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Extramedullary hematopoiesis in thyroid gland-A rare case report

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Abstract

Background: Extramedullary hematopoiesis (EMH) is defined as the production of normal blood cells outside the bone marrow. The most common sites in adults are the liver, the spleen and the lymph nodes. However, it can occur at any part of the body such as nervous system, lungs, breasts, adrenal glands, kidneys, peritoneal surface, gastrointestinal tract. It is very rare to occur in thyroid gland without any hematological abnormality.

Conclusions: Though rare but we should be aware of extramedullary hematopoiesis in thyroid gland without any hematological abnormality.

Keywords: Extramedullary hematopoiesis, Fine needle aspiration cytology, Thyroid gland, Myelofibrosis.

Introduction

Extramedullary hematopoiesis (EMH) is defined as the expansion and differentiation of hematopoietic stem and progenitor cells outside of the bone marrow. The most common sites in adults are the liver, the spleen and the lymphnodes.[1] However, it can occur at any part of the body such as nervous system, lungs, breasts, adrenal glands, kidneys, peritoneal surface, gastrointestinal tract and may be related to reactivation of the embryonic hematopoietic structure in these organs. This has been seen in association with various clinical conditions, for example, hemo globinopathies, my Elo proliferative disorders, malignancies involving bone marrow, anemia, etc. It is very rare to occur in thyroid gland without any hematological abnormality. We present a case of an adult female with EMH in the thyroid gland diagnosed on fine-needle aspiration cytology (FNAC) without any hematological abnormality.

Case report

A 50-year-old female presented to surgery OPD with chief complaints of swelling in neck and dysphagia to solids for a period of 2 months. Clinical examination reveals a firm non tender nodule measuring 1x1 cm in right lobe of thyroid gland. CBC revealed HB-9 g/dl, TLC, DLC & platelets within normal limits. Peripheral smear shows no immature cells. Thyroid profile revealed

T3-0.77 ng/ml, T4-8.5 µg/dl & TSH-2.84 IU/ml. Clinically pallor was present and no hepatosplenomegaly or lymphadenopathy was seen. On ultrasonography, right lobe of thyroid measuring 1.3 x 2.2 x3 cm and left lobe measuring 1 x 1.5 x 2 cm showing a well-defined heterogenous lesion of 0.6 x 1.2 cm, isthmus normal.

USG guided fine needle aspiration (FNAC) of thyroid nodule was performed using a 21-gauge needle and 10 ml syringe and the smears are air dried and fixed with alcohol, followed by staining with H & E and Papanicolaou stain. Cytologic smears obtained after fine needle aspiration were cellular. They revealed cluster of follicular cells with trilineage hematopoiesis. Few maturing myelocytes, erythroid cells and megakaryocytes with large multilobate hyperchromatic nuclei and abundant cytoplasm. Background contains colloid.

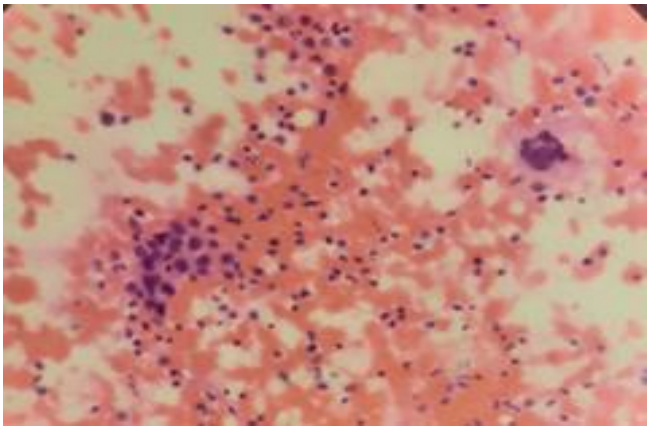

Figure 1

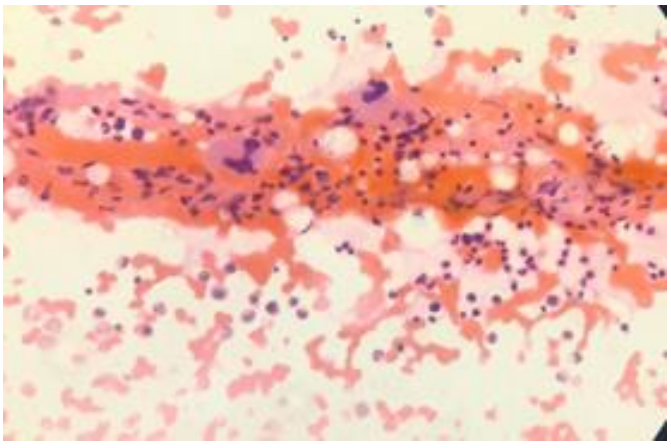

Figure 2

Figure 1 and 2 legend: FNAC smear of thyroid showing cluster of follicular cells, few megakaryocytes and background contain colloid (H&E 40x).

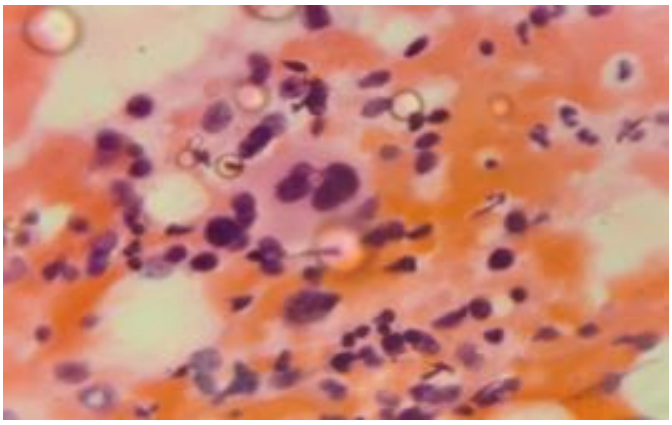

Figure 3

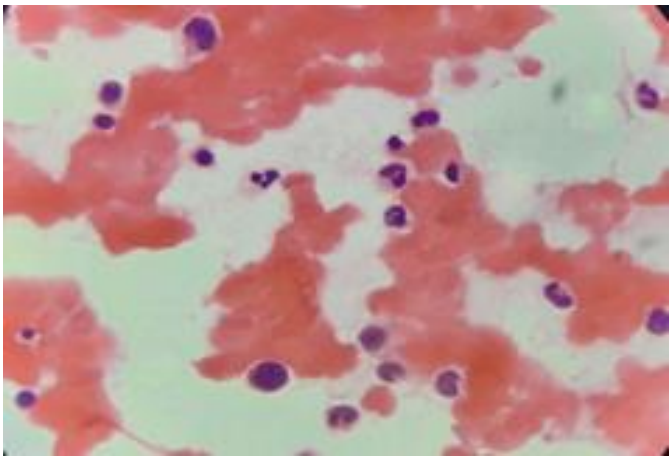

Figure 4

Figure 3 and 4 legend: Megakaryocyte and different stages of myeloid series (promyelocyte, myelocyte, meta my Elo cyte, band & neutrophil) and erythroblasts. (H&E 100x)

Discussion

For homeostasis, hematopoiesis occurs throughout life to produce through hematopoietic stem cells (HSCs). A single HSC can build an integrated hematopoietic system.[1]

When expanding themselves, some of their progeny cells remain HSCs, while other progeny cells differentiate into progenitor cells.

HSCs can be divided into long-term and short-term HSCs based on long-term or transient self-renewal. Short-term HSCs are derived from long-term HSCs and then progress into multipotential and lineage-committed hematopoietic progenitor cells (HPCs). Finally, these HPCs differentiate into all lineages (T and B lymphocytes, natural killer cells, eosinophils, basophils, neutrophils, monocytes, erythrocytes, megakaryocytes and platelets).[2]In the steady state, HSPCs of the bone marrow circulate in the peripheral blood at a detectable level. The peripheral circulation of HSPCs occurs mainly through two routes. One route is through blood circulation; that is, HSPCs from the bone marrow enter into the peripheral blood and then return to the bone marrow. The other route is through lymphatic circulation; that is, bone marrow-derived HSPCs travel from the peripheral blood into multiple peripheral tissues and are then transferred to lymph nodes and finally back into the peripheral blood via the thoracic duct. After lymphatic circulation, HSPCs either repeat the peripheral migration cycle or reenter the bone marrow.[1]

However, under some stress conditions, such as infection, malignancy, anemia and metabolic stress, and upon changes to the bone marrow microenvironment and the induction of some cytokines and soluble factors, a large number of HSPCs are released from the bone marrow into peripheral blood and other organs. This process is called mobilization.[2] These mobilized HSPCs in peripheral organs are the foundation for inducing EMH.

Therefore, the site of hematopoiesis during these specific pathological processes or excessive physiological stresses, which is termed as pathological EMH, can be any organ other than the bone marrow.[3]

It is very rare for extramedullary hematopoiesis to occur in thyroid gland especially in patients without any hematological abnormalities. In thyroid nodule a suitable micro environment for differentiating pluri potent hematopoietic cells is provided by (1) hematopoietic elements in unusual locations may arise from a common precursor, an uncommitted mesenchymal cell remaining from the intermediate cell mass; and **(2)** mesenchymal cells and capillaries retain a suitable micro environment for colonization by circulating stem cells.[3]

The presence of megakaryocytes is a very important finding of EMH as they can be readily recognized in the cytological smears but sometimes differentiating these from cells of anaplastic carcinoma of thyroid can be a diagnostic challenge.[1] Anaplastic carcinoma of thyroid can show marked pleomorphism with cells showing epithelioid to sarcomatoid morphology with large, pleomorphic nuclei, irregular nuclear membranes, coarse clumped chromatin and prominent nucleoli. Numerous mitoses and atypical mitotic figures may be seen. It is very rare to see the presence of both, that is, EMH and anaplastic carcinoma in the same thyroid. The recognition of the background of myeloid and erythroid precursors is an important clue to the appropriate identification of the large cells as megakaryocytes. [4]

We should also exclude medullary carcinoma of thyroid, as morphology can be varied ranging from plasmacytoid cells, spindle shaped cells and bizarre forms which can sometimes mimic megakaryocytes.

Non hepatosplenic extramedullary hematopoiesis is rare and often associated with myeloproliferative neoplasms with myeloid metaplasia.[5]

It is very rare for extramedullary hematopoiesis to occur in thyroid gland especially in patients without any hematological abnormalities.[4]

Prerequisites for the development of focal EMH are presence of hematopoietic precursor, extra cellular matrix, growth factor such as granulocyte macrophage

colony stimulating factor, other cytokines and hormones. In thyroid nodule a suitable micro environment for differentiating pluri potent hematopoietic cells is provided by mesenchymal cells and capillaries.[6]

The present case has been reported as there was no history of chronic anemia due to any cause, patient had an isolated complaint of dysphagia. CBC was within normal limits and peripheral smear shows no immature cells.

Thyroid profile was pointing towards euthyroid state. Clinically no hepatosplenomegaly or lymphadenopathy was seen. On cytological examination, smears from right side of thyroid nodule revealed only colloid and left side of thyroid nodule revealed occasional clusters of follicular cells, varying stages of myeloid series cells, erythroblast and megakaryocytes. Background contain colloid. The diagnosis of extramedullary hematopoiesis was not even a remote possibility in the mind of clinician.

Conclusion

Though rare but we should be aware of extra medullary hema topoiesis in thyroid gland without any hematological abnormality as it is not an indication for surgical resection unless causing mass effect.

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