

# Audit of thyroid carcinoma in children, adolescents and adults

Cindy Wei- Li Ho<sup>1,2</sup>, Margaret Zacharin<sup>1</sup>

Royal Children's Hospital, Parkville, Victoria 3052, Australia<sup>1</sup>

Department of Paediatrics, Khoo Teck Puat-National University Children's Medical Institute<sup>2</sup>

## Introduction

- **Thyroid cancer is the most common endocrine malignancy and most common secondary malignancy for childhood cancer survivors.**
- **Thyroid nodules in children have a high risk for malignancy, whether spontaneous or after radiation**

## Methods

Retrospective case note review conducted for all thyroid carcinoma diagnosed from 1989 to 2014 in children, adolescents and those adults who had a history of childhood radiation exposure.

## Results

- Total 46 patients (24 males, 22 females) : 39 (84.8%) papillary, 5 (10.9%) follicular, 2(4.3%) medullary thyroid carcinoma
- **Table 1** shows 33 patients (17 females, 16 males) with **childhood radiation exposure**:
  - Smallest nodule size - 4mm only.
  - One patient with multiple small nodules of 7-8mm had multifocal invasive papillary carcinoma
- 22 patients aged ≤16: 10 (62.5%) had childhood cancer and radiation exposure, 2 MEN2b, 1 Cowden syndrome  
1 environmental radiation exposure  
8 spontaneous thyroid carcinoma(**Table 2**)

**Table 1**

No.	Sex	Primary malignancy	Radiation	Age at diagnosis of secondary thyroid malignancy	Histology of thyroid malignancy	Interval between radiation and thyroid malignancy
1	M	Ependymoma	Cranial radiation	23	Papillary	8
2	F	Ependymoma	Cranial radiation	12	Papillary	10
3	M	Nasopharyngeal rhabdomyosarcoma	Cranial radiation	11	Papillary	7
4	F	Medulloblastoma	Craniospinal radiation	31	Papillary	23
5	M	Medulloblastoma	Craniospinal radiation	15	Papillary	13
6	F	Medulloblastoma	Craniospinal radiation	15	Papillary	9
7	M	ALL with BMT	Total body irradiation (TBI)	15	Papillary	12
8	F	ALL	Cranial radiation	21	Papillary	19
9	M	Hodgkin's disease	Mantle radiation	25	Papillary	13
10	F	Medulloblastoma	Craniospinal radiation	19	Papillary	14.5
11	F	Orbital rhabdomyosarcoma	Orbital radiation	21	Papillary	11
12	F	Medulloblastoma	Craniospinal radiation	22	Papillary	19
13	M	Astrocytoma	Cranial radiation	36	Papillary	31
14	F	Medulloblastoma	Craniospinal radiation	17	Papillary	7
15	F	Medulloblastoma	Craniospinal radiation	25	Papillary	13
16	M	Corpus callosum glioma	Craniospinal radiation	12	Papillary	8
17	F	Tcell ALL with BMT	TBI	18	Papillary	6
18	F	Medulloblastoma	Craniospinal radiation	15	Papillary	7
19	F	Metastatic Wilm's tumour	Cranial and chest radiation	15	Papillary	12
20	M	Medulloblastoma	Craniospinal radiation	24	Papillary	19
21	M	ALL with BMT	TBI	16	Papillary	6
22	M	ALL with CNS and testicular relapse, had BMT	Cranial radiation, testicular radiation, TBI	22	Papillary	11
23	F	Glioblastoma multiforme	Cranial radiation	28	Papillary	12
24	M	ALL with BMT	TBI	16	Papillary	8
25	M	AML with BMT	TBI	20	Follicular	13
26	M	Neuroblastoma	Medistinal radiation	39	Papillary	37.5
27	M	Hodgkin's lymphoma	Mantle radiation	36	Follicular	23
28	F	Astrocytoma	Cranial radiation	52	Papillary	41
29	M	Wilm's tumour	Abdominal and lung radiation	32	Papillary	28.5
30	F	Hodgkin's lymphoma	Mantle radiation	43	Papillary	27
31	M	Hodgkin's lymphoma	Mantle radiation	44	Papillary	28
32	F	Fibrosarcoma(Left tonsil)	Oropharynx	34	Papillary	31
33	F	Non Hodgkin's lymphoma	Spine, pelvis, arms/hands	46	Papillary	31

## Discussion

- **Radiation exposure is clearly linked to risk** and explains the lack of female predominance
- Small nodule size does not necessarily mean lower risk of malignancy (as seen in 2 patients)
- **Total thyroidectomy with central node dissection** as preferred modality reduce recurrences
- **Recombinant TSH rather than thyroid hormone withdrawal** where available reduces morbidity and school refusal
- **Diagnostic rTSH stimulated I<sup>123</sup> scan** is useful to determine need for ablative I<sup>131</sup> **to avoid unnecessary bone marrow exposure especially in children.**
- **Recombinant human TSH administration (rTSH) is safe and effective** means of stimulating radioiodine uptake and serum thyroglobulin(Tg) levels in patients undergoing evaluation
- rTSH **stimulated Tg + neck ultrasonography** is current best practice to screen for persistent disease in follow up

## Conclusions

- **Ultrasound screening is required for early diagnosis as small nodule size is not predictive of benign histology or absence of metastases**
- **Total thyroidectomy + central node clearance is the treatment of choice, with ablative I<sup>131</sup> where indicated**
- **Diagnostic I<sup>123</sup> scan improves decision-making and avoids unnecessary I<sup>131</sup>**
- **Despite metastatic disease at presentation in some, prognosis is favourable**

**Table 2**

No.	Sex	Age at diagnosis	Presenting complaint	Histology	Initial surgery	Outcome
1	F	11.5	Nodule	Follicular	Hemithyroidectomy	Alive, 2 yrs disease free
2	F	10	Neck lump	Follicular	Hemithyroidectomy	Alive, <1 yr disease free
3	F	12	Nodule	Papillary	Hemithyroidectomy	Alive, 6 yrs disease free
4	M	5	Nodule	Papillary	Total thyroidectomy(TT)	Alive, 11yrs disease free
5	M	12	Nodule	Papillary	Total thyroidectomy(TT)	Alive, 10yrs disease free
6	M	16	Nodule	Papillary	Total thyroidectomy(TT)	Alive, 2yrs disease free
7	M	16	Hot nodule	Papillary	Hemithyroidectomy	Alive, <1yr disease free
8	M	10	Multinodular neck mass	Papillary	Hemithyroidectomy	Alive, 27years disease free

## Management

- **Total thyroidectomy + Central node clearance from 2005, after several late metastases where total thyroidectomy and selective nodal dissection had been performed.**
- **Post –thyroidectomy diagnostic rTSH stimulated I<sup>123</sup> scan for all patients, with ablative I<sup>131</sup> if any uptake was seen**

## Outcomes

- 16 (32.6%) had metastases:
  - lymph nodes(16),lungs(5), skeletal muscle(2), bone(1).
- 24(52.2%) required I<sup>131</sup> with 4 requiring multiple courses of I<sup>131</sup>
- 42 (95.5%) with papillary and follicular carcinoma alive and tumour free; 2 died (unrelated cause)
- 2 with medullary carcinoma: 1 died, 1 on tyrosine kinase inhibitor trial

