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Good outcome of surgical splenectomy in the presence of pancytopenia in an adult sickle cell anaemia patient with splenic sequestration and massive splenomegaly

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Abstract

Background: Sickle cell disease (SCD) are genetic diseases of the red blood cell resulting from the presence of a mutated form of haemoglobin, haemoglobin S (HbS). Splenic sequestration is a life threatening complication seen commonly in children with SCA.

Method: We present a female adult patient with SCA who had massive splenomegaly and pancytopenia due to splenic sequestration and hypersplenism to whom successful surgical splenectomy was done in the presence of pancytopenia. The aim of this report was to make known to health workers that splenectomy can be done successfully in life-threatening splenic sequestration in the presence of pancytopenia with multidisciplinary collaboration. Miss B is a 27yr old SCA patient who was referred to our center from a peripheral hospital with complaint of abdominal distension for about two years, abdominal pain for about one month and rib pain for three days prior to presentation. Abdominal pain was dull in character and associated with abdominal swelling. There was associated easy satiety, weight loss, yellowness of the eyes, passage of coke-coloured urine, dizziness, weakness and breathlessness on mild exertion.

Result: Examination showed a young woman in no obvious distress, afebrile (temperature 36.7^0C), mildly icteric, pale and dehydrated. Vital signs were normal. Examination of the chest showed no abnormality. Abdominal examination showed hepatomegaly of 10cm below the right costal margin and splenomegaly of 26cm below the left costal margin. Laboratory investigation showed anaemia with haemoglobin level of 4.1g/dl, white blood cell and platelet count were within normal range. Repeated blood transfusion was given and the spleen size progressively increased in size with resultant pancytopenia (haemoglobin level of 2.9g/dl, white blood cell count of 2.2 X 10^9/l and platelet count of 41 X 10^9/l).

Conclusion: Surgical splenectomy was subsequently done successfully in the presence of pancytopenia by the collaboration of a team of Haematologist, Surgeon and Anaesthetist. Post–operatively, haematological parameters improved and patient was discharged. Successful surgical splenectomy can be done in the presence of pancytopenia. Interdisciplinary collaboration is key to successful outcome in the management of such complication.

Keywords: *Ppancytopenia, sickle cell anaemia, splenic sequestration, surgical splenectomy*.

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Résumé

Contexte : La drépanocytose (ACS) est une maladie génétique du globule rouge résultant de la présence d'une forme mutée d'hémoglobine, l'hémoglobine S (HbS). La séquestration splénique est une complication potentiellement mortelle fréquemment observée chez les enfants atteints d'ACS.

Méthode : Nous présentons une patiente adulte atteinte d'ACS qui présentait une splénomégalie et une pan-cytopénie massive due à une séquestration splénique et à un hypersplénisme chez qui une splénectomie chirurgicale réussie a été réalisée en présence d'une pan-cytopénie. Le but de ce rapport était de faire savoir aux agents de santé que la splénectomie peut être réalisée avec succès dans la séquestration splénique potentiellement mortelle en présence de pan-cytopénie avec une collaboration multidisciplinaire. Mlle B est une patiente atteinte d'ACS, âgée de 27 ans qui a été référée à notre

centre par un hôpital périphérique avec une plainte de distension abdominale pendant environ deux ans, des douleurs abdominales pendant environ un mois et des douleurs aux côtes pendant trois jours avant la présentation. La douleur abdominale était de caractère sourd et associée à un gonflement abdominal. Ils y avaient une satiété facile, une perte de poids, un jaunissement des yeux, un passage d'urine de couleur coke, des étourdissements, une faiblesse et un essoufflement lors d'un effort léger associés.
Résultat : L'examen a montré une jeune femme sans détresse apparente, sans fièvre (température $36,7^0$ C), légèrement ictérique, pâle et déshydratée. Les signes vitaux étaient normaux. L'examen du thorax n'a révélé aucune anomalie. L'examen abdominal a montré une hépatomégalie de 10 cm sous le rebord costal droit et une splénomégalie de 26 cm sous le rebord costal gauche. L'examen en laboratoire a montré une anémie avec un taux d'hémoglobine de 4,1 g/dl, le nombre de globules blancs et de plaquettes était dans les limites de la normale. Des transfusions sanguines répétées ont été administrées et la taille de la rate a progressivement augmenté avec une pan-cytopénie résultante (taux d'hémoglobine de 2,9 g/dl, nombre de globules blancs de 2,2 X 10^9/l, et nombre de plaquettes de 41 X 10^9/l).
Conclusion : La splénectomie chirurgicale a ensuite été réalisée avec succès en présence de pan-cytopénie par la collaboration d'une équipe d'Hématologue, Chirurgien et Anesthésiste. En postopératoire, les paramètres hématologiques se sont améliorés et l patiente a été renvoyée. Une splénectomie chirurgicale réussie peut être réalisée en présence de pan-cytopénie. La collaboration interdisciplinaire est la clé du succès dans la prise en charge d'une telle complication.

Mots clés : *Pan-cytopénie, drépanocytose, séquestration splénique, splénectomie chirurgicale*

Introduction

Sickle cell disease (SCD) are genetic diseases of the red blood cell resulting from the presence of a mutated form of haemoglobin, haemoglobin S (HbS) [1]. It can be inherited in homozygous form (HbSS), known as sickle cell anaemia (SCA) or in combination with other abnormal haemoglobins such as HbSC, HbSβ-thalaesemia and others, with SCA being the most common form of SCD. The co-inheritance of HbS with normal adult haemoglobin (HbA) is known as sickle cell trait. It is not classified as SCD because it is not usually associated with clinical disease. However, the abnormal gene can be transmitted to the offspring [1].

Sickle cell disease is one of the most common genetic diseases worldwide and mainly affect people of the Mediterranean region, South east Asia, Middle east and Sub-Saharan African particularly Nigeria [2]. However, due to migration it is now found all over the world. About 5 to 7% of the world population carries an abnormal haemoglobin gene [3]. The prevalence of sickle cell trait ranges from 10 to 45% in different parts of Sub-Saharan Africa [3]. Carrier prevalence in Nigeria is about 20 to 30% while 2 to 3% of the Nigerian population have SCD [4].

Sickle cell disease is characterized by the tendency of the haemoglobin molecule within the red blood cell to polymerize under hypoxic condition and deform the red blood cell from normal biconcave shape to sickle or crescent shape with resultant vaso-occlusive events and accelerated haemolysis [1]. There is marked variation in clinical manifestation of SCD which has been attributed to both socio-economic and genetic factors including pattern of sickle cell inheritance, haemoglobin F level, presence of alpha thalassaemia, nature of β-globin haplotype and other genetic influences [5,6]. Socio-economic factors include availability of funds, access to optimal health care, ambient living conditions and so on [7].

Crisis is used to describe several acute conditions associated with SCD and include visceral sequestration crises, vaso-occlusive crises, aplastic crisis and hemolytic crisis. Vaso-occlusive crisis is the most common and manifests mainly as pain which can occur in any part of the body [8]. Visceral sequestration crisis commonly involves the spleen but other organs such as the liver and lungs can also be involved [9]. Splenic sequestration is a life threatening condition seen in SCD. Children are at greater risk of splenic sequestration than adolescents and adults whose spleen tend to be fibrotic with repeated infarctions over time [9]. We present a female adult patient with SCA who had massive splenomegaly and pancytopenia due to splenic sequestration and hypersplenism to whom successful surgical splenectomy was done in the presence of pancytopenia. The aim of this report was to make known to health workers that splenectomy can be done successfully in life-threatening splenic sequestration in the presence of pancytopenia once adequate measures are taken prevent shock, excessive bleeding and infection peri-operatively.

Case report

Miss B is a 27yr old SCA patient who was referred to us from a peripheral hospital with complaint of abdominal distension for about two years, abdominal

pain for about one month and rib pain for three days prior to presentation. Abdominal pain was dull in character and associated with abdominal swelling. No associated history of trauma preceding the onset. There was no associated fever, diarrhea, anorexia, nausea, vomiting nor cough. There was associated easy satiety, weight loss, yellowness of the eyes, passage of coke-coloured urine. Rib pain started about 3 days prior to presentation, no known aggravating or relieving factor, dull in character and radiates to the back. There was associated dizziness, weakness and breathlessness on mild exertion. She was transfused with six units of blood over 3 weeks before referral to our center. Examination showed a young woman in no obvious distress, afebrile (temperature 36.7^0C), icteric, pale, dehydrated (probably as a result of not taking enough fluid due to easy satiety), acyanosed, no significant peripheral lymphadenopathy, no pedal edema. Blood pressure was 100/62mmHg, pulse rate 92beats per minute, respiratory rate 28cycles per minute, weight 50kg, SPO_2 99%. Examination of the chest showed vesicular breath sound in all the lung zones bilaterally. There was no heart murmur. Abdomen was not uniformly distended and moved with respiration. No area of the abdomen was tender. The liver was 10cm below the right costal margin with liver span of 18cm. Spleen was 26cm below the left costal margin. The kidneys were not balloted. Bowel sound was present and normotensive.

Laboratory investigations showed retic count of 3%, mantoux test 0mm, blood group O Rh positive, Prothrombin time and partial thromboplastin time were within normal range. Serum creatinine was 66µmol/l (normal range; 53 – 115), urea was 4.8mmol/l (normal range; 2.1 – 8.2), Sodiun, potassium, chloride and bicarbonate were all within reference range. Liver function test showed raised total bilirubin with value of 98.6umol/l (normal range; 5 – 21), conjugated bilirubin of 23umol/l (normal range is <8umol/l), aspartate transaminase (AST) of 33 iu/l (normal range; 5 – 18), alanine transaminase (ALT) of 9 iu/l (normal range; 3 – 15), alkaline phosphatase 188 iu/l (normal range; 21 – 92). Total calcium level of 2.3mmol/l (normal range; 2.2 – 2.5). Ionized calcium of 1.12mmol/l (normal range; 1.16 – 1.32). HIV, Hepatitis B and hepatitis C virus screening test were all negative. Direct and indirect Coombs test were negative. Abdominopelvic ultrasound scan reported splenomegaly measuring 32.2cm and hepatomegaly measuring 21.8cm in craniocaudal axis, with no other abnormality. Urinalysis showed deep amber and clear urine with pH of 5, specific gravity of 1.025, bilirubin+ and no other abnormality. Chest X-ray reported cardiomegaly. Full blood count on presentation was haemoglobin level of 4.1g/dl, white blood cell count of 6.5 X 10^9/l, platelet count of 111 X 10^9/l. Patient was initially managed conservatively for about 10days with blood transfusion, haematinics (which included folic acid, multivitamin, vitamin B Complex, pyridoxine, vitamin C) and analgesics (which included paracetamol and dihydrcodeine) with the hope that the spleen size will regress but it did not.

Patient subsequently developed pancytopenia within one week on admission as the spleen size continued to increase in size with repeated blood transfusions (with haemoglobin level of 2.9g/dl, platelet count of 41 X 10^9/l and total white cell count of 2.2 X 10^9/l) while surgery was being considered. Patient was then given pneumococcal, haemophilus and meningococcal vaccine in preparation for splenectomy. Patient was also transfusion with six units of fresh whole blood (two units daily for 3 days) with the aim of optimizing the haematological parameters in preparation for splenectomy. However, instead of the parameters coming up, the spleen was rapidly increasing in size (31cm) and almost hitting the pelvic bone while pancytopenia persisted. Decision was then taken among the Haematologist, the Surgeon and the Anaesthetist to take the patient to theatre despite the pancytopenia because that is the only way of giving the patient some chances of survival.

Patient and her relatives were counseled and written consent obtained. During surgery, the Haematologist (in possession of four units of fresh whole blood and 1 vialof tranaxemic acid [1g]) went to the theatre with the Surgeons and the Anaesthetists, ready to handle bleeding which was the fear of the Surgeons and the Anaesthetists beside severe anaemia. Intra-operatively, patient was transfused with three units of fresh whole blood and diathermy was also used by the Surgeons to reduce haemorrhage. The trenexamic acid was not given eventually because bleeding was adequately controlled. Surgical splenectomy was carried out with removal of a very massive spleen weighing 2.9kg (Figure 1).

Patient was transfused with 3 units of fresh whole blood intra-operatively and the surgery was successful. Estimated blood loss was about 400mls. Post-operatively, patient was continued on intravenous antibiotics which was started a day before surgery and for 3days post-operatively before converting to oral antibiotics for 2 weeks. She was also transfused with additional one unit of blood two

days post-operatively making a total of seventeen units of blood within six weeks. The wound heal well and the full blood count parameters started rising progressively. Patient was discharged 9 days post-operatively and at the time of discharge, she had haemoglobin level of 8.7g/dl, white blood cell count of 7.7 X 10^9/l and platelet count of 732 X 10^9/l. Patient was then placed on anti-platelet drug (Dabigatran) due to thrombocytosis. Subsequently platelet count dropped to 322 X 10^9/l when she came for check-up three weeks later and antiplatelet drug was withdrawn. The outcome of the surgery was good and patient recovered fully without any complication.

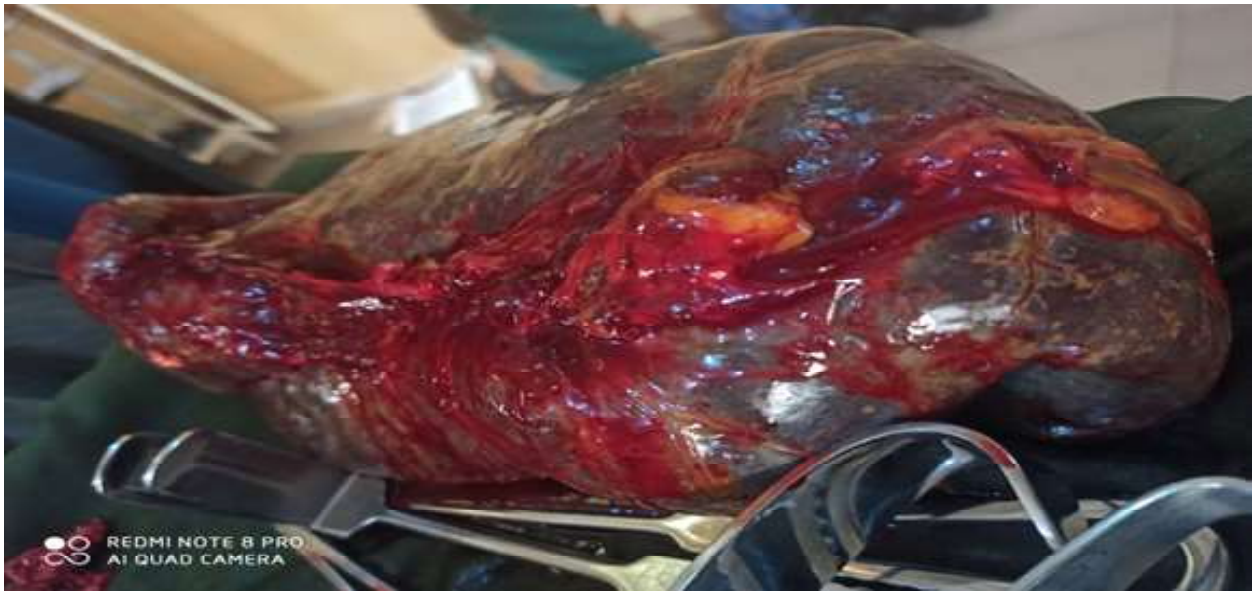

Fig. 1: Massively enlarged spleen removed from adult Sickle Cell Disease patient with splenic sequestration

Discussion

Splenic sequestration is a type of visceral sequestration crisis seen in SCA. It is a life threatening condition commonly seen in children with SCA [9]. In most adolescent and adults with SCA, repeated sickling of the red blood cells with vaso-occlusion in the spleen with local infarction eventually results in scarring, fibrosis and non-functional spleen, a condition called functional asplenia or auto splenectomy. The index patient presented with splenomegaly which is uncommon in adult patients with SCA. Though it has been reported that adolescents and adults with SCA usually have auto-splenectomy, some studies have also reported normal sized spleen and even splenomegaly in some adults [10].

Normally the spleen receives up to 5% of the total blood volume per minute [11]. In splenic sequestration, there is sudden pooling of blood in the spleen which can be enormous and lead to rapid drop in haemoglobin level, hypovolemic shock and death. Splenic sequestration can be complicated by hypersplenism with resultant pancytopenia [11].

Conservative treatment with blood transfusion to reverse the hypovolemic shock can support the body until the blood trapped in the spleen returns to the normal circulation. In this patient, conservative management failed as the spleen kept increasing in size with transfusion and became so massive that it was almost touching the pelvic bone. Apart from the potential hypovolemic shock, if the spleen was allowed to touch the pelvic bone it will suspend the diaphragm. The diaphragm will no longer be able to contract normally during inspiration to allow for adequate oxygenation of the lungs with resultant hypoxaemia and respiratory distress. To prevent these complications, decision was taken to do surgical splenectomy but then patient had pancytopenia.

Trying to transfuse the patient to correct the pancytopenia so that the patient will be fit for surgery did not give good prospect as further transfusion was actually worsening the patient's condition. At that point, the Haematologists, the Surgeons and the Anaesthetics decided to take the patient to the theatre despite the pancytopenia because that is the only way of giving the patient some chances of survival. Patient and her relatives were counseled and written consent obtained. The outcome of the surgery was good, patient recovered fully without any complication and was subsequently discharged. Management of this case

has shown that surgical splenectomy can be successfully done in the presence of pancytopenia not responding to transfusion as long as there is adequate provision of fresh whole blood for transfusion to be done intra-operatively and post-operatively if there need.

However, the transfusion need to be controlled and monitored in order not to exceed patient's steady state hemogram value to prevent hyperviscocity syndrome. The successful management of this case by the combined team of the Haematologist, Surgeon and Anaesthetist shows that with inter-disciplinary collaboration, we can achieve better results and reduce morbidity and mortality associated with this disease [12]. Infection is another feared complication of splenectomy and some patients have been reported to have died of sepsis following splenectomy [13]. Patient was given pneumovax, haemophilus and meningococcal vaccine. Patient was also commenced on intravenous antibiotics a day pre-operatively and continued three days post-operatively before it was changed to oral antibiotics and continued for two weeks. The essence was to protect the patient against encapsulated organisms such as *Streptococcus pneumonia*, *Haemophilus influenza* and *Neisseria meningitides* which have been implicated as aetiologic agents of infection in SCA patients with splenectomy [14]. The spleen functions to produce opsonin which helps in coating encapsulated organisims and enhances their destruction by the reticulendothelial system. So vaccination against the implicated organism is a right step in preventing sepsis [15].

Conclusion

Splenomegaly and splenic sequestration (complicated by hypersplenism and pancytopenia) though commoner in children with SCA can also occur in adult. Successful surgical splenectomy can be done in the presence of pancytopenia when medical/ conservative management has failed. Inter-specialty collaboration comprising the Haematologist, Surgeon, Anaesthetist and other supporting staff is key to better outcome in the management of such complication.

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