncommon in children compared to adults. The prevalence of palpable thyroid nodules in children ranges from 0.2% to 1.8%.¹ Sporadic well-differentiated thyroid cancer is the most common endocrine malignancy in children, accounting for 1% of pediatric cancers in the prepubertal age group and up to 7% of cancers in adolescents aged 15–19 year.² The most common indication for thyroid surgery in children varies among published studies, but thyroidectomy for malignant conditions is rising.^{3–8} Data in children throughout the world are relatively scarce. The objective of this study was to analyze the clinical data and outcome of thyroid surgery in a large series of children treated at a single center at King Faisal Specialist Hospital and Research Center (KFSHRC) in Riyadh.

PATIENT AND METHODS

With the approval of the Institutional Review Board (IRB) at KFSHRC, the medical records of all patients 18 years old and younger who underwent a thyroid surgery between 2000 and 2014 were retrospectively reviewed. We elected to include patients up to the year 2014 to ensure a reasonable follow-up period. Patients for the study were identified by a search of the operating room log for all procedures involving the thyroid gland for the specified age group.

Demographic data, clinical features, and surgical outcomes were collected. Specific data that were obtained included age at operation, gender, family history, presenting symptoms, history of radiation exposure, presence of multiple endocrine neoplasia type 2 (MEN 2), thyroid function test, presence and size of thyroid nodules by ultrasound, presence of lymph nodes metastasis or distant metastasis, fine needle aspiration (FNA) cytology, surgical procedure, final histopathology and length of follow-up. Outcomes analyzed were postoperative complications including (transient or permanent hypocalcemia, transient or permanent recurrent laryngeal nerve paralysis, wound infection, and hematoma), length of stay, and radioactive iodine treatment and recurrences.

Thyroid procedures in this series included hemithyroidectomy, subtotal, total and completion thyroidectomy. Surgeries were performed by either an endocrine adult surgeon or a pediatric surgeon. No intraoperative nerve monitoring was used. Early in the series, procedures were performed by adult endocrine surgeons but lately, a combined approach was adopted where pediatric surgeons and adult endocrine surgeons collaborated in such cases (15 procedures).

Hypocalcemia was defined by calcium levels below

the normal range in our laboratory regardless of symptoms. Transient hypocalcemia was identified if it lasted for less than 6 months, while permanent hypocalcemia was considered if the serum calcium level remained below normal range and the patient continued on calcium supplementation after 6 months of the surgery. All patients with a family history of MEN 2 underwent genetic testing of the RET proto-oncogene to confirm the diagnosis. All patients who underwent completion thyroidectomy had a preoperative and postoperative vocal cords assessment at the Otolaryngology clinic. Descriptive data were generated and comparisons were conducted using the *t* test for continuous data and the chi-square or Fisher exact tests for proportions.

RESULTS

Between 2000 and 2014, 103 patients underwent 112 surgical procedures (9 patients underwent two procedures) for thyroid disease at our institution. Eighty patients (78%) were females. The mean age at operation was 13.2 years (median 15 years, range 2–18 years). The most common indication for thyroidectomy was thyroid nodule, which was present in 78 (70%) of cases (**Table 1**). The mean (SD) size of thyroid nodules was 27 (12) mm. There were 17 cases (15%) associated with MEN 2 syndromes. The final pathology in two patients with MEN syndrome showed medullary thyroid cancer (MTC) while the remaining 15 patients had prophylactic procedures before development of MTC. None of the patients had a history of radiation exposure. Eighty-one patients (78%) FNA, which correlated with the final histopathology in 94% of cases. There were three cases of toxic adenoma and one case of Graves' disease, which did not require FNA. The remaining cases underwent FNA at another institution and FNA was not repeated at our institution or they came for completion thyroidectomy with documented pathology for malignancy after they had their first surgery in another hospital.

The most common diagnoses included papillary thyroid cancer (59%) and multinodular goiter or colloid

Table 1. Indications for thyroidectomy in 103 patients.

Indication	n (%)
Nodule	78 (70.0)
MEN 2 prophylaxis	17 (15.0)
Hyperthyroidism	3 (2.0)
Multinodular goiter	5 (4.0)
Completion thyroidectomy	9 (8.0)

Data are number (%).

nodule (13.5%) (Table 2). Surgical procedures included total thyroidectomy (50%), hemithyroidectomy (17%), completion thyroidectomy (31%), and subtotal thyroidectomy (1.7%). Neck dissection was performed in 59 patients. Operative complications were observed in 22 patients (19.6%). The most common complication was hypocalcemia (20 transient, 3 permanent) and

recurrent laryngeal nerve palsy (3 transient, 3 permanent), all were unilateral (Table 3). Of 66 patients with malignant lesions, 44 (67%) had lymph node metastasis and 7 patients (11%) had distant metastases to the lung. None of the patients developed postoperative bleeding, wound infection or tracheal injury. Patients were followed up for a mean of 71.7 months (median 60.0, range 9-148 months), radioactive iodine treatment was delivered to 43 patients (65%) with malignant lesions, 10 patients (15%) had recurrences, 6 were local recurrences and 4 were local and distant recurrences to the lung. Three cases received radioactive iodine (RAI) before and after recurrence. One case was low risk before recurrence so did not receive RAI until after recurrence. One case had medullary thyroid cancer, so did not receive RAI. In the remaining five cases, there was no clear data whether those patients received RAI before or only after a recurrence. All local recurrences underwent resection except for one patient who was lost follow up. There was no mortality in this study.

Table 2. Thyroid pathology in the 103 patients.

Pathology	n (%)
Benign	37 (36.0)
Normal thyroid tissue	14 (13.5)
Colloid nodule	14 (13.5)
Cyst	2 (1.9)
Adenoma	3 (2.9)
Thyroiditis	3 (2.9)
Graves' disease	1 (1.0)
Thyroid cancer	66 (64.0)
Papillary	61 (59.0)
Follicular	3 (2.9)
Medullary	2 (1.9)
Hurthle	0 (0.0)
Anaplastic	0 (0.0)
Total	103 (100.0)

Data are number (%).

DISCUSSION

The most common indication for thyroidectomy in this series was thyroid nodule, which correlates with previously published reports in the pediatric population.³⁻⁵ Children with thyroid nodules have an estimated four-fold higher risk of developing thyroid cancer compared to adults.^{9,10} The high incidence of malignancy in this series suggests children with a thyroid nodule should be carefully evaluated.

FNA is a valuable method for preoperative evaluation of thyroid nodules. However, there are limitations on the routine use of FNA in children including the need for sedation, sampling errors, and the limited availability of experienced cytopathologists.¹¹ Many previous studies reported high sensitivity and specificity of FNA in evaluating thyroid nodule in children,¹¹⁻¹⁴ which correlate with our findings.

Our data showed lymph node metastasis in 67.6% of thyroid cancer cases, which supports the notion that children with thyroid cancer frequently present with more extensive disease than adults. Lymph-node involvement at diagnosis is seen in 33% to 89% of children, compared with 20% to 53% of adults with differentiated thyroid cancer.¹⁵⁻²³ Because our hospital is the largest referral center in Saudi Arabia, especially for oncology cases, this may explain the large number of lymph node and distant metastasis in this cohort.

The most common complication reported after thyroidectomy in children is hypoparathyroidism, with an incidence ranging between 1% to 47%.^{3,6-8,15} which

Table 3. Benign and malignant lesions in 103 patients.

	Benign (n=37)	Malignant (n=66)	P value
Age (mean/years)	13.0	13.4	.88
Gender (male/female)	6/31	16/50	.48
Presence of nodule	19	59	<.0001
Hypocalcemia	7	16	.71
Recurrent laryngeal nerve palsy	1	5	.41
Bleeding/hematoma	0	0	-
Wound infection	0	0	-
Tracheal injury	0	0	-
Overall complications	8	21	.38
Mean length of stay (days)	5.2	4	.067
MEN 2	15	2	<.001

corresponds with our results of 22%, which are reported as hypocalcemia in Table 3 (22/103, 22.3%). One study found that total thyroidectomy, central and bilateral neck dissection, Graves' disease, and malignancy were risk factors for hypocalcemia after thyroid surgery.³ In this cohort, postoperative hypocalcemia was noted more in malignant cases but it failed to reach statistical significance. Moreover, there was no significant difference between benign and malignant cases in terms of mean age, gender distribution, recurrent laryngeal nerve injury, or overall complications, a finding that was reported previously.²⁶

Multiple studies in recent years have found an inverse relationship between surgeon volume and complication rates,^{27,28} but similar data in the pediatric population is lacking. One study found that high-volume endocrine surgeons have better outcomes and shorter lengths of stay and lower costs after thyroidectomy and parathyroidectomy in children compared to pediatric surgeons, general surgeons or otolaryngologists.²⁹ Scheumann and colleagues also concluded that a collaborative approach between pediatric and endocrine surgeons would have better outcomes. This has led other authors to suggest that a combined approach with endocrine and pediatric surgeons in addition to pediatric endocrinologists may optimize the care of children with surgical thyroid disease given the low number of pediatric patients.⁴ Our data do not al-

low for comparisons of different approaches given the late adoption of the combined approach.

The recurrence rate for thyroid cancer in children after thyroidectomy has varied widely in reported studies, ranging from 0 to 47%,^{16-18,30-32} while it was 10% in this cohort. Only a few studies explored the predictors of recurrence. Lymph node involvement, multiple nodules, male gender, younger age, histologic subtype and advanced tumor stage were risk factors associated with recurrence.^{17,23,30-33}

In this study, 65% of patients with malignant lesions received RAI. Although there are conflicting data regarding the indications of postoperative RAI treatment in low-risk patients, the current recommendation is that low-risk patients can be treated without RAI.³⁴⁻³⁶

There are some limitations to this study. The retrospective nature may affect the validity and quality of the data. The small number of cases in some categories did not enable us to compare groups and explore predictors relative to these factors. On the other hand, this study adds to the scarce data on thyroid surgery in pediatric age group. Malignancy is the commonest indication for thyroid surgery in children and FNA is highly diagnostic. Hypocalcemia and recurrent laryngeal nerve injury are significant complications. Cancer-related death is extremely rare but recurrence is not uncommon, and a significant number of patients with malignant cases received RAI treatment.

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