

PRIVATE & CONFIDENTIAL



Case Note Review Booklet

July 2016



ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS

Australian and New Zealand Audits of Surgical Mortality
Royal Australasian College of Surgeons

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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: Bariatric surgery I – involvement of a second bariatric surgeon may have altered outcome

Case summary

A middle-aged patient (140 kg) was admitted for a revision laparoscopic sleeve gastrectomy having had a failed gastric band removed a few months earlier. There was a background history of asthma and hypothyroidism. The patient had been non-compliant with Optifast and was noted to have a fatty liver at surgery.

Progress was routine for a revision sleeve gastrectomy until 4 days later when the patient developed shortness of breath. An abdominal computed tomography (CT) scan demonstrated a gastric leak. A second bariatric surgeon recommended placement of a tri-lumen nasogastric tube that had to come from another hospital.

The patient was returned to theatre on the day of the gastric leak and underwent a laparoscopic washout with placement of drains and a tri-lumen nasogastric tube. Bile-stained fluid was washed out at this second operation but it was difficult to visualise the actual leak site. The patient went to the intensive care unit (ICU) post-surgery, and over the next 13 days remained intubated, ventilated and on inotropic support. A tracheostomy was placed on day 10. During these 13 days there were three entries made in the notes by the surgeon.

On day 11 following the ICU admission, a CT scan showed a fairly large pelvic collection in the pouch of Douglas, in addition to a persisting perisplenic collection. Sonographic drainage the next day yielded a small amount of haemoserous fluid. By this time the patient consistently had temperature readings higher than 39°C.

In the early hours of day 13 following the ICU admission (17 days after the sleeve gastrectomy) there was further deterioration and a cardiac arrest. Cardiopulmonary resuscitation (CPR) was not successful. At postmortem, 100 mL of fluid was found in the peritoneal cavity. The cause of death was listed as multiple organ failure and sepsis due to postoperative gastric leak (gastric sleeve operation).

Comment

There were three entries added to the notes by the primary surgeon during the 13 days the patient spent in the ICU. The surgeon probably reviewed the patient more frequently, but without notes this cannot be known. The preoperative use of a very low calorie diet (VLCD) and Optifast is intended to defat the liver and make it smaller. The surgeon commented that the patient did not follow the VLCD instructions. An area of consideration is that the surgeon could have postponed the operation and re-emphasised the importance of the VLCD.

An area of concern is the management of the gastric leak. The initial management was reasonable, with the laparoscopic washout, placement of drains and tri-lumen nasogastric tube all appropriate initial steps.

However, subsequent to this there was no clear plan for the leak and there was no mention of definitive management. Options for definitive management of a gastric leak include placement of a stent along with botox injection into the pylorus or an open Roux-en-Y gastric bypass. Gastric leaks do not behave like leaks in other parts of the gastrointestinal system, largely because of the

relatively high intragastric pressure. Both of the above-mentioned definitive therapies would have had the benefit of relieving the intragastric pressure. There is also the option of endoscopic therapies, including placement of a plug into the site of the leak.

Definitive therapy should have been instituted within 3 to 5 days, especially as the patient was not improving. It is not clear why the surgeon did not involve another bariatric surgeon in the management of a complex case. An opinion was sought from another bariatric surgeon who was in the hospital the day the leak was diagnosed. However, for the 13 days following the second operation there was no evidence of an opinion from a second bariatric surgeon.

The mechanism of laparoscopic sleeve gastrectomy complications is continually evolving. There is no doubt that this was a complex and challenging problem to manage. The opinion of another experienced bariatric surgeon (although this is not to say that the first surgeon was not experienced) should have been sought and would have been extremely valuable. The laparoscopic washout with placement of drains and a tri-lumen nasoenteric tube was appropriate initial management, but should have been bridging therapy to definitive management. The absence of definitive management of the gastric leak in this case would be considered an area of concern.

Case study 2: Bariatric surgery II – unexpected death following an attempt to remove dysfunctional lap band

Case summary

This middle-aged patient had multiple comorbidities including morbid obesity, multiple venous thrombotic events on long-term anticoagulation therapy, fatty liver, hypertension, and mild to moderate aortic stenosis. The patient had various previous abdominal surgeries including appendectomy, open cholecystectomy, hysterectomy and laparoscopic insertion of gastric band (twice). The patient was admitted electively from a private facility for removal of the gastric band that was thought to be causing chronic abdominal pain.

A haematologist guided an appropriate perioperative management of the anticoagulation therapy. At the time of laparotomy the band could not be removed due to dense adhesions and a large left lobe of the liver. The operation was abandoned after about 1.5 hours with plans to return at a later date after Optifast had been used to reduce liver size. The initial postoperative recovery was uneventful and followed the clinical pathway.

On day three postoperatively there was sudden deterioration with a medical emergency team (MET) call for hypotension and decreased oxygen saturation. The respiratory wheeze and respiratory acidosis were treated by an ICU physician as asthma. In the ICU, the patient improved with asthma treatment and fluids, and the bloods revealed a white cell count (WCC) of 11,100, a C-reactive protein (CRP) of 600 and an international normalised ratio (INR) of 2 (on Rivaroxaban). The patient was started on intravenous (IV) Tazocin with a differential diagnosis of sepsis (chest versus abdominal) as a cause of the deterioration.

However, the chest X-ray showed more free gas than expected, and the blood gas showed increasing metabolic acidosis. A viscus perforation was considered, and after a discussion between the ICU and surgeon the patient was returned to theatre for exploratory laparotomy. The time between the MET call and the decision to return to theatre was 4 hours. Within an hour of arranging theatre, and upon transfer from the ICU to theatre, the patient had a cardiac arrest. CPR was carried out for 30 minutes with no success. The differential for the second deterioration was either pulmonary embolism or cardiac event. The coroner's office was informed but both the coroner and the patient's family did not want an autopsy.

Comment

Redo surgeries are often more challenging due to the loss of native tissue plane. The patient's habitus and comorbidities were contributing factors to the outcome. The treating psychiatrist was likely to have considered the chronic abdominal pain as a contributing factor to the refractory mood disorder. Although high risk, it was not unreasonable to consider surgery. At the time of the first deterioration the patient was assessed and treated by the critical care team in a timely fashion. The decision to reoperate was not delayed. The treating surgeon had appropriately called in a senior colleague for assistance. It was unfortunate that an autopsy was not undertaken. Whilst death was unexpected, all appropriate steps were taken to prevent complications and mortality, and to manage the deterioration once it occurred.

Case study 3: Bariatric surgery III – questionable decision to perform obesity surgery in an elderly patient

Case summary

An elderly patient (BMI 35) had established medical comorbidities of previous ischaemic heart surgery and percutaneous transluminal coronary angioplasty and stent insertion, obstructive sleep apnoea, hypertension and hypercholesterolaemia. Following lap band surgery 8 years previously the patient lost 16 kg, but continued to require continuous positive airway pressure for obstructive sleep apnoea. The lap band was removed for possible band erosion (not stated or known if full or partial thickness). Revisional bariatric surgery in the form of a laparoscopic gastric omega loop bypass was undertaken. The patient was discharged from the private hospital on day three and returned home to the country. Later that day the patient presented to a regional hospital emergency department (ED) complaining of fresh per rectum bleeding and abdominal pain. The haemoglobin had dropped from 117 to 92 g/dL with associated hypotension, resulting in a MET call and admission to a high dependency unit. A CT scan revealed inflammatory stranding in the left upper quadrant and an intra-abdominal collection. The original surgeon accepted the transfer of the patient back to the private hospital.

On day five postoperatively the patient was transferred to a teaching hospital under the care of an upper gastrointestinal (GI) surgeon. The reason for the delay in transfer was not apparent. The patient was immediately taken to the operating theatre for a gastroscopy, laparoscopy and conversion to laparotomy. The anastomosis staple line appeared intact, but there was a large perforation of the posterior gastric pouch that was identified as the cause of bleeding and sepsis. The perforation was controlled with a T-tube in an attempt to create a controlled fistula, and a feeding jejunostomy was inserted. The postoperative course was complicated by ongoing leakage around the attempted fistula, spontaneous intrahepatic bleeding from the right hepatic artery requiring embolisation, cardiac arrhythmia requiring pacemaker insertion, drain erosion into the stomach resulting in gastrogastric fistula formation and respiratory failure. Ultimately the patient succumbed to respiratory failure 8 weeks following readmission.

Comment

The 'damage control' care in the tertiary hospital was entirely appropriate. While there might have been some other options in trying to control the perforation (e.g. resecting the gastric pouch and bringing a Roux loop up to the oesophagus, omental patch repair), on looking back at the case one can fully understand the operative and management steps taken in this situation. The patient was well managed by an experienced upper GI team and in the ICU. While there were some delays in the regional hospital in coming to a diagnosis, and transfer should have been earlier, it should be acknowledged that there were limited resources and experience, and presumably the original surgeon was fully aware of the patient.

The questions arising from this case are associated with the original surgeon and the decision to perform an elective, non-life-saving operation in an elderly patient. The patient was obese and had significant obesity-related medical problems, a failed restrictive operation in the form of lap band 8 years prior, and even after reasonable weight loss the medical comorbidities had not been reversed. A reported erosion of the lap band led to its removal. The decision to offer the patient another bariatric operation in the form of gastric bypass, as opposed to a sleeve gastrectomy, was understandable (high risk of staple line complications in patients with previous gastric erosion). However, one would have to question the motivation behind a major elective bariatric operation in

an elderly patient with established non-reversible medical problems. Questions also have to be asked about the fact that a patient was discharged home to the country 3 days after major revisional GI surgery.

The questions associated with this case are:

- Why was an operation performed in an elderly patient with established, non-reversible comorbidities?
- What experience or training did the surgeon have with laparoscopic revisional gastric bypass surgery?
- Why choose an omega loop over a traditional Roux-en-Y gastric bypass when the gastric pouch needs to be created very close to the presumed site of previous gastric band placement/erosion?
- Was there another experienced surgeon involved in the decision making or operation?
- Why discharge a patient home to the country 3 days after major revisional gastric bypass surgery?

Feedback needs to be given and sought from the original surgeon. One issue arising from the WAASM process is that the original surgeon cannot be asked for their input when the patient dies under the care of another surgeon, or in another hospital. This needs to be addressed.

WAASM comment

The reviewer's comments in the final paragraph are pertinent. The activities of the WAASM are protected under Qualified Privilege. Legally, only the surgeon reporting the death and the reviewer are afforded protection. This means that in cases such as this, the WAASM can only provide a copy of the review to the surgeon who completed the WAASM surgical case form and had responsibility for the care of the patient at the time of death. This is a particular issue in WA as some patients who die are referred to tertiary hospitals for the management of their complications.

The ANZASM is in the process of renewing its Qualified Privilege and the hope is that there will be some provision to permit wider feedback.

Case study 4: Bariatric surgery IV - questionable decision to perform obesity surgery

Case summary

A middle-aged patient (BMI 65) was admitted for an elective laparoscopic sleeve gastrectomy. There was a history that included obstructive sleep apnoea, depression, anxiety and two previous gastric bandings. Surgery was uneventful and the patient was postoperatively admitted to the ICU for 2 days before being discharged on the fourth postoperative day.

The patient contacted the surgeon on the sixth postoperative day to report pyrexia, which appeared to settle with paracetamol. The patient contacted the surgeon again 48 hours later with a history of fever, dysphagia and abdominal pain. The surgeon suggested a gastrograffin swallow and blood tests the next morning. The patient was very unwell and was readmitted the next day, and on presentation had to be resuscitated by the ICU team. An abdominal X-ray (AXR) revealed free gas under the diaphragm, and an abdominal CT scan suggested a loculated fluid collection adherent to the greater curve of the stomach, consistent with an abscess or a contained leak. There was also free peritoneal gas and gas within the liver suggestive of portal pyaemia.

The patient was admitted to the ICU, intubated and started on antibiotics and had a laparoscopic washout on the evening of the same day (the ninth postoperative) by another surgeon. The operative notes suggested 300 mL of enteric contents but no perforation was found. After a thorough washout, two drains were inserted and the patient returned to the ICU. Postoperatively the drains consistently drained enteric fluid.

The next day the patient was febrile. The day after that (36 hours after the washout), the patient's cardiorespiratory function deteriorated with increased oxygen requirements, worsening acidosis with acute renal failure, and requiring increasing inotropic support. At an emergency operation later that morning the patient underwent a laparotomy and second washout. With the use of methylene blue a leak was found at the superior edge of the staple line of the sleeve gastrectomy. This was not sutured and after a peritoneal wash, two large bore drains were placed and a feeding jejunostomy fashioned. Postoperative care in the ICU required maximum vasopressor support but the patient continued to deteriorate and died later that day.

Comment

This patient recovered well following the primary operation and had a timely discharge. The patient called the surgeon with history of fever, which in the postoperative stage should have aroused suspicion. However, the patient was managed conservatively. Sleeve gastrectomy leaks are lethal and patients tend to deteriorate very rapidly if not managed aggressively. At the first signs of a temperature the patient should have been readmitted and investigated. When the patient was returned to theatre for the first time there were enteric contents, and it is possible that a laparotomy and a thorough inspection of the sleeve gastrectomy staple line should have been performed at this time. This may have avoided this mortality. It was very late to salvage the patient at the second operation. One would also have to question whether a sleeve gastrectomy was an appropriate operation in a patient with a history of two past eroded bands.

Case study 5: Cardiovascular I – delay in managing postoperative complications

Case summary

A middle-aged patient was admitted for elective coronary artery bypass graft (CABG) surgery for symptomatic three-vessel coronary artery disease with preserved left ventricular function. This patient had multiple comorbidities including type 2 diabetes mellitus, end-stage renal failure on haemodialysis (diabetic nephropathy), anaemia, hypertension, hypercholesteraemia, hypothyroidism and a recent episode of extended spectrum beta-lactamase sepsis.

Surgery was uneventful and the patient was easy to wean from the bypass. There was a total requirement of 6 units packed cells intraoperatively. The patient was extubated in the evening of postoperative day one with stable haemodynamics and on low dose support. Continuous venovenous haemodiafiltration (CVVHD) started; however, atrial fibrillation developed on the third postoperative day – this reverted after an amiodarone infusion.

Sternal wound infection was noted on postoperative day six and a superficial vacuum (VAC) dressing was applied. Extended spectrum beta-lactamase *Escherichia coli* was isolated from the wound swab and appropriate antibiotics were started. A CT scan revealed periaortic collection on postoperative day six.

The patient was not taken to theatre until postoperative day 10. Re-exploration revealed mediastinitis with frank pus in the pericardium. The vein graft to obtuse marginal and left posterior descending coronary artery (PDA) was found to be thrombosed. The wound was washed out and the sternum re-wired by a Fellow.

On the evening of postoperative day 10 the patient developed septic shock with hypotension, and was managed in the ward with repeated fluid boluses including transfusion of packed cells and correction of high INR. Eventually the patient required readmission to the ICU for inotropic support. Repeat CT chest revealed a further large pericardial collection and there was a further re-exploration in theatre the same day. Intraoperative findings included a tear in the aorta near the proximal vein graft anastomosis, and this was oversewn and the chest closed. The patient was returned to the ICU ventilated and required inotropic/pressor support. Two days later the patient was extubated. Further episodes of atrial fibrillation / flutter occurred and were treated with amiodarone.

The patient was discharged to the ward 8 days after re-exploration however suffered from intermittent fevers, ongoing wound ooze noted, superficial dehiscence - saline dressings, then VAC dressing were applied. Following a plastic surgery consult the patient was scheduled for wound debridement. Thirty-six days after the original operation the patient arrested in the dialysis unit with more than 15 litres of blood in the mediastinal drains. CPR was ceased and patient declared deceased shortly thereafter.

Comment

This patient had multiple risk factors for developing a wound infection. However, the management could have been better. Despite clear evidence of a pericardial collection on the CT scan, it was 4 days before the wound was explored. In the presence of frank pus in the pericardium, a simple washout and re-wiring was not appropriate. The patient should have had thorough debridement

with the chest wound left open with a view to delayed closure possibly with pectoralis major flap repair once wound swabs were negative. The cause of the aortic tear discovered during the second reoperation was not clear. However, it appears likely that this was the cause of the major bleed that led to the pulseless electrical activity arrest and subsequent death.

Case study 6: Cardiovascular II – the apparent absence of the consultant may have been important

Case summary

A middle-aged patient was admitted with acute heart failure (New York Heart Association IV) in the setting of non-ST elevation myocardial infarction and background rheumatic heart disease. There had been a previous percutaneous coronary intervention and stent to left anterior descending (LAD) artery. Comorbidities included hypertension, type 2 diabetes complicated by peripheral neuropathy and retinopathy, poor control hypercholesterolemia, chronic renal impairment and severe obesity.

After stabilisation of the heart failure, a coronary angiogram was performed 7 days after admission. This revealed 99% proximal LAD in-stent restenosis, moderate mid circumflex stenosis and a blocked dominant right coronary artery with backfilling of the PDA by collaterals. Echocardiogram showed low normal overall left ventricular function, mild right ventricle impairment with right ventricular systolic pressure 57 mm Hg, mild to moderate mitral regurgitation and mild tricuspid regurgitation. The patient was accepted for CABG and clopidogrel stopped.

Surgery was not performed until 18 days after the angiogram. During this time there were no episodes of chest pain and there was no worsening of the dyspnoea. However, multiple reviews regarding abdominal pain were recorded in the notes. There was also evidence of abdominal distension (since admission) and generalised tenderness (seemingly mainly in the left iliac fossa). Bowels were open with laxatives but no fevers were recorded. No major abnormalities were revealed on AXRs; no CT scans were performed. The inflammatory parameters were raised but improved throughout the admission.

The patient arrested after pre-induction (pulseless electrical activity arrest), was intubated and received a “short period” of CPR. Cardiac output was regained after a bolus dose of adrenaline. The handwritten operation note was very brief and there was no typed report. It is not clear whether the consultant actually operated, as a Fellow is noted in the operative report as the operating surgeon. The patient was heparinised and the left internal mammary artery (LIMA) harvested prior to institution of cardiopulmonary bypass (CPB). The LAD and PDA were grafted. The bypass and cross-clamp times appear to be long for two grafts. There was significant bleeding that required blood and blood products. Weaning off CPB required moderate to high inotropic support. On transfer to the bed the patient became severely hypotensive and required boluses of adrenaline. Transoesophageal echocardiogram at this point showed severe right ventricle dysfunction, moderate to severe left ventricle dysfunction, and severe mitral and tricuspid regurgitation.

In the ICU, levosimendan and nitric oxide were commenced. Over the ensuing days the patient's inotrope requirements varied but overall they remained high. The patient was on a maximum dose of noradrenaline (20 mL/hr of quad strength) on postoperative day three. Renal function deteriorated and CVVHD was instituted.

On postoperative day five rapid atrial fibrillation occurred with a significant drop in blood pressure, requiring high vasopressor doses. The patient's condition continued to deteriorate over the next 24 hours with worsening metabolic acidosis. Ischaemic bowel was suspected but emergency laparotomy was deemed futile given the patient's overall condition. Treatment was capped and the patient died on postoperative day seven.

Comment

A preoperative intra-aortic balloon pump (IABP) could have been considered given the severe proximal coronary disease, but this was not mandatory as there were no episodes of chest pain or worsening dyspnoea in the preoperative phase. In an obese patient this can be associated with technical challenges and complications.

After the arrest occurred, consideration should have been given to placing the patient on CPB first and harvesting the LIMA later, or in fact utilising vein grafts only. Expedition of the operation would be considered vital. The operation note raises the question of whether the operation was performed by a Fellow or consultant, and the long bypass and cross-clamp times raise further questions regarding the expediency of the surgery. Given the poor cardiac function at the end of surgery, and especially after sudden collapse of blood pressure at the end of surgery, the insertion of a preoperative IABP should be considered mandatory.

The postoperative course was fairly predictable, with acute on chronic renal failure requiring CVVHD. After initial stabilisation on high doses of inotropes, and some improvement of cardiac function on echocardiogram, the onset of atrial fibrillation led to further escalation of vasopressor requirement with the likely consequence of bowel ischaemia.

Case study 7: Cardiovascular III – omissions in early and late postoperative care leading to death in elderly patient undergoing CABG

Case summary

A very elderly patient had an exercise stress test in the late 1990s suggesting extensive coronary artery disease but no follow-up occurred. The patient had subsequently suffered renal calculi and had hernias repaired. The patient presented with chest pain and a troponin level rise of 753. The creatinine was 125, giving an estimated glomerular filtration rate of 45 mL/min. The angiogram results showed diffuse but non-critical disease in the right coronary, but critical blood supply from the left side vessels. There was an occluded LAD with distal filling of the LAD and tight disease also affecting two circumflex vessels, one of which was a reasonable target. An IABP was inserted and the patient stabilised.

Surgery was scheduled for 3 days after admission. The IABP was replaced 2 days after the original was inserted, as it had become kinked. While there was no dictated operation note there was a handwritten record in the files. The next day CABG x 2 was performed, with the LIMA placed to the LAD and the vein graft to the circumflex. The quality of the vessels was not commented on, but aortic cross-clamp was a reasonable 38 minutes and bypass was 69 minutes. The patient left theatre on 16 mL/hr of 4 mg in 50 mL noradrenaline and an initial cardiac index of 2. However, 14 minutes after arrival in ICU there was progressive deterioration, with cardiac index falling and central venous pressure rising to 17 and pulmonary artery pressure to 45. The surgeon recorded that 4 L of fluid was given during this period.

The patient was close to arrest and so the chest was reopened but no tamponade was seen. Extreme right ventricular dysfunction was noted and poor cardiac output was shown by a pH of 7.06 in arterial blood gases with lactate rising to 11.1. Overnight there was progressive improvement, although the lactate had fallen to 5.1 by the next morning. The patient was returned to theatre 2 days later when the sternum was closed. A transoesophageal echocardiogram was reported as showing good left ventricular and right ventricular function. Again, no dictated operation record was found.

It was possible to remove the IABP the next day, and the patient transferred to the ward after withdrawing CVVHD 7 days later. At this time the creatinine was elevated at 427. There was a MET call that evening due to hypoxia and after a further review by the ICU staff the frusemide was increased but there was no recommendation for further dialysis. There was a subsequent arrest with a period of CPR and a return to the ICU. The patient was extubated again 7 days after being returned to the ICU and retransferred to the ward 6 days later. Three days after this the creatinine was trending up when there was a further hypoxic MET call and after an aspiration the patient was returned to the ICU. The patient remained agitated and following discussion with the family a 'not for resuscitation' record was signed by the registrar two days later but not by the consultant. Treatment was then withdrawn.

Comment

There are two important events here. Firstly, the deterioration in a patient who was weaned from bypass at the first attempt and was only on moderate inotrope doses in the early postoperative period in the ICU. This would suggest either a problem with myocardial preservation or over transfusion leading to acute right ventricular distension. The possibility of graft failure is remote,

although there appears to be no comments in the record about graft patency at reoperation. However, a blocked graft would have suggested that recovery of function was unlikely. The patient was fortunate to survive this episode, but 2 days later the right and left ventricular function was normal. One can suspect that the acute deterioration was due to over transfusion and right ventricular distension leading to poor cardiac output and rising lactate.

The second episode of concern is that following transfer to the ward and despite regular input from the renal team, a peak creatinine of 530 was reached which led to a further arrest and transfer back to the ICU.

The predicted EuroSCORE risk of mortality was 7.94%. The indications for the operation were very strong and the patient would not have survived without intervention.

Case study 8: Delay in patient with ischaemic bowel I – adhesive small bowel volvulus with delay due to incorrect diagnosis

Case summary

An elderly lady presented to an ED with acute abdominal pain and vomiting. She was first seen in the late afternoon, but the diagnosis was thought to be gastroenteritis and she was discharged. The patient re-presented to the same ED in the early hours of the following day, when a bowel obstruction was suspected and a CT scan revealed a mechanical closed loop small bowel obstruction (SBO). The patient had previously undergone a bowel resection and hysterectomy some 6 years previously, had a previous laparotomy for adhesive obstruction and suffered from chronic constipation. There were significant medical comorbidities with a previous myocardial infarction, diabetes, severe mitral regurgitation and poor mobility.

Anaesthesia was commenced 10 hours after the reattendance. There was ischaemic small bowel volvulus secondary to a band adhesion requiring resection of 80 cm of bowel with extensive adhesiolysis and primary anastomosis. She was managed in the ICU postoperatively, requiring temporary ventilation and ongoing inotropic support. In view of the significant comorbidities, and after discussion with the family, appropriate analgesia was instituted and inotropes withdrawn.

Comment

The delay in diagnosis and subsequent laparotomy is of concern in the setting of acute small bowel volvulus where expedient management can affect the outcome. The delay in diagnosis, an issue of concern raised by the first-line assessor, was caused by a misdiagnosis at the first ED presentation. On a background of previous abdominal surgery for adhesions, a surgical opinion should have been sought at the first ED presentation. As a result, the diagnosis of volvulus was delayed by about 11 hours and there was a further 9-hour delay before the patient came to the operating theatre.

A total delay of 20 hours before surgery may have contributed to her demise, but it is likely that the patient would have died anyway due to cardiovascular comorbidity. Clearly, the bowel was ischaemic and required resection. Earlier diagnosis and operation may have avoided the need for resection and reduced sepsis, but a laparotomy to release the band obstruction would still have been required in this high-risk patient.

Case study 9: Delay in patient with ischaemic bowel II – strangulated small bowel with delay to laparotomy in a medically unfit patient

Case summary

An elderly patient who had an emergency ileal resection and end ileostomy for Crohn's disease many years previously presented to the ED in the very early hours with a 1-day history of abdominal pain, vomiting and decreased stoma output. At the initial assessment the patient was in pain, but was afebrile and normally conscious and conversing. This patient also had a history of paroxysmal atrial tachycardia, brachiocephalic clots on previous admissions associated with sepsis and were sustained on anticoagulants, hypertension, alcoholic liver disease and chronic obstructive pulmonary disease (50 cigarettes per day).

The end ileostomy had been assessed for closure 10 years previously, but surgery had been considered too high a risk. However, in a subsequent revision the ileostomy was moved to the left iliac fossa. It appears from the notes that IV fluids were commenced an hour after admission. Two litres of fluids were given over 3.5 hours. The patient was initially seen by the surgical registrar in the mid-morning that concurred with the assessment of strangulated SBO. There was a consultant review an hour later with a request for an urgent laparotomy.

The anaesthetic review did not occur for another 2 hours. The patient was transferred to the operating room almost immediately following the anaesthetic review. However, the laparotomy did not commence for another two hours, the delay secondary to anaesthetic issues were control of blood pressure, insertion of lines including bilateral intercostal drains, in view of possibility of pneumothoraxes.

At operation, 1 m of ischaemic gut was removed and an end ileostomy re-fashioned in the left iliac fossa. The patient was transferred to the ICU intubated, ventilated and on inotropic support. The patient died 2 days later following a gradual decline and multiple organ failure.

Comment

Essentially, an elderly chronically ill patient presented with a surgical emergency. Surgical review did not occur for 3.5 hours. Thereafter, consultant review and decision making occurred swiftly. However, it was another 4 hours before the surgery commenced despite the consultant requesting an emergency operation.

There may have been very legitimate anaesthetic reasons why this patient was delayed for such a long time. Only expert anaesthetic review could comment legitimately on the proceedings in the operating room.

While acknowledging the fact that this patient had multiple comorbidities, the notes suggest that the patient may have survived had they received rapid surgical assessment and immediate surgery. Patients with ischaemic gut should be operated on as soon as possible, and a 7.5 hour delay from admission to laparotomy, in a major hospital ED in a patient with multiple comorbidities, was too long.

Case study 10: Delay in patient with ischaemic bowel III – delay in proceeding to surgery for SBO

Case summary

An elderly lady presented to the same ED twice over a period of 1 week complaining of abdominal pain, nausea and constipation. She had previously undergone a hysterectomy, and had poor dietary intake and profound malnutrition.

An AXR performed on the second presentation demonstrated multiple dilated loops of small bowel consistent with SBO. There is a discrepancy in the assessment of the patient. The surgeon completing the surgical case form stated the abdomen was soft with no tenderness, yet the medical registrar's notes (written 1 hour after the surgical registrar's entry) stated that the abdomen was tense and distended. The patient was severely dehydrated and, with a clinical diagnosis of SBO in the setting of symptoms of mechanical obstruction lasting over 1 week, should have been taken to theatre that evening following appropriate fluid and electrolyte resuscitation. The admission notes indicated that the registrar had assessed the patient in the early evening.

The intraoperative steps taken to deal with the band adhesion/bowel resection were completely appropriate, as was the plan to extubate the patient. At the end of the operation the nasogastric tube (NGT) was checked to be in the stomach and the patient was extubated. After 30 minutes in recovery the patient was admitted into the ICU. A few hours later the patient vomited and aspirated. During re-intubation the patient arrested, but was resuscitated. However, over the next 24 hours the patient progressively deteriorated and after discussion with the family treatment was withdrawn.

The operation notes did not indicate whether the small bowel and stomach were 'milked' in a retrograde fashion to decompress via the NGT on suction during the operation, which would often help in allowing the abdominal wound to be closed with less tension. NGTs are prone to blockage, dislodgement and general malfunction, and cannot be fully relied upon to prevent aspiration.

Comment

There was an unacceptable delay in proceeding to theatre. The surgical case form stated that "there was no weekend emergency theatre access". If that is true, then this needs to be addressed. This could have been the reason to defer surgery to the following morning (Monday). The ICU admission time following surgery was almost 24 hours later, indicating that the patient had to wait nearly 1 day for surgery. This is unacceptable in a patient who had a clear diagnosis of mechanical SBO. If theatre access over the weekend was not possible then the patient should have been transferred immediately. A laparotomy for mechanical SBO is not a semi-elective procedure.

There appear to be inconsistencies in terms of the clinical signs relating to how well the patient actually was. A 1-metre length of infarcted small intestine cannot equate to a soft non-tender abdomen. Both the surgical team and the ED staff appear to have focussed on the depressed mental state of the patient, and this may have affected the assessment of the patient on both presentations to hospital.

Case study 11: Postoperative care I – failure to progress should always be of concern in postoperative care, even in the absence of an obvious complication

Case summary

An elderly man was admitted for an elective radical cystectomy, ileal diversion and total penectomy. He had been seen a month earlier and was booked for transurethral resection of bladder tumour (TURBT) of a bladder lesion diagnosed on CT, but at the initial operation a penile squamous cell carcinoma was incidentally diagnosed. The TURBT confirmed T2 (the tumour has grown into the muscle layer of the bladder wall) disease. Staging failed to detect metastatic disease.

The past medical history was notable for smoking, type 2 diabetes, chronic obstructive pulmonary disease and an enlarging cystic pancreatic mass (investigated in 2007 and thought to be related to chronic pancreatitis). He was preoperatively worked up with staging CT and magnetic resonance imaging, spirometry and cardiac assessment.

Postoperatively he was admitted to the ICU and extubated early. In the initial postoperative period there were no issues apart from the patient being minimally under-resuscitated with fluids. On day two postoperatively some abdominal distension and low volume vomits were noted. An AXR suggested a low-grade ileus. One other item of note was that the patient's insulin control was a little unstable. This was attributed to the past history of chronic pancreatitis. Pancreatic enzymes were to be commenced once the patient was tolerating diet. However, on discharge from the ICU on postoperative day four the patient was only taking ice chips and abdominal distension was still a feature.

On day five postoperatively the surgical night resident medical officer reviewed the patient because of a mildly raised temperature, nausea and vomiting, but found no signs of peritonism (only abdominal distension and mild generalised tenderness). Review of the observation chart shows a raised respiratory rate, a developing tachycardia and low-grade temperature rises from day five onward.

On day seven postoperatively the patient passed flatus but the notes report ongoing distension, and the next day the patient again vomited. Late the following evening, the patient continued to vomit small amounts then had a large vomit after which he collapsed and became unresponsive. A MET call was initiated but resuscitation attempts were unsuccessful and the patient was declared deceased (day eight). The case was reported to the coroner.

Comment

This patient continued to demonstrate abdominal distension, nausea and vomiting right up to his arrest. Early tests suggested an ileus but this was never reassessed following his ICU stay, despite the fact that he did not improve.

The trends in observations are noteworthy. From day five the high respiratory rate, tachycardia and low grade temperatures were evident, culminating in significant tachycardia of 100+ beats per minute on the morning of his arrest.

Alarm bells should always ring when patients show a lack of day-to-day improvement and fail to meet postoperative milestones, even when the patient appears to be temporarily improving or does not show dramatic signs and symptoms. The final postmortem of this patient may shed some light on the cause of ongoing vomiting and may identify other factors that contributed to his demise.

Case study 12: Postoperative care II – failure to close mesenteric window results in strangulated bowel

Case summary

An elderly patient with a past history of hypertension, peripheral vascular disease, hyperthyroidism, collagenous colitis and smoking presented as an emergency with acute SBO diagnosed as a caecal volvulus on CT scan and then operated on promptly that evening. The findings were of an ultra-mobile caecum and distal small bowel trapped around a band adhesion leading to ischaemia of the terminal ileum and ascending colon. A right hemicolectomy was performed with a functional side-to-side anastomosis. It was not clear in the operative notes, but was subsequently revealed in the first-line assessment report, that the mesenteric defect was not closed because it was felt that the bowel was “insufficiently mobile” to allow this. The patient had a stormy postoperative recovery, but was eventually discharged on day eight with no wound complications and restoration of gut function.

The patient was readmitted 3 weeks postoperatively with several days of nausea, vomiting and, at times, diarrhoea. On initial assessment the patient was found to be in acute renal failure, with a urea of 14 and creatinine of 353. The initial plain AXR did not show an SBO, but a subsequent CT scan the next morning did show an SBO with transition at the level of the prior right hemicolectomy and no pneumoperitoneum.

Despite this, the patient was admitted under the medical unit largely to correct the pre-renal failure. Vigorous rehydration resulted in clinical improvement over the next 12 hours. When reviewed by the general surgical team the next morning, the abdomen was felt to be benign and they recommended continued conservative management under the care of the medical unit. However, in the evening the abdominal pain increased and there was coffee-ground vomiting and a tachycardia of 100. The acute surgical unit registrar recommended placement of an NGT and that an urgent gastroscopy be performed the next morning. By the next morning (day two), after a second surgical review, gastrografin was administered via the NGT. A plain AXR taken later that day which showed both ongoing SBO with pneumatosis in the walls of the pelvic small bowel loops and portal venous gas, highly concerning for ischaemia.

By this stage the patient had received a third surgical review by another surgeon and it was finally recognised that urgent surgery was required. This was done that evening on the third admission night. There was acute SBO of the distal small bowel through a defect in the mesenteric window, which had led to ischaemia of that portion. In addition, there was global ischaemia of the proximal small bowel with a non-pulsatile thrombosed superior mesenteric artery. This situation was not remediable by resection or revascularisation and the abdomen was closed. The patient died 12 hours later.

Comment

There are a number of concerns with this case. The first concern surrounds the importance of closing the mesenteric window after performing a right hemicolectomy for fear of an internal small bowel hernia. The need to close the mesenteric window had been well established in surgical practice, although with the advent of laparoscopic right hemicolectomy, in which closing the mesentery is an additional and at times irksome step, this dogma has been challenged. There is some justification for this in the literature - an analysis by Cabot *et al.* in *Diseases of the Colon and Rectum* in 2010 reported 530 consecutive patients who underwent a laparoscopic right colectomy

with no mesenteric closure. Only 26 patients (4.9%) had an SBO during the follow-up period, 14 of whom were reoperated on. Nevertheless, sporadic case reports continue to be published of this complication. It is difficult to understand how, at open surgery when a side-to-side anastomosis has been created, it was not technically possible or quite straightforward to close this mesenteric defect to prevent such herniation. Mesenteric closure now appears to be 'an optional extra', but it may be wise to detail this in the operative notes, so that the next surgeon can reflect on the potential for this unclosed space to harbour an internal hernia.

The second concern is the danger of admitting a surgical complication under a medical unit and focusing on the consequence of a bowel obstruction (acute renal failure) rather than the cause (which was evident on the initial abdominal CT). There was therefore a delay of at least 48 hours before the true cause of the deteriorating status was considered and only after review by three different surgical teams. The present culture of not re-admitting a complication under the original surgeon compounds this issue.

Although the original issue was a simple loop obstruction in the mesenteric defect, the resulting dehydration and hypercoagulable state no doubt led to thrombosis of the major arterial supply and an unsalvageable situation. This patient had a number of comorbidities that made survival less likely, but it is quite likely that the patient could have survived a bowel obstruction that involved just the incarcerated loop, rather than the entire small bowel from global ischaemia.

Case study 13: Postoperative care III – an acute surgical abdomen following bowel resection should be treated with relook laparotomy not a fentanyl patient-controlled analgesia

Case summary

An elderly patient with ischaemic heart disease underwent an elective right hemicolectomy for a caecal mass seen on CT colonoscopy. Colonoscopy prior to CT colonoscopy was incomplete due to looping. Histopathology of the mass was benign and surgery was performed at a metropolitan hospital. The patient was in hospital for 14 days, a prolonged stay for an elective right hemicolectomy.

The patient was readmitted the next day and clinically had an acute abdomen with raised inflammatory markers. The patient claimed to have had ongoing pain since surgery, but the pain had increased after discharge. The patient was then transferred to a tertiary teaching hospital.

A CT scan at the tertiary teaching hospital did not suggest an anastomotic leak. The patient was given a patient-controlled analgesia for the ongoing pain, admitted under the surgical team and commenced on IV antibiotics. The patient was treated conservatively despite the ongoing pain and rising inflammatory markers (CRP of over 400 and WCC of 28). Another CT was performed on day six after admission as the patient continued to show signs of sepsis with tachycardia, raised inflammatory markers, tachypnoea and delirium. This CT did not suggest a leak. The patient continued to have ongoing abdominal pain and distension and was admitted to the high dependency unit.

Two days later the patient appeared moribund and was taken to theatre for a laparotomy. The patient had an anastomotic leak with 40 cm of ischaemic gut. The bowel was resected and an end ileostomy was fashioned. The patient was taken to the ICU but multiple organ failure had developed. A relook laparotomy 5 days later found further turbid fluid, but the small bowel was cocooned and therefore not inspected to avoid further injury. The patient died of multiple organ failure 8 days later.

Comment

There was a considerable delay in this patient's appropriate management. It is not clear if the patient had a leak during the first admission or from the time of readmission. The patient had a temperature spike 9 days after surgery and was commenced on oral antibiotics. Blood cultures at the time were negative.

The main delay was at the tertiary teaching hospital. It was well documented that the abdominal pain persisted but was well controlled with patient-controlled analgesia and naloxone. Abdominal pain requiring opiates 2 to 3 weeks after surgery is not normal. Despite the normal CTs, this patient should have been treated clinically and an exploratory laparotomy should have been performed earlier. This could have prevented the patient's death.

Case study 14: Postoperative care IV – lack of surgeon review results in delay, missed sepsis and death

Case summary

A very elderly patient was admitted under a physician into hospital Y in the early hours of the morning. The patient had a “worsening” swelling/haematoma in the left groin following a diagnostic angiogram, and was unable to walk. The diagnostic angiogram had been performed 2 weeks earlier by surgeon A in hospital X. The skin had “mild overlying cellulitis”. The patient had a mechanical valve, was on warfarin and had an INR on admission of 2.4.

The notes refer to a previous good quality of life although the patient was clearly an arteriopath, as the notes make reference to an aortic valve replacement, a CABG, popliteal artery stent and a carotid endarterectomy some years previously. Later the same morning an ultrasound confirmed the clinical diagnosis of a haematoma. The nurses noted “left groin warm to touch” and “red area extended to inner thigh” which was marked. It appears the patient was in a holding area or even the ED as the patient only arrived in the medical ward late afternoon.

The next morning, some 30 hours after admission, the patient was reviewed by the physician, apparently for the first time. The notes record “large area of erythematous, painful skin, 1x blister ~5mm, cellulitis and commence IV flucloxacillin”. Although there was a nurse note indicating “IV antibiotics ordered and commenced” there was no note that flucloxacillin was ever prescribed or administered. The notes also record that the physician planned to discuss the management with surgeon A (who was accredited at hospital Y). That afternoon the patient complained of “9/10 pain”. Even later in the day, a CT angiogram showed no extravasation of contrast. That night the patient was hypotensive and after discussion with the physician regarding treatment, the patient responded to fluids. Specifically, the patient was apyrexial and had no tachycardia.

The morning after (now some 54 hours after admission) the notes record a ward round by the consultant physician, and that there had been a discussion between the physician and surgeon A. Tazocin was given for the first time in the morning, and apart from a dose of cefazolin in theatre that night appears to be the only antibiotic administered. The plan was to commence Clexane and to withhold warfarin until the INR was less than 1.5 and then to contact surgeon A. There was no note as to whether it was proposed to drain the collection once the INR had normalised. Later that day, repeat bloods showed the haemoglobin had fallen from 126 to 79, the WCC risen from 6.1 to 12.6, the urea risen from 7.3 to 21.8, creatinine risen from 85 to 292 and the INR was 3.3. The systolic blood pressure was 100 mm Hg. An untimed entry later in the day reported dropping oxygen saturations and persistent hypotension, and after discussion with the consultant physician the patient was referred to the ICU. A person (grade unclear) from the ICU reviewed the patient (time not written, but subsequent timed notes by others suggest during the morning). After discussion admission to the ICU was deferred.

The patient was reviewed by an ICU consultant later in the day (time unclear as not recorded) and then transferred to the ICU in the early afternoon with the admission diagnosis of sepsis and hypotension. The notes state the intention was to take the patient to theatre to evacuate the haematoma. The notes also record that the urinary catheter inserted in the ward had nil drainage and a replacement failed, and it was thought a false passage has been created. Repeated bladder scans showed less than 300 mL each time. The fluid chart showed no urine output.

The next note was a retrospective entry by the ICU consultant in the early hours of the next day. It noted an ICU admission diagnosis of “severe septic shock”. The notes record that after admission into the ICU there had been an “urgent search for vascular surgeon”, with surgeon A “unavailable”, surgeon B “message left” and surgeon C “returned call ~18:00”. After review, surgeon C took the patient to theatre immediately and the haematoma was evacuated. A flexible cystoscopy showed a false passage with blood in the bladder. In the retrospective entry (made after the patient returned to the ICU) the ICU consultant noted that the lactate was 9 and the “prognosis looks grim”.

The next day the patient had improved somewhat from the sepsis, but had developed liver failure and was now anuric. The patient then followed a downhill course and died 24 hours later.

Comment

This patient developed a septic haematoma following a diagnostic angiogram and then died. This has to be considered an adverse event and potentially preventable.

The death was not related to the surgery undertaken by surgeon C. Indeed, quite the contrary: surgeon C immediately appreciated the necessity for urgent intervention and took the patient to theatre immediately, but by then it was too late.

The entries in the notes make it clear that on admission the haematoma was almost certainly infected and within hours was documented to be worse. Despite this being a surgical complication, the patient was admitted (apparently after a 15 hour delay) to a medical ward, was not reviewed by a consultant physician for 30 hours, and was not reviewed by surgeon A who was accredited at hospital Y. Antibiotics were apparently not commenced for 54 hours after admission. There were on-call general surgeons in hospital Y and they were not apparently consulted. The sepsis was not appreciated on the medical ward until it was too late.

Had the patient been admitted under a surgeon, or even reviewed by any surgeon the morning after admission, the sepsis would almost certainly have been appreciated, antibiotics commenced promptly, the collection drained, and in all probability this death would have been avoided. It is disappointing to note:

- antibiotics were not commenced for 54 hours when administration should have been within hours.
- surgeon A (the original surgeon) had still not reviewed the patient, nor apparently asked a senior or junior colleague to review the patient, for more than 60 hours after the patient was admitted with a surgical complication
- the high INR was no reason to delay surgery as it could have been immediately reversed.

There were multiple issues in the management of this patient. The hospital needs to review this preventable death and make changes to its referral processes.

Case study 15: Expect the unexpected

Case summary

An elderly smoker with a history of epilepsy and depression was diagnosed with oesophageal adenocarcinoma following 12 months of dysphagia. After treatment with preoperative radiotherapy, a planned three-stage laparoscopic oesophagectomy was performed by a surgical Fellow, supervised by a consultant who was also scrubbed. The procedure was delayed by 2 weeks due to bed issues.

The complex operation seemed to go well, and the patient was well for 2 days before developing respiratory failure requiring reintubation. Increasing inotropic support prompted a CT scan of the chest/abdomen and pelvis, and at subsequent return to theatre by the Fellow, a small hole of uncertain aetiology was found at the junction of D2/D3. The hole was possibly due to diathermy injury or visiport injury from the original operation. After returning to theatre the patient seemed to do well, albeit on a ventilator via tracheostomy, but off inotropes. A further CT scan on postoperative day 16 was carried out due to increasing WCC and CRP (but relatively stable clinical picture) for the last 3 days. It showed no new collection.

Bile started draining from the prior drain tube on postoperative day 17. In addition, there was possible enteric content in the laparotomy wound. There were increasing inotropic requirements with increasing inflammatory markers and worsening renal function. The NGT was reinserted. The patient was taken to theatre by a different consultant surgeon. Free bile was found but no obvious defect identified largely due to dense adhesions seen. Over the next 2 days the patient became anuric, with increasing sepsis and respiratory function and acidosis. Treatment was withdrawn following discussions between the family, the ICU and surgeons.

Comment

Oesophagectomy is a major operation that carries a high risk of morbidity. The operation seems to have been undertaken with all due care and postoperative documentation was clearly presented. Deep vein thrombosis prophylaxis was appropriate.

The surgical team responded appropriately to the changes in the patient's clinical status with appropriate investigations and surgical interventions. The duodenal injury was managed with a continuous 3-0 polydioxanone suture. The operation report does not suggest there was an omental patch. Interrupted sutures with an omental patch may possibly have better sealed the duodenal defect, perhaps preventing further sequelae. The second operation was performed by the Fellow without the consultant present. The presence of the original consultant may perhaps have made a difference to the outcome, but this is difficult to prove. This also may not have been possible, as the consultant surgeon was the only upper GI surgeon available within the metropolis in question. The patient was handed over to a different consultant surgeon (non-specialist upper GI surgeon) as the primary surgeon subsequently went on leave.

The question of why the duodenal perforation occurred following the first operation is key to this case. The consultant surgeon and Fellow suggested injury from either diathermy or from the visiport entry to the abdominal cavity. Perhaps a different mode of entry, such as an open trocar insertion, should be considered in future cases.

SHORTENED FORMS

AXR	abdominal x-ray
CABG	coronary artery bypass graft
CPB	cardiopulmonary bypass
CPR	cardiopulmonary resuscitation
CRP	C-reactive protein
CT	computed tomography
CVVHD	continuous venovenous haemodiafiltration
ED	emergency department
GI	gastrointestinal
IABP	intra-aortic balloon pump
ICU	intensive care unit
INR	international normalised ratio
IV	intravenous
LAD	left anterior descending (artery)
LIMA	left internal mammary artery
MET	medical emergency team
NGT	nasogastric tube
PDA	posterior descending (coronary) artery
SBO	small bowel obstruction
TURBT	transurethral resection of bladder tumour
VAC	vacuum
VLCD	very low calorie diet
WCC	white cell count