PRIVATE & CONFIDENTIAL

Case Note Review Booklet

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The Royal Australian and New Zealand College of Obstetricians and Gynaecologists

Excellence in Women's Health

ANZASM

Australian and New Zealand Audit of Surgical Mortality

Contents

CASE STUDIES

DISCLAIMER: This booklet is produced for Fellows of the Royal Australasian College of Surgeons. Information is obtained under a quality assurance activity.

Case study 1: Delay to surgery I - hip fracture 1

Case summary

A very elderly patient, previously living independently at home, was admitted to a tertiary teaching hospital following a fall at home. There was a past medical history of hypertension, hypothyroidism and iron deficiency anaemia.

At the time of admission, x-rays demonstrated a fractured neck of femur. The preoperative haemoglobin (Hb) was 99g/L, white cell count (WCC) 15.5 x 10^9/L and there was mild renal impairment.

Following admission, the patient was commenced on deep vein thrombosis (DVT) prophylaxis with enoxaparin and take to theatre 4 days later for internal fixation. It is unclear why there was a 4 day delay.

On the first postoperative day, there was concern regarding aspiration pneumonia and the patient was commenced on tazocin and had 3 days treatment. A single unit of blood was transfused on the third postoperative day. On day 22 post-admission, the patient was discharged to a rehabilitation facility.

Two months postoperatively, the patient was readmitted from the rehabilitation facility to the tertiary teaching hospital with a purulent discharge from the hip surgery wound. Upon readmission, enoxaparin DVT prophylaxis was recommenced. The patient was noted to have a productive cough and clinical signs of left lower lobe pneumonia and was commenced on ceftriaxone.

The patient returned to theatre the day after admission for a debridement and washout of left hip wound. Four days later, the wound was closed. On the second postoperative day, the Hb dropped from 80g/L to 70g/L and there may have been some associated melaena. There appears to have been a concern about the respiratory function and following review by the gastroenterology registrar, a gastroscopy was withheld until the respiratory function improved.

The following evening the patient was found unresponsive in bed. A medical emergency team (MET) call was activated, but it was deemed that the patient was cold and pulseless at the time of review. Resuscitation was not commenced, and the patient was confirmed deceased. It was noted at the time of death that there was a large volume of melaena surrounding the patient and it was assumed gastrointestinal bleed was the ultimate cause of death.

Comment

There has not been any major mismanagement of this patient. There was a 4 day initial delay in surgical intervention for a fractured neck of femur and while not desirable, it did not directly result in complications. It was appropriate to use enoxaparin for DVT prophylaxis when the patient was immobile and that was promptly ceased when there was concern about gastrointestinal bleeding. All the complications that occurred are not uncommon in this age group and, given the circumstances, it was appropriate to delay gastroscopy because of the patient’s poor general condition and at the time there was no obvious active gastrointestinal bleeding.

Case study 2: Delay to surgery II - hip fracture 2

Case summary

A patient was admitted with an impacted subcapital neck of femur fracture. There were multiple medical comorbidities with advance dementia. The patient was considered an extremely high anaesthetic risk with an American Society of Anesthesiologists (ASA) grade of 4. An appropriate neck of femur fracture pathway and dynamic hip screw were performed satisfactorily 3 days later.

The postoperative recovery was complicated by exacerbation of cardiopulmonary comorbidities resulting in a decision by the family and medical staff for suitable palliative care treatment.

Comment

An earlier fixation in theatre would have been desirable. Severely displaced fractures that require a hemiarthroplasty have excellent evidence of better outcomes with earlier surgery. This delay was likely a consequence of emergency access to theatre for high risk cases.

Case study 3: Delay to surgery III - hip surgery 3

Case summary

An elderly patient with multiple medical comorbidities underwent revision hip replacement surgery for recurrent dislocation. One week post-surgery, the patient was transferred to a metropolitan hospital for ongoing rehabilitation.

The patient had a known haematoma which was being treated with intravenous (IV) antibiotics via a peripherally inserted central catheter line. Seventeen days post- admission, a 75mL collection of bloody fluid was drained from around the hip under ultrasound guidance. All appeared to be slowly settling clinically and the patient was discharged home 11 days later with ongoing antibiotic therapy.

One week later, the patient was readmitted to the same metropolitan hospital with a temperature of 38^{o}C, tachycardia of 108 beats per minute and was documented as being unwell. Although the hip wound was noted to be healed and not erythematous, it was warm to touch. An initial diagnosis of pyrexia of unexplained origin was made and a series of investigations was carried out. The following day, an ultrasound of the hip revealed a large collection of fluid around the hip joint. Later that night, two MET calls were required for hypotension with rigors, tachycardia and high temperatures.

The patient was resuscitated overnight, and the following morning was transferred to the original tertiary teaching hospital, where a prompt washout of the hip joint was carried out. The patient was managed in a critical care unit post-surgery but died 4 days later from multiple organ failure.

Comment

The decision to wash out a haematoma around a hip is not always straightforward, particularly in patients who are ASA 3 or above. This patient did appear to be making slow but steady clinical progress with a relatively conservative approach which would support the initial management.

Upon readmission almost 6 weeks after the revision hip replacement, the patient was clearly unwell with a high temperature and tachycardia and, in the absence of any other source of clinical infection, the hip joint would have been the likely source of the sepsis. With this in mind, a prompt early transfer to the tertiary teaching hospital may have enabled an earlier wash out of the infected hip with the possibility of a more positive outcome.

Case study 4: Delay to surgery IV – lack of continuity of care compromises survival in highly comorbid patient

Case summary

A middle-aged patient, with multiple serious medical comorbidities and on numerous 'high risk' medications, presented to an emergency department (ED) with an acute abdomen and associated sepsis. The initial computed tomography (CT) scan indicated a duodenal diverticulum with perforation, thought to be contained within the retroperitoneum.

The patient was admitted to an acute surgical unit (ASU) and managed conservatively. By day 5, the patient was sufficiently unwell and required transfer to the intensive care unit (ICU). By day 7, the need for surgery was inescapable and a 6 hour laparotomy followed. Repair of the perforated duodenal diverticulum was combined with a duodenal exclusion procedure.

The duodenal repair subsequently broke down, but no further operation was deemed appropriate. The patient progressed to develop multiple organ failure and generalised fungal infection, succumbing in the ICU on postoperative day 34.

Comment

Without doubt, this patient was at high risk of peri-operative complications. The initial reluctance of the governing surgical team(s) to proceed was understandable. But at a relatively young age and in the absence of a terminal illness, an expectant approach to management was always potentially problematic. That the underlying pathology in this case required surgical remedy was apparent from an early stage. The delay in undertaking corrective surgery adversely impacted upon the likelihood of survival.

When urgent patient care is handed over to successive surgical teams, as can occur under the ASU model employed in this case, there is a risk that the definitive decision to operate will be repeatedly deferred and delayed. This might have been a contributory factor to the delay in undertaking the necessary surgery in this case.

Case study 5: End of life care I - confused advice given to relatives

Case summary

An elderly patient was admitted from a nursing home with a 2 day history of vomiting and abdominal distention. No history was obtainable from the patient, who had advanced dementia and other comorbidities such as aortic valve and mitral valve replacement, atrial fibrillation, hypertension and gastro-oesophageal reflux disease. The patient was also on warfarin.

Initial examination recorded that the abdomen was distended, soft and that there was no pain. There was no mention of a left femoral hernia present until a much later examination. Blood tests revealed a WCC of 13 $x10^9$/L and lactate of 3.8mmol/L. A chest and abdominal x-ray revealed dilated small bowel loops and multiple air fluid levels.

The patient was reviewed by a consultant surgeon. A nasogastric tube (NGT) was inserted and more than 500mL of faecal material drained. A CT scan of the abdomen was ordered. A few hours later there was a MET call. At this stage, the decision with the spouse was made for ‘comfort care’ and not for resuscitation and to be reviewed again the next day.

Early the following morning, the CT was reported to show distal small bowel obstruction from the left femoral hernia. There was collapse and consolidation noted in the lung bases. Re-examination noted a non-tender 4x3cm left groin lump. By the time the patient was reviewed by the surgical fellow, the urine output has decreased, the NGT pulled out and the patient mechanically restrained because of agitation.

The surgical fellow discussed management with the patient's spouse and son, who appears to have indicated that due to the dementia and now acute kidney injury, the patient, was very high risk, the existing quality of life was poor and surgery might not be the best option. It was also mentioned that one of the goals of surgery was to reduce pain from the strangulated hernia. After this discussion, the relatives requested surgery as they did not want the patient to suffer with the bowel obstruction.

At surgery, the patient had left inguinal incision and strangulated femoral hernia confirmed and reduced. A laparotomy was then performed to fully inspect the state of the small bowel involved. The non-viable bowel was resected and primary anastomosis performed. After a 2.5 hour operation, the patient became anuric and hypotensive despite being given dopamine. The high dependency unit (HDU) and ICU teams did not consider care in their units was appropriate. The patient died less than 24 hours postoperatively.

Comment

The initial examining doctor made no mention of the left femoral hernia. Given the findings on the abdominal x-ray and the bloods, this is of concern.

Given the patient's advanced dementia and high risk comorbidities, one would question whether it was appropriate to offer surgery and it seems the decision and advice given to the relatives was very confused. There does not appear to have been any consultant input to either the decision or consultation and, if correct, that is also of concern.

Case study 6: End of life care II – futile surgery for catastrophic duodenal bleeding may not have been appropriate

Case summary

An elderly patient presented with a 24 hour history of melaena and was admitted overnight with a plan for gastroscopy the next morning. There was a background of ischaemic heart disease, peripheral vascular disease, hypertension, and heavy smoking. The patient was on aspirin.

Whilst in hospital, the patient developed sudden shock and an emergency gastroscopy was performed by a consultant gastroenterologist. The site of bleeding was found to be in the third part of duodenum, but could not be controlled endoscopically. Replacement with blood products continued, but the patient was deemed to be too unstable to attempt embolisation. A decision was made to proceed to laparotomy.

The operation was performed by the surgical fellow. A midline abdominal scar was noted in the operating theatre. Difficulty was encountered due to adhesions, as well as gastric distension due to several litres of fresh blood and clots. The duodenum was opened at the pylorus and first part, but ongoing bleeding could not be controlled. This led to cardiac arrest and death.

Comment

There are several areas of concern and the patient could probably have been spared a futile end of life operation. The patient had previously had an aortic aneurysm repair through a midline abdominal incision. This was not noted, by either the medical or surgical teams. The site of bleeding reported by the gastroenterologist was in the third part of the duodenum. The surgical team did not appear to be aware of this. Thus, the possibility of an aorto-duodenal fistula was not considered. If the surgical consultant had been involved earlier, operative intervention might well have been avoided.

Case study 7: End of life care III – sometimes we just need to talk about it

Case summary

A very elderly patient with dementia and multiple comorbidities, including atrial fibrillation, was admitted with a 1 week history of diarrhoea. The patient had a daughter as the carer and was not independent. The patient had presented to another major hospital 2 days prior and was managed for dehydration prior to being discharged. A CT scan suggested possible colitis of the ascending colon, with thickening of the ascending colon and terminal ileum.

The patient was managed conservatively for 1 week with antibiotics and antiplatelet agents. During this period, aspiration pneumonia occurred. A repeat CT scan was mentioned in the discharge summary but not in the notes. The colon remained thickened and, although no bowel obstruction was seen, the possibility of a transverse colon lesion was raised. A colonoscopy was arranged but abandoned.

It is impossible to comprehend from the notes what occurred following the colonoscopy. However, the consultant documented that a near obstructing cancer was present and, as such, an urgent right hemicolectomy and ileostomy were required, noting that death from a perforated caecum and peritonitis was unacceptable. It is noted that the anaesthetic team were reluctant to anaesthetise the patient and felt that there was a high risk of death during anaesthesia and immediately postoperatively.

Postoperatively, the patient was managed in HDU/ICU and, although well for 24 hours, then progressively deteriorated. Five days post-procedure palliative measures were introduced, with death 2 days later.

Comment

There were a number of decision-making steps that are difficult to comprehend, such as the diagnosis of possible ischaemic colitis of the right colon. Until the CT scan 4 days post-admission, there appears to have been no thought that a cancer was likely.

It is difficult to see that the outcome would have been different regardless of surgical intervention. It is concerning that the consultant felt a procedure must be performed whilst believing that failure was likely. After the work that has been done around end of life decisions and surgical futility by the Royal Australasian College of Surgeons and its ANZASM arm, one would have hoped that surgeons no longer feel that they must operate and that no other options are available.

However, there was no discussion around seeking a colleague’s advice, discussion with palliative care or even informing the patient and the carer about the likely outcome even if the patient survived surgery. Major abdominal surgery in a frail individual generally leads to at least a 10 per cent decline in function, which would have resulted, at best, in full nursing home care.

Case study 8: End of life care IV - a patient of extreme age and frailty died despite maximal care

Case summary

An extremely frail elderly patient, with multiple medical problems and living in a nursing home, became unwell with abdominal pain and sepsis and was sent to the local metropolitan hospital ED.

A diagnosis of cholangitis was made after a CT scan and a decision was made to transfer the patient to a tertiary teaching hospital for endoscopic retrograde cholangio-pancreatography (ERCP) and drainage. If such care was warranted, then pre-transfer medical care with IV fluids and IV antibiotics would have been appropriate.

On arrival in the tertiary teaching hospital general ward, there was further deterioration resulting in a MET call after which a non-ST-elevation myocardial infarction was diagnosed. There was also a further diagnosis of acute-on-chronic renal failure.

A discussion between the admitting team, ICU and anaesthetic teams resulted in a decision to proceed to HDU care with inotropic support, and then ERCP drainage and stenting. The patient continued to deteriorate, and it became obvious that further active care was futile and palliative care was commenced. Death ensured 7 days later.

Comment

This is an example of a failure to avoid and prevent futile tertiary invasive care and surgery in the terminal phase of life. The opportunity to de-escalate care was missed at three points in this patient's last journey in the health system.

1. Decision to transfer to ED.
2. Decision at the first metropolitan hospital to investigate, treat and transfer.
3. Decision at the tertiary teaching hospital to proceed with HDU care and operation despite ongoing deterioration.

Senior clinicians should be making these decisions.

Case study 9: End of life care V – failure to optimise palliation

Case summary

A very elderly, frail patient presented with a 3 hour history of acute onset, severe, generalised abdominal pain associated with vomiting and diarrhoea. There was a history of cerebrovascular stroke, atrial fibrillation, breast cancer (on hormonal therapy), congestive cardiac failure and diabetes.

The patient was admitted to a peripheral hospital by ambulance and admitted under the care of the general physicians who correctly diagnosed a small splenic infarct and probable mesenteric ischemia due to a thrombotic event, possibly triggered by the patient ceasing warfarin 3 weeks previously. A surgical opinion was sought when the pain returned 2 days after admission.

The local surgeon seems to have suggested that an operation could be considered with some chance of survival, but it is not clear from the notes whether this referred to a splenectomy or surgical reversal of the mesenteric ischemia. After that discussion, the patient and the family decided to proceed with surgery and the patient was transferred to a tertiary hospital 45 minutes away.

The clinical diagnosis of mesenteric ischemia was confirmed on arrival and a CT was repeated to confirm the thrombus in the superior mesenteric artery. Discussion with the patient and family members concluded that surgical intervention was not warranted, palliative care was instituted, and death occurred after a further 2 days.

Comment

There are two concerns. Death from mesenteric ischaemia can only be avoided by prompt diagnosis and surgery (if indicated). Patients with serious surgical problems admitted to a medical ward never do well, and in this case incurred a 2 day delay.

While it is difficult to know what was actually discussed at the time of the initial surgical review, as the documentation was done by the resident medical officer (RMO), it is clear that the patient was given the impression that surgical intervention would be worth considering. A consultant-to-consultant conversation between the transferring medical team and the receiving surgical team might have identified that transfer was futile. However, these conversations are often between relatively junior staff members, and in this case not documented in either set of notes. The decision to palliate should have occurred before transfer.

Case study 10: End of life care VI - wrong ward, wrong assessment and poor consultation result in poor palliation

Case summary

An elderly, morbidly obese patient was declined for elective repair of a large incisional hernia because of multiple, severe medical comorbidities. The patient was on several medications, including apixaban. In the month prior to admission, the patient had increasing problems coping with daily life, abdominal pain, nausea, loss of appetite, constipation, shortness of breath, decreasing mobility, and an acute kidney injury.

The patient was admitted under a tertiary hospital medical team with a plan for surgical review the following day. The surgical team noted the incarcerated, though not strangulated, incisional hernia but decided the patient's operative risk was too high to justify surgery, to the extent that the patient was not for future surgical review.

Early the following day, the patient's incisional hernia and abdominal pain caused significant distress. The patient rapidly deteriorated and developed peritoneal irritation and worsening biochemistry as the day progressed. By early evening, the deteriorating vital signs triggered a MET call, the evidence pointing to an abdominal catastrophe. When stabilised, the patient underwent an urgent triphasic CT angiogram followed by general surgical review. Clinical findings pointed towards a large, strangulated incisional hernia, while the CT showed pneumatosis in the bowel, contained within the hernial sac.

The patient was classified as an ASA 4. The patient then underwent an emergent exploratory laparotomy, extended right hemicolectomy and end ileostomy for a necrotic right colon contained within the incisional hernial sac. The surgery lasted 3 hours, with postoperative ICU care. The patient rapidly deteriorated and died 4 hours post-surgery.

Comment

At the first review, the surgical team correctly declined to offer this patient a semi-emergent operation as the comorbidities were too great. Although not stated, the absence of compelling signs of bowel compromise in a patient taking apixaban may have been a surgical consideration. This was followed by what seems to have been a confused plan.

Given the decline for surgery, the patient remained under medical care. There was more than 15 hours delay, from the time of increased abdominal pain and systemic decompensation that required a MET call, until a CT was performed, and further surgical review requested. Had the patient been on a surgical ward, the deterioration would most likely have been detected earlier.

When the patient deteriorated, there was then a heroic operation in a desperate attempt to save life. It can only be speculated, but if the risk was deemed too high on admission it must have been even greater after deterioration. It is doubtful that an earlier, and probably shorter and less extensive operation would have changed the outcome.

Case study 11: End of life care VII - death after surgery for unsalvageable leg ischaemia

Case summary

A very elderly patient, living in a nursing home, presented to the ED with at least 10 hours of bilateral leg ischaemia, which was worse on the right side. There was decreased sensation and the foot was very cyanotic.

There was a history of a previous abdominal aortic aneurysm repair via a stent graft and a femoral-femoral crossover graft. At the time of admission, it appears that the femoral-femoral crossover graft was infected. It is unclear whether this diagnosis was made clinically or with a CT scan.

The patient was initially reviewed by the consultant vascular surgeon and a CT angiogram was organised to assess the ischaemic right foot. There is no clear indication in the notes that an occluded stent graft was suspected. The patient also had atrial fibrillation and was not on warfarin, and this might have been a differential diagnosis. The CT angiogram was reviewed by the registrar and there appears to have been a discussion with the consultant, where it was identified that the endoluminal stent was occluded. A brief note made by the registrar suggested that the patient was keen on proceeding with an operation which would involve an axillo-bifemoral bypass graft and excision of the femoral-femoral crossover graft. There is no mention that this was discussed with any family member at any point. This was a massive operation to be undertaking in a very elderly patient who already had a prolonged history of acute ischaemia, and the chance of survival would have been very close to zero.

The procedure was uneventful, but the legs did not recover from the prolonged ischaemia, so the choice then became a bilateral amputation or palliation. The decision, quite rightly, was made to manage the patient palliatively and death occurred a couple of days later.

Comment

The first-line assessor made the comment that the surgeon did not feel that the decision to operate was an area of consideration. However, treating the patient conservatively would have meant a certain death after a short period of palliation. Surgery would almost definitely result in death, but only after a prolonged period of palliation which would have been difficult for the patient and family.

Certainly, most surgeons would not have offered an operation to a very elderly nursing home patient with this level of ischaemia and sepsis. This is a difficult choice when the patient is keen for the procedure. It is concerning that the decision to proceed with surgery was made by the registrar in consultation with the vascular surgeon. The vascular surgeon should have reviewed the patient and discussed the pros and cons of the surgery with the patient and the family.

Case study 12: Poor documentation by surgeon I – second-line review could have been avoided

Case summary

A middle-aged patient collapsed and underwent bystander cardiopulmonary resuscitation by Saint John Ambulance. The patient arrested again in ED and was intubated. A bedside echocardiogram (ECHO) suggested right ventricular (RV) dilatation and a CT pulmonary angiography confirmed the diagnosis of a massive pulmonary embolism. An incidental finding was made of a possible left renal mass and a renal cell carcinoma (RCC) was queried. The patient was treated with thrombolysis, was transferred to ICU and required significant pressor support.

Early referral was made for thrombectomy, but this was delayed given that thrombolysis had been given. Note was made by the cardiothoracic registrar that during the initial referral, the cardiothoracic team was operating on an aortic dissection. Due to ongoing deterioration in perfusion, veno-arterial extracorporeal membrane oxygenation (ECMO) was instituted in ICU by a senior surgeon. The cannulae used were quite small with ICU making note of an estimated weight of 80kg.

The following day, the patient was taken to theatre due to dropping Hb and increasing instability. A chest x-ray showed mediastinal widening and an ECHO confirmed pericardial effusion. The patient underwent median sternotomy with drainage of 500mL of serous fluid. Both pleural spaces were evacuated, and note was made of clots within. The ECMO was changed to cardiopulmonary bypass via the same cannulae and a standard pulmonary embolectomy was performed. The thrombus was noted to be inconsistent with pure thrombus and possibly a tumour. The ECMO was reinstituted, and a trans-oesophageal echocardiogram (TOE) at completion showed severe RV dysfunction and normal left ventricular (LV) dysfunction.

In the coming days, the patient developed multiple organ failure with acute kidney and liver injury. Continuous renal replacement therapy was instituted. On day 3 of admission, vascular surgery was consulted due to left foot malperfusion, despite the presence of a distal perfusion cannula. Due to ongoing RV dysfunction, note was made by the treating surgeon as to the possibility of an RV assist device (RVAD). The patient continued on support with ECMO and pressors, as well as multiple organ support. Levosimendan was given on day 6 post-arrest. A TOE on day 7 showed normal LV and mild-moderate RV impairment. Note was made on day 8 of gangrenous extremities. The patient was decannulated from ECMO on day 8 of presentation, with ongoing multiple organ failure. On day 11, note was made of worsening ischaemia of the extremities with increasing pressors and fevers.

As of day 13, histological diagnosis was still pending. Sources of sepsis considered included left foot, gut or mediastinitis. At this point, non-operative management was agreed upon. On day 15, the clinical situation continued to deteriorate, and the patient died a short while later.

Comment

It is noteworthy that a more thorough case presentation by the treating surgeon would have assisted the first-line assessor (who provided a one-line assessment) and avoided the necessity for a second-line review. These reviews are time-consuming and costly and, in this case, probably not indicated.

There are no significant comments to be made regarding the clinical management. The earlier thrombectomy would have been unlikely to improve the prognosis in this case. Incidentally, no cytology or histopathology reports were in the medical notes. Whilst this case appears to have

arisen from a tumour embolus, earlier histological confirmation would have provided better ability to establish goals of care. Was the excised embolus actually sent for histopathology?

The only other comment relates to the suggestion of RVAD use. This patient had every conceivable contraindication to mechanical circulatory support and this should not have been entertained at any point.

Given the acute deterioration in ED, thrombolysis was appropriate. It is unlikely that earlier surgery would have made any difference to the outcome. This patient had every possible form of support but, unfortunately, was critically unwell from the outset and was unlikely to survive. The diagnosis of RCC could have been established earlier. Essentially though, there are no recommendations to make in this case and the patient was managed appropriately with what was essentially a terminal illness.

Case study 13: Poor documentation by surgeon II – second-line review could have been avoided

Case summary

An elderly patient with multiple comorbidities (including diabetes, ischaemic heart disease and end stage renal failure) presented with critical limb ischaemia affecting the left leg, with ulcer of the left foot and rest pain. Despite the medical problems, the patient appeared to be self-caring and functional in daily activities of living.

The patient underwent a diagnostic angiogram in a private hospital, which confirmed three vessel occlusive disease which was not amenable to endovascular treatment. There was no documented immediate complication from the angiogram. Two days later, the patient was transferred to a tertiary teaching hospital under the same surgeon for further management.

Shortly after arrival at the tertiary teaching hospital, the patient underwent a further diagnostic angiogram of the left leg which showed the same findings as the one two days previously. It is not clear from the notes why the angiogram was repeated, but this may have been to better assess the extremity using iodine based contrast rather than carbon dioxide, as had been used previously.

Based on the findings, the patient was considered for either primary amputation or femoral distal bypass. These options were discussed with the patient in depth and documented in the notes. Cardiology review was sought and provided by both the on-call cardiac registrar and from the patient's private cardiologist. Both felt that risk existed from major surgery but that no further optimisation was available for the patient's current heart status. Renal input was also sought.

Two days later, the patient underwent a technically successful left popliteal to dorsalis pedis bypass with reversed vein.

The patient was kept intubated in ICU postoperatively. The early postoperative period was complicated by ‘ooze’ from the right groin at the site of the two recent angiogram punctures. This was managed conservatively by ceasing anticoagulation and compression. The patient was extubated at the end of the first day but developed electrocardiogram and troponin changes, suggesting a left anterior descending (LAD) coronary artery myocardial infarction. The patient was re-intubated and 2 days after the surgery underwent a coronary angiogram and stenting of the LAD coronary artery.

Over the next 3 days, the patient progressively deteriorated with a decreased conscious level, ischaemic gut confirmed on CT angiography, and progressively ischaemic feet on both sides. After a family meeting, the patient was made not for resuscitation. Despite this, several attempts at cardioversion for episodes of ventricular tachycardia then ventricular fibrillation were made 2 days later. They were not successful, and the patient died.

Comment

The patient's management appears to have been appropriate. It is uncertain why a second angiogram was performed, and bleeding complications did arise as a result. Better documentation in the notes might have shed light on this. The decision to operate was not undertaken lightly and was clearly discussed in a multi-disciplinary team setting.

The question from the first-line assessor was *"why was the distal bypass procedure abandoned? Was patient assessed and worked up prior to proceeding with bypass?"* In fact, it is clear from the notes that the bypass was initially completed and technically successful, so it is uncertain why the first-line assessor asked this question. It does highlight, however, the exceptionally poor detail provided in the clinical section of the surgical case form.

The real criticism is the apparent lack of interest that the patient's surgeon had in providing adequate explanation about the death in the surgical case form. An extra minute spent by the treating surgeon would have saved several hours being spent on a second-line review and all the clerical work involved in completing it.

Case study 14: Poor documentation by surgeon III - inadequate management of intra-abdominal infected haematoma

Case summary

This was a very elderly patient with massive splenomegaly secondary to advanced chronic myelomonocytic leukaemia which required regular transfusions, chemotherapy and steroid treatment. The patient was otherwise relatively well and independent at home.

Although likely done well, there is not information on any preoperative work up and assessment in the material submitted. More importantly, there is no demonstrable risk assessment or discussion regarding pros and cons of surgery are noted. The admission notes are poor and started postoperatively. Given the stated background, the operation seemed reasonable to offer given the promise of improved quality of life.

Post-surgery, there was concern regarding fever, tachyarrhythmia and acute brain syndrome - likely due to sepsis. This was treated with antibiotics on the premise of a postoperative lower respiratory tract infection, based on the chest x-ray findings of left basal atelectasis. Blood cultures were negative. The abdomen was soft and, although there was a significant postoperative drop in Hb on days 3 to 5 (from 98g/L to 75g/L), there was no imaging of the abdomen to rule out intra-abdominal source of infection or bleed. The patient received two units of blood.

This patient was discharged and readmitted with a likely infected haematoma. This represents a substantial delay in its diagnosis and treatment.

Oral antibiotics commenced when the patient improved and was later discharged for rehabilitation (day 13). Some ongoing delirium/confusion was thought to be multifactorial. There was a note regarding preoperative hallucinations and it is not clear if this was addressed in the preoperative work up and consent. Incompletely treated sepsis should have also been considered.

The patient was re-admitted 10 days later (day 25) with sepsis thought to be due to pneumonia or an intra-abdominal source. A CT demonstrated a small intra-abdominal collection, likely infected. The surgeon recommended aspiration and culture though there is no documentation of either aspiration or treatment. It may be that the decision to treat this with ongoing antibiotics was taken but this is not documented. The patient was treated for pneumonia and progressively deteriorated and, following family discussion was palliated.

Comment

1. There is inadequate documentation regarding the discussion of the benefits and risks of surgery and of any risk assessment on a very elderly patient who was not managing well at home. Despite this, it is reasonable to have been offered surgery, given the need for frequent transfusion.

2. There was a delay in assessing the patient for intra-abdominal sepsis and bleeding which potentially led to the patient's ultimate demise.

3. There is a significant inaccuracy in the surgical case form representation of the course to death. The form states that 'CT chest and abdomen revealed bibasal pneumonia and no intra-abdominal collection'. This statement is clearly incorrect and is concerning.

Case study 15: Fat embolism I - possible fat embolism leads to early postoperative death following elective total knee replacement

Case summary

An elderly patient underwent an elective total knee replacement. Preoperatively, the multiple medical comorbidities were reviewed by a cardiologist and general physician. All reversible issues had been optimised and the patient stratified as low risk. A total knee replacement with a spinal anaesthetic, adductor canal block and general anaesthetic was undertaken.

The patient returned to the ward after surgery in the morning. In the mid-afternoon, the patient complained of some double vision and was reassured. The patient then reported numbness and weakness in the left leg (recent spinal anaesthetic and nerve block), but also difficulty coordinating hand movements. The patient was formally and thoroughly assessed by the RMO, who also noted an acute deterioration in the patient's visual acuity (subjective) but no change in visual fields. Findings were discussed with the anaesthetist and on call physician. Further monitoring was advised.

In the early hours of postoperative day 1, the patient complained of bilateral arm weakness and was assessed by the RMO. A non-anatomic pattern of weakness was documented. A transient ischaemic attack was considered but felt unlikely. Aspirin (300mg) was prescribed, a CT head was planned for first thing in the morning, pregabalin was withheld, and staff continued close monitoring on the ward. At the formal consultant medical review on the morning of postoperative day 1, there had been a recovery in most elements of examination, and a stroke was felt to be unlikely. Strong analgesia was withheld, as mild delirium was considered. A CT head was pursued, which showed areas of abnormality in the posterior right cerebral hemisphere suggestive of either chronic ischaemia or acute embolic ischaemia. Further evaluation with magnetic resonance imaging was suggested, but this was not carried out due to the incompatibility of the patient’s pacemaker.

Early afternoon on postoperative day 1, the patient was found to be drowsy on return from the CT scanner. Thorough examination concluded postoperative delirium, medical and surgical teams were informed at all stages.

The patient was reviewed again in the early hours of postoperative day 2 and found to have a persistent tachypnoea. A further medical review during the second post-operative day showed no improvement. That afternoon, the patient was transferred to another hospital for neurological and neurosurgical services for further investigation and care. Further imaging included a CT head perfusion scan, CT angiography neck carotid and plain CT head. These were highly suggestive of a fat embolism as a cause for the brain infarcts. A right upper lobe pulmonary embolism was seen as an incidental finding on the CT neck angiography.

The patient died 6 days later with the primary cause of death on the discharge summary being a cerebral vascular accident (CVA). There is no coroner's report or record of discussions with the coroner's office.

Comment

The CVA appears to have been the primary cause of death, and a fat embolus could have been the cause for the early phenomenon of initial inconsistent and transient neurological signs and symptoms. A fat embolus should have been considered earlier as a diagnosis and, if so, the medical team may have chosen to move more quickly with regard to head imaging and transfer to the stroke unit. It is unlikely that the outcome could have been altered with further medical intervention.

The sometimes confusing and inconsistent neurological findings with fat embolism can make diagnosis difficult. It should have been confirmed with the surgical and medical teams at the first hospital that this was the likely diagnosis and that they were aware of this phenomenon.

Case study 16: Fat embolism II - death probably secondary to fat embolism syndrome

Case summary

A middle-aged patient was crushed and suffered extensive injuries to the lower limbs, pelvis and abdomen. The patient received emergency first aid at the scene and was transferred to the nearby trauma centre for ongoing care. On arrival at the ED, multiple injuries were identified, including bilateral femoral and open tibial and fibular fractures, a fractured pelvis with an associated haematoma, a pneumomediastinum and bilateral small pneumothorax, and a bleeding splenic laceration.

Despite these injuries, the patient was conscious on arrival, albeit with an unrecordable blood pressure and a pulse of 130 beats per minute. A massive transfusion was required. A pan CT was performed and shortly after, a CT guided embolisation of the splenic artery.

After preoperative care in ICU, the femoral fractures were fixed with bilateral femoral nails and external fixation was performed on the fractured tibias and fibulas. Postoperatively, care was in ICU but, approximately 33 hours post-injury, the patient was noted to have bilateral fixed dilated pupils. A CT scan was performed, which revealed diffuse cerebral oedema with mass effect and evidence of coning.

In theatre, an intracranial pressure (ICP) monitor and an external ventricular drain were inserted. Supportive treatment, including mannitol, thiopentone and hyperventilation, was given. However, there was no response to treatment, the pupils remained fixed and dilated, and ongoing treatment was deemed futile. Ventilatory support was withdrawn.

Comment

The first-line reviewer questioned whether a CT scan of the head was performed. The admission cranial CT scan was normal. The second CT scan revealed diffuse changes, with multiple areas of low attenuation with associated global mass effect, and changes of tonsillar herniation and distortion of the mid brain (coning). The reporting radiologist stated, "fat embolism syndrome should be considered".

The most likely cause of the fatal cerebral oedema was fat embolism syndrome (FES). While fat embolism with isolated deficits is reasonably common, severe long bone injuries occasionally result in a systemic inflammatory response with varying degrees of a triad of petechial rash, pulmonary oedema and cerebral oedema.

It does not seem, on reading the case notes, that FES has been considered, although there was one mention of fat embolism. Fat embolism syndrome should have been considered a possibility in this patient due to the multiple severe long bone injuries. The main preventative treatment of FES is early stabilisation of long bone fractures. This patient was resuscitated, assessed and underwent splenic artery embolisation, and was in theatre undergoing orthopaedic stabilisation with a consultant orthopaedic trauma surgeon within 12 hours of arrival in the ED. It would be very difficult to have achieved this any sooner.

Detection of neurological changes in FES is usually detected as deteriorating mental state in patients with long bone fractures. This patient was intubated and ventilated, and changes were only detected when the pupils were fixed and dilated. The only way the increasing intracranial pressure could have been detected would have been prophylactic insertion of an ICP monitor. No support for prophylactic ICP monitor insertion after multiple long bone fractures was found in a literature search.

Once FES is established, there is no specific treatment. Cardiopulmonary support is provided while awaiting resolution. The patient received full ICU support until withdrawal of treatment. Despite apparent lack of consideration of FES, the patient appears to have received excellent care and there is nothing that could have been done to improve the outcome.

Reference

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Kellogg RG, Fontes RB, Lopes DK. Massive cerebral involvement in fat embolism syndrome and intracranial pressure management. *Journal of Neurosurgery*. 2013 Nov;119(5):1263-1270.

SHORTENED FORMS

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anesthesiologists
ASU	acute surgical unit
CT	computed tomography
CVA	cerebral vascular accident
DVT	deep vein thrombosis
ECHO	echocardiogram
ECMO	extracorporeal membrane oxygenation
ED	emergency department
ERCP	endoscopic retrograde cholangiopancreatography
FES	fat embolism syndrome
Hb	haemoglobin
HDU	high dependency unit
ICP	intracranial pressure
ICU	intensive care unit
IV	intravenous
LAD	left anterior descending
LV	left ventricular
MET	medical emergency team
NGT	nasogastric tube
RCC	renal cell carcinoma
RMO	resident medical officer
RV	right ventricular
RVAD	right ventricular assist device
TOE	trans-oesophageal
WAASM	Western Australian Audit of Surgical Mortality
WCC	white cell count