Kasabach–Merritt Syndrome Associated With a Large Cavernous Splenic Hemangioma Treated With Splenectomy: A Surgeon’s Introspection of an Uncommon, Little Read, and Yet Complex Problem—Review Article

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Abstract Cavernous hemangiomas of the spleen are small benign lesions found incidentally, majority of times while patients are being investigated for some other disease and patients remain asymptomatic otherwise for this condition. The natural history of cavernous hemangiomas of spleen is slow, symptoms or complications, when present, occur late, they are rarely large and can manifest as a palpable non-tender mass in the left upper quadrant. A very rare syndrome is associated with this condition called Kasabach–Merritt syndrome (KMS), which is defined as diffuse cavernous hemangioma of the spleen alongwith anemia, thrombocytopenia, and coagulopathy. Perioperative diagnosis can be confirmed by imaging study which can be CT, MRI, or ultrasound. Splenectomy is considered the treatment of choice for such patients with symptoms. To our knowledge, a very few cases have been reported so far. The purpose of writing this review article is the reporting of this rare case and to provide some experience related to the management of this condition in a patient with KMS.

Keywords Deranged coagulation profile · Kasabach–Merritt syndrome · Splenic hemangioma · Splenectomy

Case Report

A 38-year-old lady was referred from a remote village secondary care center to our hospital Christian Medical College-

Ludhiana India, with the chief complaints of fullness and progressive distension of left upper abdomen for 1½ years with progressive weight loss and early satiety. On examination, she was thin built, poorly nourished with pedal edema (weight 34 kg) and pallor. On abdominal examination, skin was tense and shiny, veins were visible, and massive splenomegaly was present. Laboratory investigations showed anemia, thrombocytopenia, and deranged coagulation profile (Table 1).

The patient was extensively evaluated to exclude portal hypertension, lymphoma, and plasma dyscrasias. A bone marrow biopsy showed 80 % cellularity with normoblastic erythropoiesis, granulopoiesis showing maturation up to neutrophil stage with increased megakaryocytes, mild plasmacytosis ranging from 11 to 20 %. Upper GI endoscopy (Fig. 1) showed that there was external compression in fundus and body of stomach with no mucosal changes. CECT scan of abdomen (Fig. 2) confirmed a large splenic mass with features of mass effect in left upper abdomen. Patient was immunized with pneumococcal and *H. influenza* vaccine 48 h prior to planned surgical intervention. Preoperatively she was transfused 2 units of red cell concentrate, requiring a single unit transfusion intraoperatively alongwith 4 units of fresh frozen plasma. She underwent exploratory laparotomy and splenectomy, as the treatment option for hypersplenism by exclusion. The incision chosen was a Mercedes Benz incision. Early ligation of splenic artery was achieved prior to dissection of splenic hilum. Intraoperative findings (Fig. 3) were a grossly enlarged spleen, pressure atrophy of left lobe of liver, and engorged splenic veins, remaining solid and hollow viscera were normal. Gross pathological examination of the splenectomy specimen was measured 25×19×13 cm and weighed 3270 g. Cut surface showed large hemorrhagic and cystic areas replacing most of the splenic tissue. Normal splenic

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Table 1 Hematological and biochemical parameters

Hemoglobin	7.7 g%
TLC	10,390 / mm ³
Platelets	103,000 / mm ³
PCV	23.2 %
ESR	80 mm/h
DLC	N-83 %, L-10 %, E-02 %, Meta -03 %, Myelo -02 %
Blood film	RBC—mild anisopoikilocytosis with macrocytes, occasional macro-ovalocytes with predominant normochromia WBC—adequate with hypersegmented neutrophils Platelets—lower side of normal
Malarial parasite	Negative on peripheral blood smear
Coagulation profile	PT—20.6/12, INR—1.81, APTT—41.6 /24
Liver function tests	T Protein: 8.6; Alb: 2.8 Brb [T], 0.9; Brb [D], 0.5; GGT, 15 Alk Phosp: 91; SGOT, 44; SGPT, 19
Protein electrophoresis	ALB; 47.7 % [55–65], Alpha 1 GLB; 5 % [1–5.7] Alpha 2 GLB, 10.3 % [4.9–11.2]; Beta GLB, 8.1 % [7–13] Gamma GLB, 28.9 % [9–18.2] Total Se-Protein: 5.7 g/dl [6–8] M-Band: Absent Polyclonal gammopathy: Increased in gamma GLB
Renal function tests	Creatinine: 0.4

tissue could be identified at the periphery. Histopathology of the spleen showed large cavernous blood filled spaces (Fig. 4), consistent with a diagnosis of cavernous hemangioma. Small foci of extra medullary hematopoiesis were also seen. The patient had an uneventful postoperative recovery. The diagnosis in retrospect was defined as Kasabach–Merritt syndrome.

Fig. 1 Upper GI endoscopy showing extrinsic gastric fundal compression. Notice the normal overlying mucosa

Discussion

“What the eye doesn't see and the mind doesn't know, doesn't exist.” This phrase was extensively quoted by our teachers during the quest of learning medicine and holds true eternally [1].

A palpable spleen, which may even be visible, is a common physical finding in the tropics and sub-tropics. The blood flow through the spleen is mainly rapid and intrasinusoidal. In splenomegaly, there is usually a second slower circulation through the pulp cords. The spleen becomes congested following any rise in pressure within the splenic vein. Hypersplenism is a term applied to a depression of one or more blood elements (red cells, white cells, and platelets) associated with splenomegaly [2]. On average, the weight of a normal spleen is 100 to 250 g. Spleen size depends on age, sex, and body habitus. Massive splenomegaly, always indicates underlying pathology, usually defined as a spleen extending well into the left lower quadrant or pelvis or which has crossed the midline of the abdomen. Massive spleens weigh at least 500 to 1000 g. In a large retrospective study evaluating splenomegaly in patients, the most common disorders associated with splenomegaly were hematologic, infectious, hepatic, congestive, and inflammatory. Among patients with massive splenomegaly, 31 % had a hematologic disorder, 17 % had hepatic disease, and 8% had infectious disease. Chronic leukemias were associated most frequently with massive splenomegaly [3]. Amongst patients in India, malaria is the commonest cause of splenomegaly. Other causes, in order of importance, are chronic myeloid leukemia, non-cirrhotic portal fibrosis (17.4 %), enteric fever, cirrhosis of liver (17.4 %), and hyper-reactive malarial splenomegaly also called as tropical splenomegaly syndrome, the commonest cause of massive splenomegaly (30.4 %). In any study, there remain a proportion of cases, about 25–40 %, where cause of splenomegaly is not identified on usual evaluation [4]. Despite extensive work-up to establish the cause of splenomegaly, splenectomy may be required for diagnosis in certain situation and has an important role in establishing the pathology in patients presenting with idiopathic splenomegaly [5]. In our patient, it was thus imperative to initially suspect and evaluate the common etiologies implicated before coming to the elusive etiology of Kasabach–Merritt syndrome (KMS).

Hemangiomas, usually cavernous, are the most common benign neoplasm of spleen found incidentally on imaging. Rarely, they can be multiple or diffuse as seen in hemangiomatosis or be associated with generalized angiomatosis syndromes [6]. They are slow growing usually less than 2 cm in size [7]. Hemangioma presenting as massive splenomegaly is very rare. Multiple hemangiomas (splenic hemangiomatosis), as a part of generalized angiomatosis, involve multiple organs, especially the liver and skeleton [8, 9]. In 1940, Kasabach and Merritt reported a case of an infant with a huge hemangioma causing thrombocytopenia-related

Fig. 2 Contrast enhanced CT scan revealed grossly enlarged spleen with mass effect on adjacent organs (as shown by red and orange arrows). Internal architecture normal with prominent sinusoids showing slow filling of contrast as indicated by blue arrow

Contrast enhanced CT Scan revealed grossly enlarged spleen with mass effect on adjacent organs (as shown by red and orange arrows). Internal architecture normal with prominent sinusoids showing slow filling of contrast as indicated by blue arrow.

purpuric spots, alongwith microangiopathic hemolytic anemia secondary to consumption coagulopathy, and defined it as Kasabach–Merritt syndrome (KMS) [10]. This condition of the young although benign can be life threatening due to complications secondary to thrombocytopenia and coagulopathy, mortality rate in the range of 30–40 % [11]. Splenic hemangiomas with KMS are rare however have been reported, although this syndrome is more frequent in cutaneous hemangioma. Liver, spleen, mediastinum, and bone are sites that are most common for diffuse cavernous hemangiomas [12]. Although the pathogenesis is not established, the pathophysiology of KMS is generally presumed to be that of platelet trapping by abnormally proliferating endothelium within the hemangioma, which results in the activation of platelets with secondary consumption of clotting factors. Thrombocytopenia may be secondary to platelet sequestration in the abnormal endothelium of the tumor; there may be even hypofibrinogenemia because of intravascular coagulopathy [13]. A large hemangioma activates platelets, coagulation

factors leading to their consumption causing clinical bleeding tendencies, and intravascular coagulation. The bleeding which ensues is the primary cause of death in these patients [14]. Complete tumor resection of the vascular lesion provides cure by nulling the coagulopathy, which can recur in these cases when incomplete tumor resection occurs [15, 16]; splenectomy provided diagnosis in addition to cure in our patient. B-ultrasound, contrast CT, or MRI demonstrate no characteristic patterns for diffuse cavernous hemangiomas of the spleen in rare cases. A diffuse cavernous hemangioma should be highly suspected when the patient presents with consumptive coagulopathy [17]. Non-surgical treatment of KMS involving radiation, corticosteroids, interferon alpha2, embolization, and chemotherapy (vincristine) have been reported [18]; however, the merits and disadvantages need to be debated upon.

Intra operative image showing the grossly enlarged spleen and dilated splenic vein as indicated by the blue and pink arrows respectively

Fig. 3 Intraoperative image showing the grossly enlarged spleen and dilated splenic vein as indicated by the blue and pink arrows, respectively

Large cavernous blood filled spaces (black arrow) with intervening splenic red pulp (green arrow). Hematoxylin& Eosin, 100x

Fig. 4 Large cavernous blood filled spaces (black arrow) with intervening splenic red pulp (green arrow). Hematoxylin & Eosin, 100×

Although the general principles for management are certainly acceptable, there are more clinical scenarios to keep in mind and with better understanding of the pathogenesis, more appropriate and efficient therapies could be developed. KMS is clinically a heterogeneous condition which always causes dilemma in the mind of surgeons treating that case, due to life threatening and heterogeneous presentation of KMS which may be due to delay in diagnosing the case or confirming it.

In our patient, the diagnosis of KMS was made following histopathological examination of the splenectomy specimen; the evaluation and treatment at the onset were symptomatic and by excluding other common etiologies. Splenectomy was the treatment offered for symptom relief and additionally it provided us with the diagnosis. As surgeons, it would be prudent to be aware of the Kasabach–Merritt syndrome, even wiser to keep it as a differential in a patient presenting with massive splenomegaly with antecedent complications.

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