

Gelatinous Transformation of Bone Marrow: A Rare Cause of Pancytopenia

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ABSTRACT

Gelatinous marrow transformation (GMT) also known as serous atrophy is a very rare entity characterized by fat cell atrophy, accumulation of extracellular gelatinous material in the bone marrow and adjacent marrow hypoplasia. This morphologically defined condition is non specific and can be seen in many hematological and non hematological conditions. Hence, appropriate identification and management of underlying etiology is important. Mostly seen in adult patients and very few cases are reported in pediatric age group.

We describe two cases of pediatric age group who presented with pancytopenia. First was a case of protein energy malnutrition and underlying chronic liver disease. Second was a case of disseminated tuberculosis. On bone marrow aspiration both showed fat cell atrophy, marrow hypoplasia and accumulation of extracellular eosinophilic material which was PAS positive suggestive of gelatinous transformation of bone marrow. Our case report adds to the existing literature on gelatinous marrow transformation diagnosed on bone marrow aspiration study. It also suggests that this condition should be looked for as a cause of pancytopenia.

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Introduction

Gelatinous transformation of bone marrow (GMT) also known as serous atrophy is characterized by fat cell atrophy, adjacent marrow hypoplasia and deposition of extracellular gelatinous material. ^[1] Histochemical nature of this substance is identified as hyaluronic acid mucopolysaccharide. ^[2] This morphologically defined condition is not specific for a particular disease, but represents clinical consequence of a generalized illness. Hence, appropriate identification and management of underlying etiology is important. Morphologically may get confused with marrow edema, necrosis or amyloidosis. ^[3]

Here, reporting two cases of GMT in pediatric age group presenting with pancytopenia diagnosed on bone marrow aspiration study.

Case Report(S)

First case was a two year old male child who presented with generalized swelling developing over two months,

failure to thrive and two episodes of febrile seizures in six months. No history of oliguria. On examination, he was pale, irritable, and sick looking with dry, rough skin and hypo pigmented hairs. Liver was just palpable. Complete blood count revealed Hb 8 gm/dl, RBC count 2.7million/mm³, PCV 32.2%, TLC 3500/mm³ & platelets 1.2 lac/mm³. Liver function test showed AST 141 U/L, ALT 86U/L, total protein 3.6 gm/dl. Urine albumin, sugar, ketone, urinary DNPH and fecl3 were negative. Urine urobilinogen level was within normal limit and was seronegative for HIV. With this clinical findings and laboratory investigations differential diagnosis kept were protein energy malnutrition, storage disorder, and chronic liver disease. Peripheral smear and bone marrow aspiration study were advised. Peripheral smear examination suggested pancytopenia. Bone marrow aspiration smears showed marrow hypoplasia, fat cell atrophy and accumulation of eosinophilic extracellular material in the background of hematopoietic cells. (fig 1, 2)



Fig. 1: Marrow hypoplasia, fat cells depleted (10x-Romanowsky)

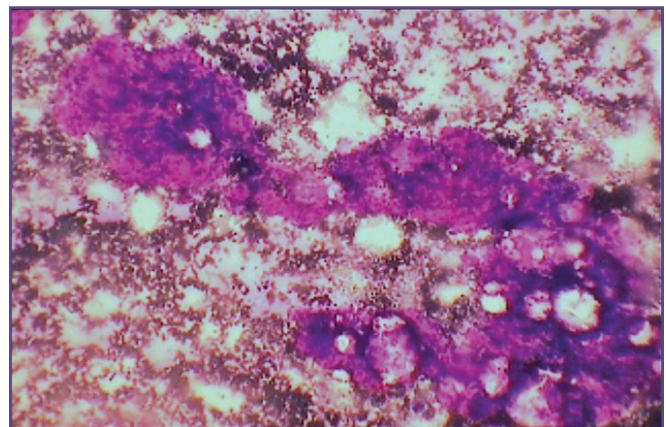


Fig. 2: Eosinophilic extracellular material in the background of hematopoietic cells (Romanowsky, 10x)

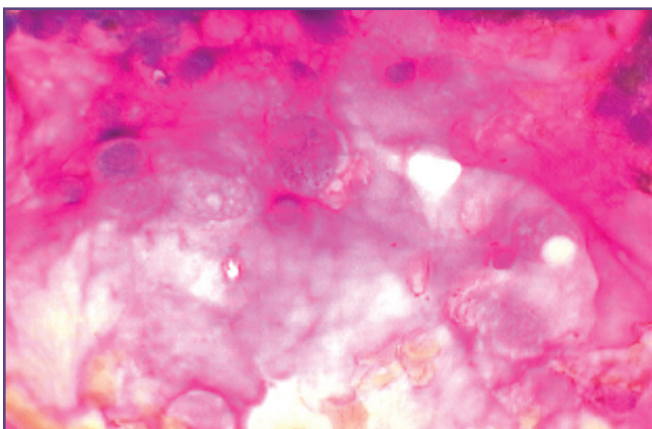


Fig. 3: Amorphous eosinophilic fine fibrillar material (Romanowsky, 40x)

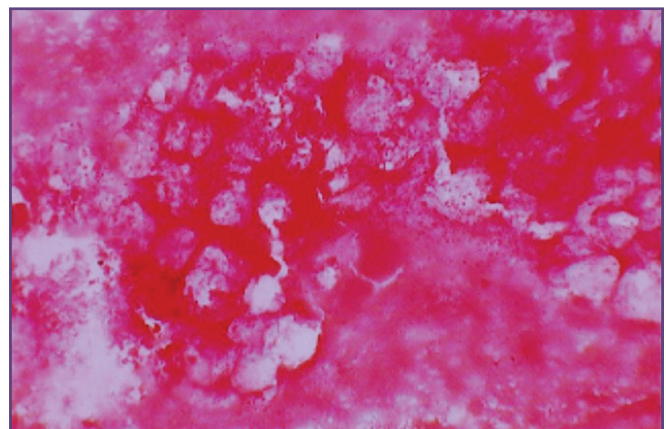


Fig. 4: PAS Positive material

Second case was an 11-year-old male child, known case of tuberculous lymphadenitis on anti-tubercular therapy presented with abdominal distension, edematous feet, generalized lymphadenopathy and hepatosplenomegaly. Liver function test revealed total proteins 2.6 gm/dl, total bilirubin 1.6 mg/dl, AST 64 U/L, ALT 50 U/L. Clinical diagnosis kept were disseminated tuberculosis with severe sepsis & suspected lymphoreticular malignancy. Peripheral smear and bone marrow aspiration study were advised. Peripheral smear showed pancytopenia, shift to left, toxic granules while bone marrow aspiration smears showed marrow hypoplasia, depleted fat cells and eosinophilic extracellular material in the background of hematopoietic cells. However gelatinous marrow transformation was given as an associated finding with other marrow changes of severe infection.

In both the cases differential diagnosis kept on bone marrow aspiration study was gelatinous transformation, amyloidosis, marrow necrosis. Special stains like PAS, congo red were done. The material was found to be PAS positive. Thus diagnosis of GMT was given. First patient improved symptomatically with nutritional support, also hematological parameters showed improvement. Second patient died on second day of admission.

Discussion

Gelatinous material is an amorphous, eosinophilic, fine or fibrillar, stain pink purple with romanowsky or H&E stain. It also stains positive with alcian blue at pH 2.5 and PAS stain.^[5,6] It's a degenerative change of marrow where hematopoietic cells are decreased in number & embedded within the gelatinous material associated with absent or marked reduction of fat cells. Pathogenesis is largely unknown but it is said that deficiency of total calorie intake both carbohydrates and proteins underlie such type of change where in marrow fat get utilized in catabolic state & there is an excessive accumulation of acid mucopolysaccharides which serves to fill & replace marrow spaces normally occupied by fat cells. This increased accumulation could adversely affect the local environment for normal hematopoiesis probably by interfering with cellular adhesivity, thus compromising the marrow function leading to cytopenia.^[2] The condition may be reversible if underlying disease is treated.

Morphologically it resembles marrow edema, necrosis or amyloidosis.^[3] Necrosis is granular and may be associated with necrosis of the adjacent bone. Edema is differentiated by absence of fat cell atrophy. Amyloidosis

is homogeneous and excluded by Congo red staining. Gelatinous marrow transformation (GMT) can be a rare but important differential diagnosis in the evaluation of pancytopenia other than aplastic anaemia, myelophthisic anaemia, megaloblastic anaemia, and myelodysplastic syndrome. Most of the cases reported in the literature presented with bi or pancytopenia.^[3,4,8,9]

Only rare case reports are available showing GMT in children.^[4] In a large series conducted by Bohm^[1] on 158 patients, GMT was found in all age groups except children. On the other hand, in a study by Jain et al^[3] they observed GMT in 14 children out of 43, the youngest being a child of 6 months with cholestatic jaundice. Our both cases are of pediatric age group. Our first case is of protein energy malnutrition. Chronic malnutrition may be the source of GMT because it is very commonly seen in anorexia, starvation, and other malnourished states.^[6] Wang et al described a case of GMT in a patient with a starch-free diet, which was reversible after restoration of a normal diet.^[7]

It has also been described in HIV infection, cachexia secondary to chronic diseases like tuberculosis, malignancy, leukemia post chemotherapy, acute febrile illnesses, systemic lupus erythematosus, chronic liver disease, chronic renal failure, severe hypothyroidism.^[1,8,9] A detailed evaluation of all the above-mentioned possible causes is necessary in a patient of pancytopenia and gelatinous transformation of marrow with marrow aplasia.

Our both cases were diagnosed on bone marrow aspiration study. Most of the cases mentioned in the literature are diagnosed on bone marrow biopsy or with combined use of aspiration and biopsy study.^[1, 3, 4, 8, 10]

Conclusion

In the presence of accumulation of extracellular eosinophilic material in the background of fat cell atrophy and marrow hypoplasia, diagnosis of gelatinous marrow transformation should be kept in mind and it should be looked for as a cause of pancytopenia. Though not specific, it suggests underlying chronic debility requiring meticulous investigations & treatment.

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Competing Interests:

None declared

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