CASE REPORT

Solid variant of papillary thyroid carcinoma in a 14-year-old girl

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SUMMARY

Solid variant of papillary thyroid carcinoma (PTC) is a rare, poorly characterised variant and predominantly reported in children with a history of radiation exposure. This variant has a high propensity for extra-thyroidal extension and cervical lymph node metastases. A 14-year-old Malay girl who had no history of radiation exposure, presented with multiple cervical lymphadenopathy and it was clinically suspicious for tuberculosis or lymphoma. An incisional biopsy revealed a metastatic PTC. The patient underwent total thyroidectomy with bilateral lateral neck dissection and histopathology report was solid variant of PTC. Whole-body I¹³¹ scan was performed which revealed an intense tracer uptake in the neck. She was planned for radioactive iodine ablation and now on regular follow-up for monitoring of possible tumour metastasis.

BACKGROUND

Papillary thyroid carcinoma (PTC) is the most common type of malignant thyroid tumour constituting more than 70% of thyroid malignancies.¹ The common variant of PTC include classical, follicular and tall cell variant, whereas the uncommon variant include oncocytic, columnar cell, diffuse sclerosing and solid variant.² Solid variant is a distinct entity that has been rarely described in the literature. It is known to be associated with the Chernobyl nuclear accident in 1986 when this variant was reported in more than 30% of children with PTC after Chernobyl disaster.³ In a recent review, solid variant of PTC comprises about 3% (20/756) of the total PTC.⁴ This variant usually presents with differential diagnoses of poorly differentiated carcinoma, medullary carcinoma, anaplastic carcinoma and metastatic carcinoma of the thyroid. It has a less favourable prognosis than the classical papillary type, however, much better than poorly differentiated carcinoma.⁴ Therefore, morphological distinction of this variant is important to avoid over-diagnosed as more aggressive tumours. The aim of this report is to present a rare case of solid variant of PTC and review the literature on the morphological identification, clinical course and prognosis.

CASE PRESENTATION

A 14-year-old girl presented with a lateral neck swelling which was increasing in size for about 1 year duration. Apart from the swelling, no other associated symptoms were given. On physical examination, there were multiple small lymph

nodes palpable on the superior anterior triangle of the neck over the medial aspect of the sternocleidomastoid muscle bilaterally. These enlarged lymph nodes were varied in size, firm in consistency, matted, fixed and non-tender on palpation. Thyroid glands were not palpable and vital signs were normal. Abdominal examination revealed smooth surface hepatomegaly with liver edge located three fingers breadth below the right sub-costal margin. Examination of other systems was unremarkable. Based on the history and physical examination findings, extra-pulmonary tuberculosis and lymphoma were given as clinical differential diagnoses.

INVESTIGATIONS

A series of blood investigations for lymphoma and investigations for extra-pulmonary tuberculosis were performed. However, the results showed no abnormalities. Chest radiograph was also unremarkable.

Incisional biopsy of the cervical lymph node revealed metastatic PTC. On microscopic examination, the lymph nodes architecture was distorted and infiltrated by tumour cells arranged in solid nests. The cells showed uniform round nuclei with inconspicuous nucleoli and well-defined pale eosinophilic cytoplasm. Micropapillary formation, intranuclear inclusion and focal psammoma body were seen. Immunohistochemical staining was positive for thyroglobulin and cytokeratin 7. These immunoprofiles supported that the origin was from follicular cells of the thyroid.

CT scan of the neck, chest and abdomen for further evaluation was performed. CT scan showed multiple well-defined lobulated enlarged lymph nodes over the jugular chain. There were multiple rings of calcification within the left thyroid lobe. Enlargement of lymph nodes were also seen at the superior mediastinum, precarina region and bilateral axillary areas. There was no retrosternal extension. Lungs, liver and kidneys were free of metastatic deposits.

The patient underwent total thyroidectomy and bilateral lateral neck dissection. Intraoperatively, the left thyroid gland was enlarged with a firm mass measuring 30×20 mm in diameter. The tumour was infiltrating the left recurrent laryngeal nerve and clear dissection was not achieved. Enlarged lymph nodes over the jugular chain bilaterally were dissected. Right recurrent laryngeal nerve and all four parathyroid glands were identified and

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preserved. All the tissues were sent for histopathological examination.

Gross examination showed a total thyroidectomy specimen weighed 82 g, with the right lobe measuring 35×20×11 mm, left lobe 45×20×11 mm and isthmus 20×18×11 mm. There were papillary-like structures on the ruptured surface of the left thyroid lobe extending to the isthmus. Serial sectioning showed homogeneous whitish cut surface with foci of calcification within the left lobe and the isthmus. The right lobe of the thyroid revealed foci of small whitish lesions on sectioning. Multiple lymph nodes were received which included the right cervical, left cervical, central cervical, right jugular, left jugular and mediastinal lymph nodes.

On microscopic examination, the left lobe of the thyroid and isthmus showed papillary thyroid carcinoma with multifocal tumour involvement. The neoplastic follicular cells predominantly arranged in solid nests separated by delicate fibrohyaline stroma and surrounded by thin to thick fibrous stroma at the periphery resembling insular pattern (figure 1). In some areas, tumour cells arranged in trabecular or cord-like pattern. However, papillary configuration with fibrovascular core was absent. The tumour cells were large with classical nuclear features such as nuclear crowding, optically clear nuclei, pale powdery chromatin, irregular nuclear contours, scattered intranuclear cytoplasmic inclusions and nuclear grooves (figure 2). They have moderately abundant pale eosinophilic cytoplasm with distinct cytoplasmic membrane (figure 2). In focal areas, capsular invasion and vascular invasion by the tumour was present (figure 3). Psammoma bodies (figure 4) and multinucleated giant cells were present in many foci. The right lobe of the thyroid was also infiltrated by the tumour in many foci. No mitotic activity seen and there were no area of necrosis or haemorrhage. Sections from the excised lymph nodes revealed metastatic tumour infiltration in the left cervical, central cervical, right jugular and left jugular. The right cervical and superior mediastinum lymph nodes were free of tumour. Immunohistochemical staining showed the tumour cells were positive for thyroid transcription factor-1 (TTF-1) (figure 5) and negative for calcitonin.

DIFFERENTIAL DIAGNOSIS

Before the incisional biopsy of the cervical lymph node, clinical suspicion of the case was extrapulmonary tuberculosis or lymphoma.

Figure 1 Solid variant of papillary thyroid carcinoma. Note the solid nests surrounded by delicate fibrohyaline stroma. No papillary growth is present (H&E staining ×10).

Figure 2 Solid variant of papillary thyroid carcinoma (PTC). At higher magnification note the classical nuclear features of PTC; nuclear clearing, intranuclear cytoplasmic inclusions, nuclear grooves and abundant pale eosinophilic cytoplasm with distinct borders (H&E staining ×40).

TREATMENT

After total thyroidectomy and bilateral lateral neck dissection, the patient had transient symptomatic hypocalcaemia that was treated with intravenous calcium gluconate. The patient was discharged well with calcium supplement. Thyroxine was not started as the patient was planned for whole-body I¹³¹ scan later.

OUTCOME AND FOLLOW-UP

Whole body I¹³¹ scan was performed 2 weeks after surgery and revealed an intense tracer uptake in the neck. No abnormal tracer accumulation elsewhere to suggest distant metastasis. The patient was planned for radioactive iodine ablation to ablate the residual tumours.

DISCUSSION

Solid variant of PTC is commonly seen in patients exposed to radiation and it was reported among survivors of the Chernobyl accident.⁵ Nikiforov *et al*⁶ compared the morphological and genetic characteristics of 38 cases of post-Chernobyl PTCs and among radiation-induced tumours, solid variant was found in 37%, follicular variant in 29%, classical papillary in 18% and diffuse sclerosing variants in 8%. These solid variant seen in

Figure 3 Vascular invasion by solid variant of papillary thyroid carcinoma (H&E staining ×20).

Figure 4 A psammoma body in solid variant of papillary thyroid carcinoma, characterised by laminated, concentric calcification (H&E staining $\times 20$).

Chernobyl had a high propensity for extrathyroidal extension and cervical lymph nodes metastases were found up to 83% of patients.⁵

Nikiforov *et al*⁴ reviewed the morphology, clinicopathological features and follow-up of 20 patients with solid variant of PTC. All tumours had between 70% and 100% of solid growth with nests of tumour surrounded by thin rim of fibrotic stroma in 11 cases and by broad fibrotic bands with extensive fibrosis in nine cases. Only small area of microfollicular and vague papillary growth were present intermixed with solid areas in few cases. In all cases, the tumour cell showed abundant cytoplasm and had nuclear features characteristic of classical papillary carcinoma including oval shape, irregularity of nuclear contours, nuclear clearing, grooves and pseudoinclusions. Papillary formation with fibrovascular core was absent. Nucleoli were inconspicuous and psammoma bodies were present in eight cases. Bilateral tumour spread in three cases and multifocal one lobe involvement was seen in 11 cases. Seven tumours had extrathyroidal extension, intravascular invasion was present in two cases and regional lymph node metastases were noted in 11 cases. All tumour showed cytoplasmic immunoreactivity for thyroglobulin, nuclear immunoreactivity for TTF-1 and negative for calcitonin. Two patients died 7–10 years after initial surgery because of locally advanced disease or multiple distant metastases. Two

Figure 5 Solid variant of papillary thyroid carcinoma with nuclear positivity for thyroid transcription factor-1 ($\times 20$).

patients were alive with lung metastases 24–14 years after initial surgery and three patients had local recurrences.⁴

Silver *et al*⁷ reported a clinical review on aggressive variants of PTC and found that solid variant PTC together with tall cell variant, columnar cell, diffuse sclerosing and insular variants are potentially more aggressive than conventional PTC. It presents with features associated with worse prognosis including higher histological grade, extracapsular spread, large tumour size and the presence of distant metastases. The prognosis is directly related to the presence of these features. Limited by the relatively small number of cases that have been studied, clinical treatment decisions should be based on the stage of the disease but with the knowledge that aggressive variants tend to be associated with higher risk factors.⁷

Our case showed histopathological features suggestive of PTC even though the examination performed on the incisional lymph node biopsy sample. This is because the presence of characteristic features of PTC. Moreover, the immunohistochemical positivity for thyroglobulin supported the thyroid follicular cells origin. However, examination of the total thyroidectomy specimen point to consider other differentials which include insular carcinoma, poorly differentiated carcinoma, medullary carcinoma and also metastatic carcinoma of the thyroid. The reason for many differentials was because of the solid arrangement of the tumour predominantly in nests resemble insular pattern. This resemblance was due to solid islands or nests of cell separated by delicate fibrous septa. However, it was distinguished from insular carcinoma and other forms of poorly differentiated carcinoma, because the nuclear features are characteristic for papillary carcinoma. Furthermore, the cells are larger with abundant eosinophilic and finely granular cytoplasm as compared with insular carcinoma in which the cells are rather small with round, dark, monomorphic nuclei and scanty cytoplasm.⁷ The abundant granular cytoplasm with trabecular growth patterns can mimic medullary thyroid carcinoma. However, medullary thyroid carcinoma lacks the nuclear features of PTC and it is positive for calcitonin and negative for TTF-1 immunohistochemically. Metastatic carcinoma of the thyroid was less likely because the tumour cells are positive for thyroglobulin and TTF-1.

Damie *et al*⁸ reported a case of a 12-year-old girl with left cervical lymphadenopathy, in which differential diagnoses of poorly differentiated carcinoma, medullary carcinoma, anaplastic carcinoma and metastatic carcinoma of the thyroid were considered; however, finally it was confirmed solid variant of PTC metastases to left cervical lymph nodes. In that case, fine needle aspiration cytology (FNAC) suggested a differential of Hurthle cell neoplasm or medullary carcinoma of the thyroid. However, total thyroidectomy and left radical neck dissection showed solid nests of cells separated by fibrous septa, foci of calcification and characteristic nuclear features of PTC. The patient was referred for a whole-body radioiodine scan and found 0.22% uptake of iodine remnant. The child was treated with a dose of 30 mCi for remnant ablation.⁸

That case was identical to our case in terms of age, lack of radiation-exposure and the clinical presentation. Therefore, the solid variant of PTC should be considered as one of strong differential diagnosis in paediatric age group, presented with multiple cervical lymphadenopathy even though there is no history of radiation exposure and in cases with doubtful FNAC report. The surgeon should be aware of the histological variant of PTC and prepare to perform at the first or second stage a total thyroidectomy, lateral neck dissection, additional lymphadenectomy and/or resection of invaded surrounding structures and search for distant metastasis.

Learning points

- ▶ Solid variant of papillary thyroid carcinoma (PTC) is a rare variant, predominantly occur in children with a history of radiation exposure.
- ▶ Solid variant of PTC is diagnosed histologically when the tumour is predominantly arranged in solid nests, without or with only small areas of papillary formation and typical nuclear features of papillary carcinoma.
- ▶ Solid variant of PTC is categorised under the aggressive variants of PTC when most cases presented with extrathyroidal extension and cervical lymph node metastases.
- ▶ The management of solid variant PTC includes total thyroidectomy, bilateral neck dissection (in cases with cervical lymphadenopathy) and postoperative radioiodine ablation.

Contributors WFWAR was involved in general conception, design and revised the manuscript. MNMH was involved in drafting the discussion in clinical aspect and

case presentation. WTT was involved in drafting the article in pathology aspect and IHB was involved in drafting the article in investigation parts.

Competing interests None.

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