Reminder of important clinical lesson

The pitfalls of protocols – a case of postpartum splenic artery aneurysm rupture

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Summary

The authors present a case of splenic artery aneurysm rupture, which neatly illustrates some of the problems of modern medical practice and the potential detriment of blind adherence to protocol driven care, without adequate reflection on the whole clinical picture and possible alternative diagnoses.

CASE PRESENTATION

A 25-year-old primigravida presented in labour at 38 weeks gestation after an uncomplicated pregnancy. Labour progressed uneventfully culminating in the birth of a healthy baby boy with minimal peripartum blood loss. Three hours postpartum (2300) she collapsed in the corridor and her observations revealed that she was hypotensive with a sinus tachycardia. The on-call obstetric resident prescribed 1 litre of crystalloid and a full blood count was requested. The haemoglobin (Hb) was 7.9 g/dl. Her predelivery Hb was 11.9 g/dl. This drop in Hb was thought to be due to haemodilution and possible broad ligament haematoma.

At 0300, the obstetric resident was recontacted since the patient had severe upper abdominal pain, exacerbated by movement alongside right and left upper chest and shoulder-tip pain. She was dyspnoeic and her oxygen saturations were low and an arterial blood gas sample revealed a PaO₂ of 7 kilo Pascal's (kPa). As per departmental protocol based on Royal College of Obstetricians and Gynaecologists (RCOG) guidelines, oxygen and Enoxaparin 1.5 mg/kg were administered to treat a suspected pulmonary embolism.

At 0800 during labour ward rounds, the obstetric consultant performed a pelvic ultrasound scan which revealed only a 2 cm by 2 cm broad ligament haematoma. As she remained hypotensive and tachycardic with upper abdominal pain, an urgent departmental abdominal and a pelvic ultrasound was requested. The ultrasound scan showed free fluid in the pouch of Douglas with some right adnexal collection which measured 14×7×11 cm with low echo levels. A moderate amount of free fluid was seen within the peritoneal cavity and the spleen appeared slightly enlarged at 12.5 cm.

Soon after the ultrasound the patient became haemodynamically unstable with a feeble pulse and unrecordable blood pressure. She was rushed to theatre and an emergency laparotomy performed. Two litres of fresh blood with copious clots were found in the abdominal cavity. No gynaecological cause was identified, however, an aneurysmal splenic artery was found to be actively bleeding at the

splenic hilum with surrounding clots. The on-call surgical team was contacted and a splenectomy was performed after achieving haemostasis. She received a massive transfusion. In total, 26 units of blood, 4 pools of platelets and 1500 ml of fresh frozen plasma were required to resuscitate the patient and the patient was transferred to the intensive care unit (ITU).

She developed disseminated intravascular coagulation postoperatively. She dropped her Hb during the early postoperative period from 14.7 to 8.7 g/dl within a few hours. A second look laparotomy revealed a large retroperitoneal haematoma which was evacuated, but no obvious fresh bleeding point was identified. This haematoma was probably secondary to her impaired coagulation status rather than from her primary pathology. The retroperitoneal space was packed and the patient returned to ITU.

INVESTIGATIONS

Although the aneurysmal splenic artery was found to be bleeding at the time of the laparotomy, there was some clinical concern whether another aneurysmal vessel could have led to the retroperitoneal haematoma. Despite logistical difficulty in obtaining out of hours interventional radiology, angiography was performed at 36 h to definitively exclude any other source of bleeding. Angiography revealed no further bleeding and the length of the splenic artery stump precluded coil insertion (figure 1).

OUTCOME AND FOLLOW-UP

Subsequent management was conservative and she made a full recovery and was discharged home with her baby 2 weeks post her initial presentation. Histological evaluation of the spleen revealed a hilar blood clot and another separate piece of 4×3×2 cm blood clot. Despite multiple block examinations of the blood clots at the hilum no vascular or vessel abnormality could be identified. Thus the diagnosis of splenic artery aneurysm rupture remains a clinical one made at laparotomy.

Figure 1 This image illustrates the splenic artery (arrow) post ligation. Note also the surgical packs intra-abdominally.

DISCUSSION

Spontaneous bleeding from a splenic artery aneurysm is a rare and usually catastrophic event, and the majority of cases are associated with pregnancy.¹ The first reported case of splenic artery aneurysm rupture during pregnancy was published in 1950 by Tennent and Starritt in the *Glasgow Medical Journal*.² Subsequently, over 430 cases (130 peripartum) have been reported in the literature, but the aetiology of splenic aneurysm formation remains obscure. The mortality for splenic artery aneurysm rupture in the general population is high at 25%, but even higher when associated with pregnancy. The estimate rises to 75% for the mother and 95% for the fetus, if occurring antenatally. This may reflect the delay in diagnosis in this subgroup of patients; since the majority of all patients are asymptomatic until splenic rupture.³ This suggests that a ruptured splenic artery aneurysm remains an important and rare differential diagnosis in haemodynamic instability during pregnancy and in the postpartum period.⁴

Our case illustrates a number of issues pertinent to modern medical practise: firstly, the potential detriment of protocol and guideline-driven care in the absence of the wider picture and a definite diagnosis. Protocols or guidelines, good though they are, are only useful as guidance when the

diagnosis is assured. Although our patient met the diagnostic criteria of the guideline for pulmonary embolism, she had several worrying symptoms and signs which pointed to a possible intra-abdominal bleed. At this stage giving therapeutic dose of low molecular weight heparin did not help the clinical situation, and may have indeed been detrimental. This unilateral thinking also led to a further delay in considering an alternative diagnosis and definitive surgical intervention.

The RCOG recommends a policy of aggressive therapeutic anticoagulation in patients with a high clinical index of suspicion for pulmonary embolism.⁵ This is a laudable consideration in light of the fact that the most recent Confidential Enquiry into Maternal and Child Health documented thromboembolic disease as the leading cause of postpartum maternal death.⁶ NICE clinical guidelines on prevention of venous thromboembolism are expected in September 2009. However, as a policy this is not without risk if the diagnosis proves not to be correct.

The use of suitable and sensitive diagnostic imaging modalities should be considered early in the investigation of worrying, unexplained symptoms or signs. Suitable imaging can provide invaluable information, but is limited by the technical expertise and diagnostic skills of the performer

and interpreter. In our patient, the clinicians were falsely reassured by haemodilution and the identification of a broad ligament haematoma on the bedside pelvic scan. This alone would not have been sufficient to produce an acute Hb drop of 4 g/dl which is equivalent to a loss of 1500 ml of blood. As the obstetric resident did not possess the skills to perform ultrasound scans, a senior obstetrician consult at night or an urgent CT scan would have enabled the diagnosis of an acute intraperitoneal bleed and a laparotomy to be undertaken much earlier.

The diagnosis of a pulmonary embolism remained unchallenged for 15 h. Failure to arrive at an alternative differential diagnosis until she showed signs of a near catastrophic cardiovascular collapse was due to blind adherence to protocol/guideline. If the cardiovascular collapse had occurred in the antenatal or intrapartum period, this patient may have received early definitive surgical intervention. This scenario has been reported in a few case reports of splenic artery aneurysm rupture, where early surgical intervention has led to decreased maternal and foetal morbidity. There has been increasing reliance on protocol based practice particularly among the junior doctors, which has led to a decrease in lateral thinking. Such over reliance prevents medical staff to step back, think and use their clinical judgement in arriving at the correct diagnosis. One needs to understand, although protocols/guidelines are formulated to provide uniform best practice, guidelines are generic and not customised to that particular patient's presentation and whatever evidence it is based on, is only an approximation of reality.

Up to 10% of all patients may suffer from a delay in making the correct diagnosis or may even die before the diagnosis is made. Misdiagnosis often occurs due to anchoring or fixation (skewed thinking due to extra emphasis being placed on the initial data), availability (non utilisation of all available information) and attribution (stereotyping). Our case illustrates two such errors (non utilisation of all available information and inability to prevent and manage fixation errors) which are known to occur in emergency situations and in protocol driven practice. Furthermore, increasing pressure on the doctors to see more patients in a short span of time, could also dilute their lateral thinking skills as such skilful decisions cannot be made in haste. Although, European working time directives were implemented with patient safety in mind, it has led to a fragmented approach of patient care and at times important information may be lost in transition.

Recently research has scrutinised human errors in complex systems, such as the healthcare service, by drawing on lessons from outside medicine, for example, aviation

industry, Chernobyl disaster. Valuable insights have been gained and incorporated into the clinical governance activity, which has helped to reduce human error and systems failure.^{7 8} Techniques to identify and prevent such errors from happening in clinical practice are often taught in crisis resource management/patient safety courses. Furthermore, medical education by simulation training has been introduced not alone to challenge and to prevent the propagation of human error but to identify and address the potential pitfalls within the system including protocol driven practice.

Learning points

- Our case neatly illustrates the importance of the problems of the application of protocol driven care. If a framework of cautious reflection, thorough consideration of clinical context, and the need for re-evaluation of the diagnosis if the clinical condition deteriorates had also been employed, the correct medical intervention would have been undertaken much sooner
- On occasion it is necessary to 'think outside of the box' of protocols and guidelines. Medicine is becoming increasingly complex and we need to be vigilant, and use all the technological advances at our disposal, wisely, aiming to circumvent the potential quagmire of the Chernobyl effect in our own clinical practices.

Competing interests None.

Patient consent Obtained.

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