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Sporadic Papillary Thyroid Carcinoma with Bilateral Pulmonary Metastases in a 7 year old girl: A Case report and Literature Review

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Abstract

Papillary Thyroid Carcinoma (PTC) is uncommon in children especially below 10 years of age. Childhood PTC is associated with aggressive biological behavior but favorable prognosis than comparably staged adults. We report a case of sporadic PTC with nodular pulmonary metastases in a 7-year old girl for its rarity.

Keywords: Sporadic papillary thyroid carcinoma; Total thyroidectomy; Pulmonary metastases

Introduction

Thyroid cancer is rare in children but nevertheless, constitutes 1.4% of all pediatric malignancy with an incidence of 0.54 cases per 100,000 persons per year [1,2]. Papillary thyroid cancer is the most common endocrine malignancy in children and constitutes more than 90% of all thyroid cancers. The incidence of papillary thyroid cancer in children is increasing worldwide at a rate of 1.1% per year in the United States [3,4] and over 3% among adolescents across Europe [5]. The highest incidence of childhood PTC is between the ages of 15 and 19 years with female preponderance of 5: 1. PTC is rare in children below 10 years of age and the gender difference is not apparent in pre-pubertal children. Although thyroid nodule is uncommon in children, it carries a greater risk of malignancy (22-26% vs 5-11%) compared to adults and it is the most common presentation of differentiated thyroid cancer (DTC) [6-9]. There are important clinical, pathological and molecular differences between pediatric and adult PTC. These differences are more distinct in prepubertal children and include (a) larger primary tumor, often multicentric and bilateral with extrathyroidal extension at the time of diagnosis; (b) metastatic pattern and features namely, more frequent lymph-node involvement and distant metastasis at the time of diagnosis, lungs almost always sole distant metastatic site and pulmonary metastasis nearly always functional; (c) close to normal or frequent sodium iodide symporter (NIS) expression and responsiveness to radioactive iodine; (d) higher recurrence rate but longer progression free survival and excellent prognosis. Due to its rarity, longer overall survival, and ethical concerns of prospective studies in these underage populations, the treatment recommendations for pediatric PTC have been extrapolated from adult PTC outcomes. However, the distinctive biological behavior of childhood PTC warrants a unique management guideline.

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We report a rare case of sporadic PTC with pulmonary metastases in a 7-year old girl. The clinical management is discussed and literature reviewed.

Case Report

A seven-year-old female child presented with multiple neck swellings, which progressively increased in size for past 2 years. She had history of intermittent fever with non-productive cough and occasional dysphagia. There was no history of exposure to ionizing radiation or family history of cancer. Fine needle aspiration cytology (FNAC) from lateral neck swelling was performed suspecting tuberculous lymphadenopathy. FNAC was inconclusive and open surgical biopsy of cervical lymphnode was performed. Histopathological examination (HPE) revealed metastatic deposits from follicular variant of papillary thyroid carcinoma (FVPTC). Magnetic resonance imaging (MRI) and computed tomography (CT) of neck showed irregular mass replacing the left lobe of thyroid (Figure 1) and multiple enlarged lymphnodes in the neck, the largest being 42 mm x 32 mm abutting the internal jugular vein and carotid artery in the left side of neck (Figure 2). Computed tomography of the chest (CT chest) revealed multiple subcentimeter hyperdense lesions in both the lungs (Figure 3). Under general anesthesia, total thyroidectomy (TT) with central compartment neck dissection (CCND) and bilateral modified radical neck dissection (MRND) type III was carried out (Figure 4). Intraoperatively, irregular hard mass about 67 mm x 55 mm x 46 mm

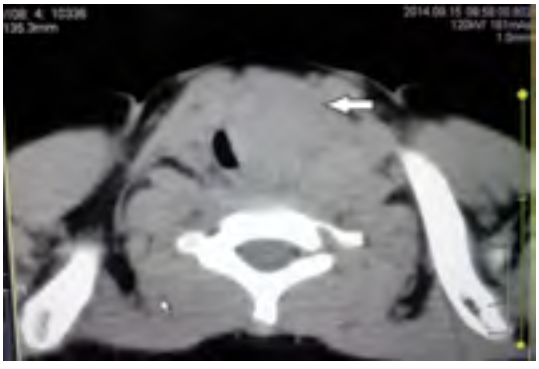

Figure 1: CT neck showing irregular mass in the left lobe of thyroid narrowing and displacing the trachea to the right side

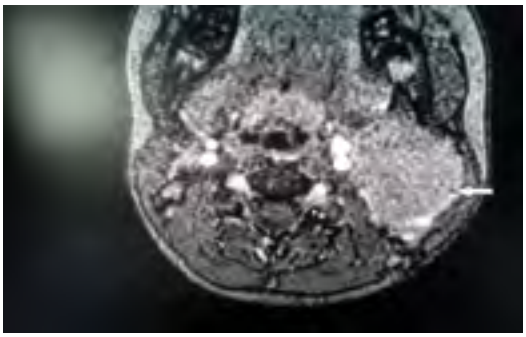

Figure 2: MRI neck showing enlarged level II lymph-node at the base of skull

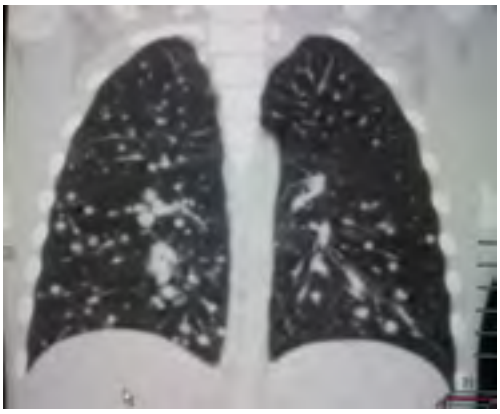

Figure 3: CT Chest showing multiple nodular pulmonary metastases

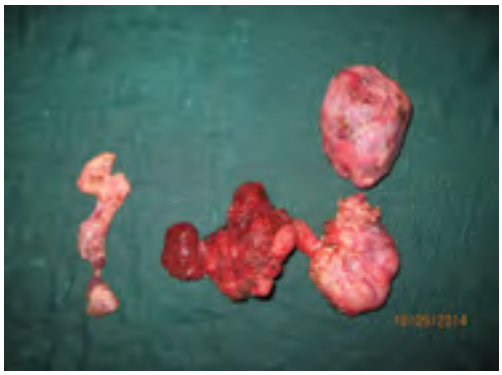

Figure 4: Post-operative specimen of Total thyroidectomy, bilateral CCND and MRND type III

replacing left lobe of thyroid was defined which was densely adherent to the trachea and infiltrating left recurrent laryngeal nerve (RLN) (Figure 5). Multiple enlarged lymph-nodes with metastatic deposits were identified in the level II, III and IV in the right side (Figure 6) and level II, III, IV and V in the left side of the neck (Figures 7 and 8). External branch of superior laryngeal nerves, all the parathyroid glands and right RLN (Figure 9) were identified and preserved. HPE (Figures 10 and 11) revealed FVPTC about 51 mm x 45 mm in size in the left lobe of thyroid, unifocal lesion with lymphatic invasion (absent vascular invasion) and papillary metastatic deposits in the 11 of 22 lymph-nodes. Chvostek's sign and Trousseau's sign were positive on second postoperative day. Intravenous 10% calcium gluconate at 1 mg/kg/hour was administered with supplementation of oral calcium 1.5 g/day and calcitriol 0.5 mcg/day. She received two therapeutic doses of ^{131}I radioactive iodine (RAI) each

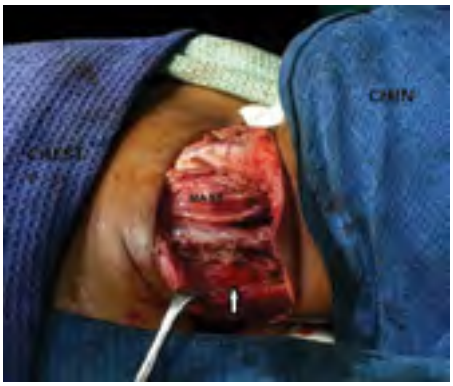

Figure 5: Intra-operative photograph showing irregular mass in the left lobe of thyroid. Arrow pointing enlarged posterior group lymph-nodes in the left side of neck

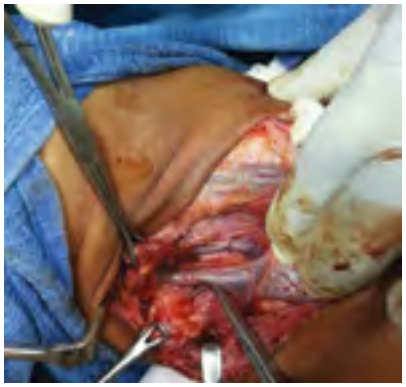

Figure 6: Enblock neck node dissection skeletonizing the great vessels in the right side of neck

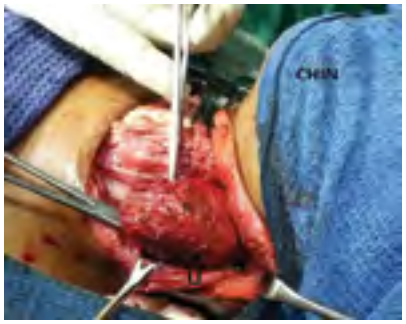

Figure 7: Intra-operative photograph showing enlarged left level II lymph node

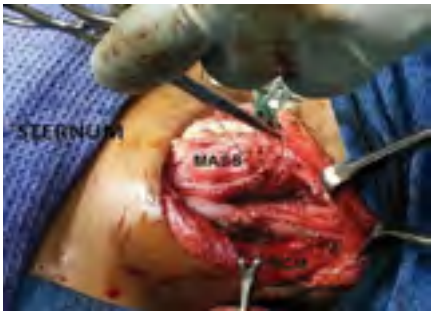

Figure 8: MRND type III left side skeletonizing left carotids and IJV and preserving sternocleidomastoid (SCM)

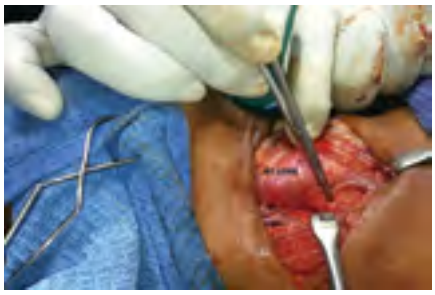

Figure 9: Normal appearing right lobe of thyroid and right recurrent laryngeal nerve

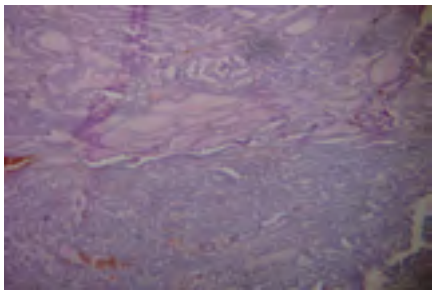

Figure 10: H&E 10x. shows thyroid parenchyma with a neoplasm in follicular configuration

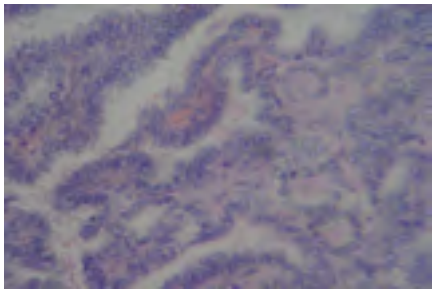

Figure 11: H&E 40 x. malignant cells have optically clear nuclei (Orphan Annie nuclei) with nuclear crowding and overlapping suggestive of follicular variant of papillary thyroid carcinoma

120 mCi for pulmonary metastases at an interval of 6 months following 4 weeks of iatrogenic hypothyroidism raising TSH to 100mIU/L. The child is on suppressive dose of levothyroxine and close surveillance with serial TSH, 6 monthly serum thyroglobulin (Tg), thyroglobulin antibody (Tg-Ab), cervical ultrasound and ^{131}I diagnostic Whole-body scan (^{131}I Dx WBS). At 3 years post- surgery, the child is symptom free with no loco-regional recurrence or development of extra-pulmonary metastases.

Discussion

The case discussed here is a typical presentation of Childhood PTC with large primary tumor, loco-regional and distant pulmonary metastases at the time of diagnosis. The goals of treatment of pediatric PTC are to eradicate the disease and extend not only the overall but also disease-free survival. Optimal initial therapy shall be aggressive surgery with total thyroidectomy with elective or therapeutic CCND. Total thyroidectomy addresses the following; (a) removes multicentric disease; (b) facilitates RAI remnant ablation; (c) improves the sensitivity of follow up surveillance with serum thyroglobulin and ^{123}I or ^{131}I Dx WBS scans; and (d) efficiency of subsequent ^{131}I RAI therapy for distant metastases. Dinauer et al. [10] reported that recurrence was significantly higher for children treated with lobectomy when compared with children treated with subtotal or total thyroidectomy. Proponents for elective CCND argue that the incidence of central compartment lymph-node metastases is as high as 25% even in a clinically node-negative neck [11]. Prophylactic CCND improves clinical staging, RAI recommendations, post-operative risk stratification and avoids high risk re-operative surgery associated with permanent hypoparathyroidism and RLN injury. MRND shall be performed for biopsy proven lateral compartment lymph-node metastases as in our case followed by ^{131}I RAI remnant ablation. These procedures are known to lessen the cause specific mortality and loco-regional recurrence in juvenile PTC [9,12]. Berry picking and radical neck dissection should be avoided. TSH suppressive therapy with appropriate dose of levothyroxine is recommended to prolong disease free survival without affecting the psychosomatic development of children. Inoperable functional metastases are treated with therapeutic doses of ^{131}I RAI every 6 to 12 months until complete response or loss of functionality and refractoriness to treatment.

Interestingly, in our case, preoperative radiological imaging revealed multiple nodular pulmonary metastases at the time of diagnosis in contrast to the miliary pattern of pulmonary metastases commonly seen in children. The child showed marked response to therapeutic doses of ^{131}I RAI for pulmonary metastases. Her initial ^{131}I Post-therapy scan (Figure 12) showed intense radiotracer uptake activity in thyroid bed and both lung fields. Subsequent ^{131}I post-therapy scans (Figure 13) after 6 months revealed minimal radiotracer activity in both the lungs. Moreover, cervical ultrasound is negative and Tg showed a marked decline from the initial baseline (immediate post-operative) value of 246 ng/ml to 40 ng/ml at 16 months post-surgery. Clinical experience suggests that RAI completely eradicates tumor less than 10 mm and pediatric PTC metastases are more radiosensitive than adults. However, Reynold et al. suggested that a very small lesion of 0.1 mm size has a poorer therapeutic response as most of the ionizing energy emitted from ^{131}I decay will be absorbed outside the tumor focus (the maximal range of beta particle is 2.4 mm) [13]. This phenomenon may explain the lack of complete scintigraphy remission observed in our subject.

Life-long surveillance with serial serum Tg, Tg-Ab, cervical ultrasound, and ^{123}I or ^{131}I Dx WBS tailored to clinical need is recommended. The rising levels of Tg may be the only sign of local recurrence in children and surgical removal by high volume surgeon is the treatment of choice. The presence of Tg-Ab, interferes with the interpretation of Tg and the rising titer of Tg-Ab may be used as surrogate marker for tumor recurrence [9]. Recurrence of iodine-avid cervical disease > 1 cm which is not evident in anatomical imaging (cervical ultrasound or cross-sectional imaging CT or MRI) shall be treated with ^{131}I RAI therapy. Given

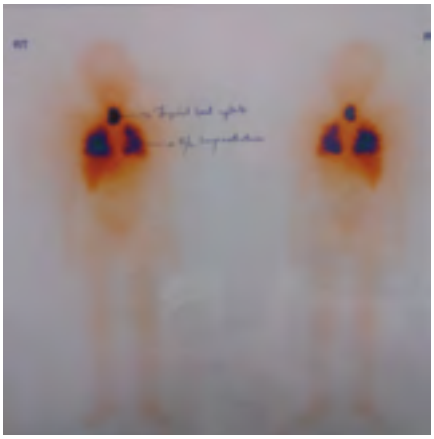

Figure 12: ^{131}I Post-therapy scan (12/2014) showing intense radiotracer activity in the thyroid bed and both lungs

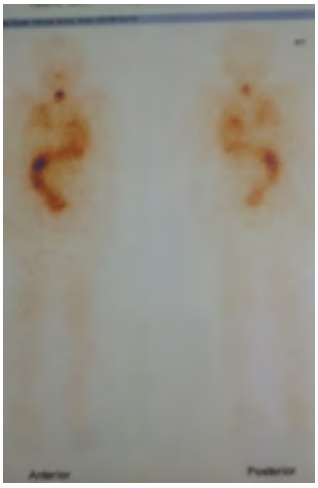

Figure 13: ^{131}I Post-therapy scan (6/2015) showing minimal diffuse radiotracer activity in both lung fields

the possibility of life threatening bilateral lung fibrosis and other adverse effects such as sialadenitis, xerostomia, infertility and increased risk of second malignancy, myelodysplasia and leukemia with therapeutic doses of ^{131}I RAI, ^{131}I RAI should be administered judiciously in children (possibly based on dosimetry). Sperm banking should be considered in post-pubertal males receiving > 400 mCi RAI. In children with low volume cervical disease < 1 cm, ^{131}I RAI therapy offers no survival benefit and therefore, TSH suppression alone would suffice [9].

Patel et al. had reported that tyrosine kinase expression is increased in PTC and possibly associated with an increased recurrence risk [14]. However, the use of novel targeted therapies such as Tyrosine kinase inhibitors in pediatric PTC is limited to few case reports. In addition, childhood PTC has a higher prevalence of chromosomal rearrangements and a less frequent point mutations of RAS and BRAF compared to adults [15]. On the other hand, BRAF mutation, V600E is the most common genetic alteration in the adult PTC. These point mutations cause genomic instability and progression to less-differentiated tumors with loss of NIS expression and poor response to ^{131}I RAI treatment. In contrast, RET/PTC rearrangements are more common in childhood PTC and do not cause genomic instability and therefore, lesser progression to dedifferentiated tumors [9]. This explains the near – normal expression of NIS symporter and responsiveness to RAI therapy in children and longer progression free survival.

Conclusion

The incidence of thyroid cancer is increasing in children and PTC is the most common histology. Any pediatric thyroid nodule should be evaluated with high index of suspicion. Although childhood PTC presents with advanced disease and frequent distant metastases, the prognosis is excellent. Hence, we advocate early aggressive surgery of total thyroidectomy with CCND, MRND for biopsy proven lateral compartment disease, radioactive iodine therapy, TSH suppressive therapy and life-long surveillance for longer disease-free survival.

Conflict of Interest

The author's have nothing to declare.

Support Source

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References

1. Diesen DL, Skinner MA (2012) Pediatric thyroid cancer. Semin Pediatr Surg 21(1): 44-50.
2. Verburg FA, van Santen H, Luster M (2016) Pediatric papillary thyroid cancer: current management challenges. Onco Targets Ther 10: 165-175.
3. Golpanian S, Perez EA, Tashiro J, Lew JI, Sola JE, et al. (2016) Pediatric papillary thyroid carcinoma: outcomes and survival predictors in 2504 surgical patients. Pediatr Surg Int 32(3): 201-208.
4. Hogan AR, Zhuge Y, Perez EA, Koniaris LG, Lew JI et al. (2009) Pediatric Thyroid Carcinoma: Incidence and Outcomes in 1753 Patients. J Surg Res 156(1): 167-172.
5. Steliarova-Foucher E, Stiller CA, Pukkala E, Lacour B, Plesko I et al. (2006) Thyroid cancer incidence and survival among European children and adolescents (1978-1997): report from the Automated Childhood Cancer Information System project. Eur J Cancer 42(13): 2150-2169.
6. Guille JT, Opoku-Boateng A, Thibeault SL, Chen H (2015) Evaluation and management of the pediatric thyroid nodule. Oncologist 20(1): 19-27.
7. Jatana KR, Zimmerman D (2015) Pediatric thyroid nodules and malignancy. Otolaryngologic Clinics of North America 48(1): 47-58.
8. Josefson J, Zimmerman D (2008) Thyroid nodules and cancers in children. Pediatric Endocrinology Reviews 6(1): 14-23.
9. Francis GL, Waguespack SG, Bauer AJ, Angelos P, Benvenga S, et al. (2015) Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid 25(7): 716-759.
10. Dinauer CA, Breuer C, Rivkees SA (2008) Differentiated thyroid cancer in children: diagnosis and management. Curr Opin Oncol 20(1): 59-65.
11. Teixeira G, Teixeira T, Gubert F, Chikota H, Tufano R (2011) The incidence of central neck micrometastatic disease in patients with papillary thyroid cancer staged preoperatively and intraoperatively as N0. Surgery 150(6): 1161-1167.
12. Thompson GB, Hay ID (2004) Current strategies for surgical management and adjuvant treatment of childhood papillary thyroid carcinoma. World J Surg 28(12): 1187-1198.
13. Reynolds JC, Robbins J (1997) The changing role of radioiodine in the management of differentiated thyroid cancer. Semin Nucl Med 27(2): 152-164.
14. Patel A, Fenton C, Ramirez R, Dinauer CA, Tuttle RM, et al. (2000) Tyrosine kinase expression is increased in papillary thyroid carcinoma of children and young adults. Front Biosci 5: A1-A9.
15. Penko K, Livezey J, Fenton C, Patel A, Nicholson D, et al. (2005) BRAF mutations are uncommon in papillary thyroid cancer of young patients. Thyroid 15(4): 320-325.