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Case report

Cartilaginous metaplasia of thyroid nodule

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Abstract

Adenomatous goiter is the most common form of thyroid disease. Although degenerative changes like fibrosis, calcification, cystic changes and hemorrhagic tissue are commonly found, cartilaginous metaplasia is an unusual phenomenon in the thyroid gland. Heterotopic cartilage formation is a very rare finding in both neoplastic and non-neoplastic lesions. Only 2 cases have been reported so far. Here we present a case of a 65-year-old female who presented with a midline swelling in her neck for 2 months associated with difficulty in swallowing. The lymph nodes were not palpable and there were no pressure symptoms. Ultrasonography was suggestive of thyromegaly with large goiterous change in left lobe and isthmus of thyroid. Fine Needle Aspiration Cytology (FNAC) revealed Bethesda Category I lesion. The patient underwent left hemi-thyroidectomy. Microscopy revealed encapsulated lesions composed of variable-sized follicles filled with colloid. Cystic areas lined by benign follicular cells showing foci of cartilage were also observed. Consistent with diagnosis of adenomatoid goiter with cartilaginous metaplasia. This case shows a rare histopathological change in the thyroid nodular lesions.

Key words: Adenomatous goiter, Cartilage, Metaplasia, Thyroid

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Thyroid nodules are a common phenomenon with nodular goiter being the most prevalent form of thyroid diseases. These nodules often undergo various degenerative changes, but heterotopic cartilage formation is an exceedingly rare occurence[1]. In fact, only two cases of cartilaginous metaplasia in a thyroid nodule have been reported[1,2] in the literature, to the best of our knowledge. This rare case provides valuable insights into the degenerative changes like hemorrhage, calcification, cyst formation[2]; warranting further research into the underlying mechanisms.

Case report

A 65 year old female presented to the Surgery outpatient department with a midline swelling in the neck since 2 months. It was associated with pain during swallowing. Size of the swelling was 1.5 x 1cm. The patient had on other complaints. There were no other pressure symptoms seen. No palpable lymph nodes were felt. No family history of thyroid disorders was reported. She had no significant past medical and surgical history.

Investigations

Diagnostic evaluations were conducted following a comprehensive medical history and physical examination. Laboratory tests included a thyroid profile, which revealed serum Triiodothyronine (T3) and Tetraiodothyronine (T4) levels of 94.5 mg/dL and 10.7 ng/dL, respectively, within the normal reference ranges. A complete blood count showed leukocytosis, indicating an elevated white blood cell count. Ultrasonographic examination demonstrated thyromegaly, characterized by an enlarged goiterous lesion in the left lobe and isthmus of the thyroid gland. A nodular lesion measuring 6.9 x 2.5 x 2.2 cm was identified, exhibiting cystic and heterogeneous features with colloid degeneration and a 2.3 mm calcification. Fine Needle Aspiration Cytology (FNAC) was performed, and the cytological findings were consistent with a Bethesda Category I lesion, indicating a benign thyroid nodule.

Gross examination

Hemi thyroidectomy was performed and the specimen was received in formal saline. It measured 7cm x 4cm x 3cm with an intact capsule (Fig 1). The cut surface was soft to firm in consistency. Colloid filled nodule along with cystic and whitish areas seen.

Fig 1. Gross features of thyroidectomy specimen

Histopathological examination

Findings revealed capsulated nodular lesion composed of follicles of varying sizes filled with colloid and lined by benign follicular epithelium (Fig 2). Few cystic areas are seen showing foci of cartilaginous tissue. But no atypia seen (Fig 3).

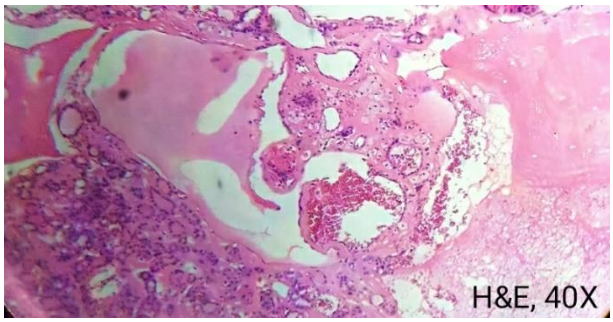

Fig 2. Thyroid follicle with colloid

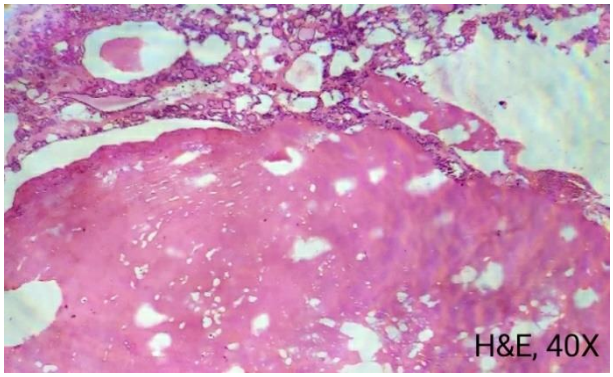

Fig 3. Cystic areas with foci of cartilaginous tissue

Discussion

Hemorrhage, calcification, fibrosis and cystic degeneration are the commonly occurring secondary changes that occur in nodular lesion[2]. Ectopic cartilage formation is an exceptionally rare finding both in neoplastic and non-neoplastic lesions[1,3].

Therefore, this case re-emphasizes the importance of meticulous extensive grossing of thyroidectomy cases when gross visual examination reveals any suspicious myxoid areas. Areas with bone-like changes (osseous metaplasia) are typically hard and gritty, so they are often sampled for further examination[4,5,6]. However, small areas of cartilage-like changes (Chondroid metaplasia) may be overlooked during visual examination because they resemble solidified colloid in color and texture. This could explain why Chondroid metaplasia is less commonly reported in thyroid lesions compared to osteoid metaplasia.

The histogenesis of cartilage in nodular goiter remains a subject of uncertainty. Virchow proposed a hypothesis suggesting that osteoblasts, responsible for bone formation in thyroid nodules, are actually modified fibroblasts, which undergo metaplasia to acquire osteogenic capabilities[7]. This hypothesis implies that fibroblasts, cells typically involved in

connective tissue formation, can differentiate into osteoblasts, leading to bone formation in thyroid nodules. This concept is still a topic of investigation and debate in the scientific community.

It is quite plausible that chondroblasts arise from fibroblasts by metaplasia. Basbug et al[8] showed a significantly higher expression of bone morphogenetic protein-2 (BMP-2) in calcified thyroid tissue accentuating the role of bone morphogenetic proteins in producing ossification in thyroid nodules. Bone Morphogenetic Protein-2 plays a vital role in cartilaginous formation as well, by promoting increase in number of chondrocytes and their maturation during endochondral bone formation[9]. Hence it seems possible that cartilaginous and bony differentiation in thyroid lesions occurs as a consecutive process.

The first recorded instance of chondrocyte proliferation in the thyroid gland was documented by Visonà et al[1], in the year 1990. The patient, a 72-year-old male, presented with swelling and hoarseness. Later, in the year 2022, Palo[2] reported a similar case involving a 54-year-old female with an anterior neck mass. Our current case involves a 65-year-old female patient who presented with dysphagia and swelling. Notably, swelling was a common symptom in all three cases, while dysphagia was an additional feature in our case. These instances highlight the rare occurrence of chondrocyte proliferation in the thyroid gland. This condition can affect individuals differently, underscoring the need for further research and understanding.

Conclusion

This case study highlights the rare occurrence of heterotopic cartilage formation in a thyroid nodule. The patient presented with a midline swelling in the neck and difficulty swallowing, leading to the discovery of a large goiterous change in the left lobe and isthmus of the thyroid.

The fine needle aspiration cytology revealed a Bethesda Category I lesion, and subsequent hemithyroidectomy revealed cartilaginous tissue in the nodule. This finding emphasizes the importance of meticulous examination of thyroidectomy specimens, as cartilaginous changes may be overlooked due to their resemblance to solidified colloid.

The study suggests that cartilaginous and bony differentiation in thyroid lesions may occur as a consecutive process, highlighting the need for further research into the role of bone morphogenetic proteins in thyroid nodules. This rare case contributes to our understanding of the degenerative changes that occur in thyroid nodules over time.

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Conflicts of interest: None

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