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National Case Note Review Booklet

Lessons from the Audit

DELAYED SURGERY

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The Royal Australian
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Chairman's Report

This Case Note Review booklet highlights the difficulties faced in many environments of delayed surgery. Delay can be due to many factors: a delayed diagnosis, delays associated with transfer, inefficient management of patients through the hospital system, and slow assessment and action by the surgical team, to name but a few.

The cases highlighted within this series would, in some cases, have made no difference to the outcome even if they had been rapidly managed. Nonetheless, the lessons to be learnt are that, despite this, surgical engagement and appropriate diagnosis has led to delays which could have been avoided. Even when procedures are finally conducted, on a number of occasions the lack of consultant engagement was certainly difficult to understand and probably unacceptable. The need to act in a timely fashion, particularly in cases of cardiac compromise, viscous perforation and contained infection, do require rapid management. Hospitals do need appropriate staffing so this can occur, but also the surgical team needs to be aware that delays can be fatal.

I hope that this National Case Note Review booklet brings home some of these issues that we should all be aware of and constantly alert to.

As always, we would welcome any constructive feedback or comments as a result of these cases.



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Chairman, Australian and New Zealand Audit of Surgical Mortality (ANZASM)

Recommendations

Some common themes emerged from the cases presented in this booklet, with the following recommendations being made:

- Effective communication around transfer of patients between institutions is critical, such that the receiving institution has a full understanding of the context in which a patient is being transferred. Consultant input into this process is encouraged.
- Determining the surgical diagnosis in a timely fashion can significantly impact patient outcomes. Early interpretation of diagnostic procedures and test results, and consultation with colleagues, can facilitate appropriate intervention that will maximise potential patient benefits.
- Once a diagnosis has been made, and the appropriate surgical intervention decided upon, every effort should be made to minimise hospital delays wherever possible.

Case Studies

Case 1: Delayed implementation of surgical management plan jeopardised favourable outcome for elderly patient

General surgery

CASE SUMMARY

A female patient in her late 80s presented with a one-week history of colicky abdominal pain and bowels not opened for three days. A computed tomography (CT) scan with rectal contrast confirmed an incomplete obstruction due to sigmoid stricture and suggestion of pericolic gas locules. Medical history included rheumatoid arthritis, coronary artery disease with coronary artery stents and unstable cardiac rhythm with loop recorder inserted, gastro-oesophageal reflux disease, and colorectal cancer with right hemi-colectomy (2001). Follow-up colonoscopy three years prior to admission was reported as normal.

Due to the surgical and anaesthetic risk, the patient was transferred to a second hospital for laparotomy and stoma formation.

The patient was reassessed on admission, and it was decided that a colonic stent would be the preferred option for relieving the obstruction, due to the inherent perioperative mortality risk in performing a laparotomy and colostomy. Three days later, flexible sigmoidoscopy was performed. No tumour was seen, and the scope was unable to be advanced.

The following day, the patient collapsed. It was thought she may have suffered a myocardial infarction and post-collapse there were episodes of supraventricular tachycardia on the monitors. A heparin infusion that had been instigated was ceased within the following 24 hours.

A repeat endoscopy—with a plan to stent or proceed straight to surgery—was delayed, making this day seven after the patient's primary admission to the first hospital. The operation was then postponed a further 24 hours, during which time the patient passed small fluid bowel actions but continued to have a distended tender abdomen.

On day eight, a laparotomy and defunctioning colostomy were performed. Postoperatively, the patient became septic and was transferred to the intensive care unit (ICU). Despite full intervention in ICU, the patient continued to deteriorate, and she died one week later.

DISCUSSION

This patient was always at high risk of postoperative mortality due to the attendant medical comorbidities. It was a difficult case with a high risk of perioperative mortality whichever treatment options were selected.

The only question that arises is if laparotomy and colostomy had been performed as the first procedure after flexible sigmoidoscopy failed to negotiate the stricture, whether a more favourable outcome may have been achieved. This was a clinical decision based on risk. Certainly, if the patient had been able to have an endoscopic stent placed at the first intervention this would have been the preferred option. It is not clear from the notes why a stent was not planned at the first flexible sigmoidoscopy.

CLINICAL LESSONS

There were significant delays before this high-risk patient was able to receive surgery, presumably due to systemic issues, as they otherwise remain unexplained. This case highlights the need for surgeons to advocate strongly for their patients.

Case 2: Airway obstruction in advanced thyroid malignancy

Otolaryngology, head and neck

CASE SUMMARY

A male patient in his late 50s was transferred to a tertiary centre with impending airways obstruction. A benign fine needle aspirate had clouded the clinical picture of a rapidly enlarging mass.

Despite signs of significant airway obstruction, the patient was not seen by an ear, nose and throat surgeon for three days. When the airway was examined, a fixed vocal cord was found. Adrenaline nebulisation and intravenous (IV) dexamethasone were needed, however definitive airway securing was not performed until another four days had passed, now being one week after admission. With impending airway compromise, an urgent fibre-optic intubation, tracheostomy and attempted thyroidectomy were performed.

Postoperatively, the patient was unable to be weaned from the ventilator. Pathology showed a malignant spindle cell tumour of the thyroid, and a CT scan of the chest had shown multiple metastatic deposits with evidence of pleural effusions. There had been a delay in reading a chest X-ray that showed possible evidence of metastatic disease.

The patient was treated palliatively after surgery and passed away from respiratory failure.

DISCUSSION

This case has several areas for consideration. A patient with an impending airway obstruction waited seven days for a definitive diagnosis and airway control.

The final diagnosis was likely to be a form of anaplastic thyroid cancer for which no intervention would have helped, and the patient's outcome may not have changed. However, if it was an aggressive thyroid cancer, then aggressive surgery and possibly radioactive iodine may have improved the situation. The definitive pathology report to clarify this was not available.

The cause for postoperative respiratory failure is the other area of concern. Presumably due to the metastatic disease and pleural effusion, this may have been exacerbated by the delay in securing an airway. Admittedly, if it was anaplastic carcinoma, ultimately no intervention would have helped. Perioperatively, the tracheostomy was required, and this in itself did not cause the patient's demise.

CLINICAL LESSONS

This was an advanced thyroid malignancy likely to cause the patient's death no matter what treatment was performed. Nevertheless, avoidable delays in management and diagnosis occurred.

Case 3: Delayed exploration of soft tissue infection

General surgery

CASE SUMMARY

A female patient in her early 70s re-presented after a period of treatment for community-acquired pneumonia. She was an ex-smoker with a medical history of chronic obstructive airways disease and ischaemic heart disease. At admission, her primary complaint was shortness of breath, ascribed to either ongoing pneumonia or heart failure. Erythematous areas at the left hip, left axilla and right hip were noted¹. She was initially treated as a recurrence of pneumonia, with suspected cellulitis of the left breast, right flank and back.

The patient commenced IV antibiotics under the general medicine team and the general surgeons were consulted. Recent ultrasound had demonstrated no drainable collection. The plan for IV antibiotics continued.

Surgical review the next day found no improvement. The patient was noted to have a likely abscess of the left breast. No plan for surgical management of the abscess was made. An infectious disease consultant was asked for an opinion.

Over the following days, significant pain in the left breast and right hip was the primary complaint. Still no surgical plan was made for any operative intervention. On the Friday, a plan was made for surgery that day, however this was later amended to 'tomorrow', and later replaced with 'Monday' (three days later than initially intended). Surgical review on the Saturday noted: 'clinically not necrotising fasciitis' after 'de-epithelialising the blisters.'

The patient deteriorated significantly over the weekend. On the Sunday morning she was admitted to ICU, and after surgical review and an incision under local anaesthetic at about 14:00 hours, she was taken to theatre later that afternoon. Significant necrotic soft tissue and muscle were debrided from the chest wall, abdomen and flanks, and left breast.

The patient was quite unstable on return to ICU. She returned to theatre the following day, where more necrotic tissue was debrided from the chest wall, abdomen, flanks (bilateral), left breast and lower back. After re-operation the patient failed to respond. She passed away the following day.

DISCUSSION

The only area of consideration in this case is earlier exploration of the wound.

Earlier exploration of the necrotic areas, especially after identification of a possible abscess on the second day of admission may have led to more aggressive treatment.

Even in hindsight, however, the actual diagnosis here is uncertain. If the diagnosis was necrotising fasciitis, then earlier radical debridement may have had a chance of success. However, in this patient with multiple comorbidities and recent pneumonia, chance of survival from necrotising fasciitis was likely to be small. Some would not have progressed to debridement even if the diagnosis was more certain. If the deterioration was merely a symptom of multiorgan failure secondary to progression of sepsis from pneumonia, then earlier more radical debridement would probably not have made any difference.

CLINICAL LESSONS

This is an instance of a very significant delay when managing a soft tissue infection. Earlier exploration of the wound should have been considered. The incision under local anaesthetic should have been done four or five days earlier when the suspicion was raised that this was more than just cellulitis.

REFERENCES

¹ Lee CY, Li YY, Huang TW, et al. Synchronous multifocal necrotizing fasciitis prognostic factors: a retrospective case series study in a single center. *Infection*. 2016;44(6):757-763. doi:10.1007/s15010-016-0932-9

Case 4: Delayed treatment of necrotising myositis

Vascular surgery

CASE SUMMARY

An Indigenous female in her mid-50s from a remote community presented to a rural hospital at 10:30 with a fever of two days duration, flu-like symptoms, cough, and a peeling, red, blistered left leg with scalded appearance (the patient denied a burn injury). Medical history included type 2 diabetes mellitus (DM), chronic renal failure (not on dialysis), peripheral vascular disease with right below knee amputation (BKA), left forefoot amputation, and a stroke/cerebrovascular accident (CVA).

The patient was assessed as septic (possible chest or left leg origin) and started on vancomycin and lincomycin. She was resuscitated and transferred to the base hospital by air that afternoon. Her blood pressure (BP) dropped en-route so she was commenced on metaraminol and piperacillin/tazobactam were added to the regime.

One hour after arrival at the base hospital at 18:30, the patient was reviewed by the surgical registrar, who considered necrotising fasciitis or burn as the differential diagnosis for the left leg changes. The registrar arranged with the on-call consultant to review the case together, however no further surgical notes appeared until an intern note at 09:00 the following morning.

The patient, meanwhile, had been admitted to ICU and intubated that evening. Resuscitation and antibiotics were ongoing, and the findings in the leg were described as 'cellulitis'. A CT scan showed a large right pleural effusion with collapse of the right lung, gross subcutaneous oedema, ascites and peripheral vascular disease with stenosis in femoral vessels. A pleural drain was placed and produced serous fluid, leading to complete re-expansion of the right lung. An ICU medical review at 23:00 indicated that debridement of the leg was being considered. The patient remained reasonably stable overnight, with ICU entries still referring to 'cellulitis' of the left leg.

At the time of the surgical entry by the intern at ward rounds the next morning, necrotising fasciitis was still being considered. Vascular surgeon was consulted for a second opinion and a bedside biopsy was taken around midday. A left above knee amputation (AKA) was undertaken at 18:18 that evening, more than 24 hours after admission to the base hospital and 32 hours after presentation.

The remainder of the admission consisted of ongoing multidisciplinary support in ICU, complicated by renal failure, ongoing fever, pneumothorax and multiorgan

failure. It was thought there could be ongoing sepsis in the amputation stump, but several surgical and vascular reviews appeared to rule this out.

Limits of care were discussed five days after surgery and the patient died nine days later.

DISCUSSION

The health of this patient was severely compromised. When she developed a severe septic condition there was a considerable chance of death, even with the best medical care.

It seems likely that this was a case of necrotising myositis secondary to group A streptococci infection (the relevant microbiology report was not identified but summaries indicate that group A streptococci were the main organisms). The operation report is brief, but this and subsequent entries talk of gas gangrene and necrotising myositis, along with ongoing references to necrotising fasciitis and cellulitis.

The initial assessment, differential diagnosis, treatment and early transfer appear exemplary. Appropriate antibiotics were instituted to cover the possibility of necrotising fasciitis. Initial assessment and ongoing resuscitation at the base hospital was also appropriate and timely, and early surgical registrar review was appropriate. A necrotising infection of the leg was considered in the differential diagnosis and arrangements were made for a consultant surgical review at the earliest possible time.

ICU initiated early intubation, extensive monitoring and a CT scan, which confirmed a large pleural effusion and collapsed right lung. The effusion was immediately drained of serous fluid and the lung expanded, making it less likely that the chest was the primary source of sepsis.

By approximately 22:00 on the first day (12 hours after presenting at the rural hospital), the patient's hemodynamic state was stable, her problems were well delineated, and all resuscitative measures had been instigated. This would have been the ideal time to have explored the leg with a view to debridement or amputation, given the still open diagnosis of a necrotising infection of the leg as the primary cause of this serious presentation. This did not occur for another 20 hours. This was a significant failure of surgical decision-making and is an area of concern.

In cases of necrotising fasciitis or myositis, early radical surgical debridement of devitalised tissue is the principle definitive intervention shown to decrease mortality. Even with early surgical debridement, this patient had a high chance of dying, given her much compromised state. The delay in surgical intervention increased this likelihood.

Ongoing treatment and support, including the decision to de-escalate treatment, appear exemplary. The hospital records are extensive, comprehensive and legible in their typed format. In this context, documentation of the crucial surgical decision-making is relatively poor. In particular, no record relating to a consultant review on the evening of the first day was identified, and the course to the eventual decision to proceed to theatre on the second evening was also unclear.

Necrotising infection comprised the differential diagnosis from the very beginning in this case. All other adjunctive measures appear to have been initiated in a timely way, making the subsequent delay in surgical intervention even more regrettable.

CLINICAL LESSONS

Ongoing discussion and presentation of this case (and other cases of necrotising infections) at hospital meetings involving surgeons, ICU and emergency department (ED) staff, should emphasise and reinforce the emergency nature of surgical intervention. It is important to develop a culture of early recognition (which appears to have been very good) and intervention.

Decisions to perform gross, mutilating debridement on sick patients, who often cannot fully participate in decision-making, are very challenging. This is an ideal situation where an early second opinion from a trusted, experienced colleague is very useful and wise.

Case 5: Delayed treatment of diabetic foot sepsis compromised outcome

Vascular surgery

CASE SUMMARY

A male patient in his mid-60s was admitted with severe right foot sepsis (C-reactive protein [CRP] 190) and wet gangrene under the care of the renal physician. Medical history included end-stage renal failure on haemodialysis, type 2 DM, peripheral neuropathy, peripheral arterial disease, heart failure, non-alcoholic fatty liver cirrhosis, anaemia and depression. A transfer request was discussed with the vascular surgery team at a second metropolitan hospital, who advised that transfer was not urgent.

The next day, the patient was reviewed by a vascular surgeon and transfer was again requested. One day later, the patient was transferred and booked for a BKA the following day.

Surgery was performed two days later—five days after initial patient presentation. Wound inspection four days after surgery noted bruising around the wound edge. Inspection two days later revealed blister and pustules on the stump, which was tense, oedematous and erythematous. The patient developed signs of chest infection the following day.

The wound was again reviewed by the vascular consultant three days later—10 days after the BKA. Conversion to an AKA was raised. Wound review occurred two days later and again the next day, when the AKA was planned for the following day. The surgery proceeded as planned.

Haemoglobin (Hb) of 75 g/L the day after surgery, dropped to 58 g/L the next day and two units of blood were transfused. Two days later, the medical emergency team (MET) was summoned for reduced Glasgow coma scale (GCS), and the patient was diagnosed as having transient fluctuation in neurological state due to haemodialysis. The patient suffered asystolic cardiac arrest three days later and was unable to be resuscitated.

DISCUSSION

There are several areas of concern in the care of this patient. Some of these had the potential to impact the outcome, however, death was always likely.

The patient had wet gangrene and severe infection of the foot with CRP 190, which

would mandate immediate transfer and emergency surgery. Instead, the transfer was delayed for 48 hours and the surgery (BKA) was delayed for five days.

The wound was found to be ischaemic and infected after surgery, and although the wound was reviewed by multiple members of the vascular team and thought to require AKA, this was not carried out for another eight days.

The patient was also not cared for in the high dependency unit on either occasion post-surgery. This, again indicating a lack of appreciation of the high mortality associated with major amputation secondary to peripheral arterial disease, particularly in the setting of diabetes and renal failure.

There was no record in the clinical notes of discussion of the management plan with family or in a multidisciplinary setting (perhaps this happened but was not recorded).

The patient was noted to have low Hb after the AKA, however, the transfusion didn't happen until Hb dropped to 58 g/L. Adherence to a strict transfusion guideline of under 70 g/L will likely trigger cardiac ischaemia in this group of high-risk patients.

CLINICAL LESSONS

Significant delay in accepting transfer of the patient and arranging surgery for both the BKA and the subsequent AKA was the main concern.

Case 6: Missed small bowel injury following complex revisional bariatric surgery

General surgery

CASE SUMMARY

A female patient in her mid-60s was admitted to a private hospital for elective weight loss surgery. She was morbidly obese, weighing 135 kg with a body mass index of 51. Medical history included a gastric band of some 20 years, with consequent band failure, pouch dilatation and dysmotility manifested by residual food in the pouch on multiple endoscopies, severe reflux and a hiatal hernia with a past Cameron ulcer. Total colectomy for ulcerative colitis had been performed more than 20 years previously, and her midline was characterised by a large ventral hernia. She had no other significant medical problems.

The five-and-a-half-hour surgery entailed on-table gastroscopy, laparoscopic adhesiolysis, explantation of the gastric band, small bowel resection, laparoscopic hiatus hernia repair, and laparoscopic sleeve gastrectomy converted intraoperatively to open single loop gastric bypass following further open adhesiolysis. A small bowel injury during the adhesiolysis resulted in a small bowel resection with a primary stapled anastomosis.

The early postoperative course was notable for tachycardia, tachypnoea, poor oxygen saturations, and an inadequate and declining urine output. As the morning of postoperative day one progressed, the patient became hypotensive (down to systolic in the low 70s), which was addressed with metaraminol. Agents, including ketamine and fentanyl, were employed to manage problematic pain.

She became increasingly unwell during the day. Although afebrile and no longer tachycardic, she developed oliguria, and was later intubated and ventilated because of respiratory and lactic acidosis. The reason for her deterioration was unknown; consideration was given to acute chest syndrome/acute respiratory distress syndrome/intra-abdominal sepsis.

The patient remained hypotensive and oliguric during the evening, with increasing vasopressor requirements. She had very poor cardiac function on echocardiogram (ejection fraction 35%) and worsening hypoxaemia. A CT scan revealed a few small pockets of intraperitoneal air but no free fluid. Discussion between the operating surgeon and ICU specialists concluded that this was a respiratory/cardiac issue.

In the early hours of postoperative day two, the patient deteriorated further and was transferred to a public hospital, where she was assessed by the surgical team.

A CT pulmonary angiogram was performed, and no pulmonary embolus found. The upper gastrointestinal surgical team reviewed the patient and diagnosed intra-abdominal sepsis. She was taken to theatre for emergency laparotomy and a small bowel injury was found with significant contamination. The patient was critically unwell, so damage control laparotomy was performed, with resection of the small bowel enterotomy without anastomosis, and laparostomy. The following day, a relook showed a necrotising infection in the left abdominal wall requiring extensive debridement. The small gut was viable, and no further bile leak was seen. At relook 48 hours later, the small bowel was anastomosed.

The patient returned to theatre on many occasions over the ensuing eight weeks. She developed multiple fistulae, including gastrocutaneous from the proximal pouch and enterocutaneous further down the small bowel. Despite multidisciplinary management of this complex patient, she succumbed to overwhelming sepsis almost two months later.

DISCUSSION

This was a complex revisional bariatric procedure in a morbidly obese woman in her mid-60s. Unfortunately for this patient, the delay in early surgical intervention rendered her course prolonged and ultimately fatal.

It is apparent from the operative report that significant dissection and adhesiolysis were required to free up the anatomy to perform the planned procedure. Of significant note, after this extensive dissection, the original planned bariatric procedure was converted to another procedure intraoperatively. Of equal note, during the course of the surgery the laparoscopic approach was converted to open surgery.

Within 24 hours of the procedure, the patient was seriously unwell, such that she required intubation and mechanical ventilation. The decline was initially heralded by tachycardia, tachypnoea and oliguria. Soon after, hypotension requiring inotropic support, acute kidney injury, and finally, respiratory/lactic acidosis, declared the patient critically unwell. In the background, she had pain that was very difficult to manage, requiring opioid and ketamine infusions.

In the setting of a long and complex surgery, particularly one where there is a long staple line, at least two gut anastomoses and a laborious adhesiolysis, one would have expected an abdominal focus to be given first consideration as the culprit in this patient's serious decline. It appears from the notes that the surgeon and intensivists involved in her care gave inadequate credence to this likelihood, instead focusing on a cardiorespiratory aetiology. The relatively normal CT does not exclude a major abdominal catastrophe, given the clinical signs in this morbidly obese patient.

The opportunity to salvage this patient was probably missed in the first 24 hours following surgery. It seems likely that she already had bile peritonitis at that juncture, and a timely relook laparotomy would have identified this injury before she became even more critically unwell. Early intervention may have required only a simple oversewing of an enterotomy or perhaps resection, but, at the very least, the ongoing insult would have been contained and the physiological insult limited.

A second, albeit possibly more controversial, consideration is the surgeon's choice to convert from sleeve to single loop bypass. While the principle of conversion on the basis of creating a low-pressure system (bypass) to decompress the high-pressure system (sleeve) is supported, the option of a classic Roux-en-Y configuration would be favoured for the simple reason that if this were to leak (at the gastrostomy-jejunostomy), it is a 'dry' limb. There are only salivary secretions passing through the alimentary limb, as the hepato-pancreato-biliary limb (along with its far more corrosive enzymes) has been diverted away from the gastrojejunostomy, typically by a length of at least 50 cm. Thus, to dry out the alimentary limb requires only a nasogastric/nasojejunal tube. In contrast, the single loop anastomosis has 2–3 L of gastric, bile and pancreatic secretions passing by, with far worse consequences in the event of an anastomotic leak. This case was already difficult due to the adhesions; furthermore, the gastric band adhesions at the top end had compromised the sleeve, which was then converted to a gastric pouch, again favouring the option of the Roux-en-Y.

CLINICAL LESSONS

In the early postoperative period, certainly within the first 24 hours, a seriously unwell surgical patient must have an abdominal cause for decline excluded, even if this must be proven by reoperation. This is particularly relevant in morbidly obese patients whose physiology and clinical signs may mask serious intra-abdominal pathology. Given the scale and complexity of surgery, it is difficult to imagine that decent drain tubes were not in place after the first operation. The output of these would have signalled the bowel leak and led to earlier intervention. A very high index of suspicion is prudent and equally a low threshold for take back is safe. A negative diagnostic laparoscopy/laparotomy is far easier to justify than a delayed diagnosis resulting in a poor outcome. The missed diagnosis of peritonitis was critical.

The site of initial surgery was problematic. By the second postoperative day, the private hospital was considered inadequate and transfer to a public hospital was undertaken. Given the fairly predictable serious complications with this high-risk case, the initial choice of hospital was an issue.

The operating surgeon knows the patient better than anyone else involved in their

care. Thus, the surgeon should be cautious not to be unduly influenced by other specialists involved in the patient's care when this advice seems contrary to their surgical opinion or the patient's clinical state. The opinions of other specialists should certainly be considered and are often very valuable, but in situations such as this, sometimes the simple answer is to go back for another look and ask: What abdominal injury has caused the decline? Have I proven without doubt that the abdomen is not the culprit?

When considering revisional bariatric surgery, which carries a higher risk for serious complications, procedural choice is always best tailored to a patient's individual characteristics and previous operations. Options for conversion are largely the surgeon's choice, with the data supporting a multitude of options. It is worth remembering that two-stage procedures are a reasonable option. Sometimes it is better to bail and come back to fight another day.

Case 7: Delayed/missed diagnosis ends in perforated ischaemic bowel

General surgery

CASE SUMMARY

A male in his early 50s presented with worsening intermittent abdominal pain occurring over the preceding few weeks. There was history of diarrhoea with no obvious blood, and intermittent vomiting. A colonoscopy had been performed two weeks previously, identifying inflammation in the caecum. Biopsies of this were non-specific. Medical history included testicular cancer 15 years ago, bilateral inguinal hernia repairs, CVA in 2015, emphysema, epilepsy and a non-specific psychiatric disorder.

Initial assessment showed the patient to be afebrile and cachectic. His abdomen was soft, with tenderness in the right iliac fossa. Pain was described as severe. CRP was 229 and white cell count (WCC) 14.3. He was transferred to the treating hospital that evening and seen in ED. At that time, he was hypertensive with pulse rate (PR) 80 beats per minute (BPM). A CT scan showed dilated small and large bowel with maximum diameter of the small bowel 4 cm. No obvious transition point was seen and there was no free fluid or air. The patient was admitted under the general medical unit.

The surgical registrar assessed the patient near midnight on the following day, as he was complaining of severe abdominal pain requiring morphine. The abdomen was soft with no distension and mild lower abdominal tenderness. A presumed diagnosis of enteritis was made, and the patient continued treatment under the medical team. He was reviewed by the surgical team, including the consultant, the following morning (BP 159/100 mm Hg, PR 77 BPM). The abdomen was soft with tenderness on the right side and no evidence of peritonitis. There was no evidence of abdominal collection or obstruction.

An opinion from the gastroenterology team was obtained. The main concern at that time was abdominal pain and distension. The patient had become significantly hypertensive with BP 171/106 mm Hg. CRP had risen to 260 and WCC remained high. There had been no bowel motions for the last three days. It was concluded that the patient had an ileus.

The patient had a further assessment by the surgical registrar 36 hours later. PR had risen to 99 BPM and abdominal distension was noted. The patient had some vomiting, and a nasogastric tube was inserted. Six hours later he collapsed, with a BP of 86/40 mm Hg and PR of 124 BPM. His abdomen was distended and there were

signs of generalised peritonitis. A diagnosis of perforated viscus was made, and the patient was taken promptly to theatre where a laparotomy was performed. Surgery was performed by a Fellow with a consultant present in the theatre.

Ischaemic bowel from the duodenojejunal flexure to the terminal ileum was found, with the colon blood supply compromised from the caecum to the rectosigmoid region. The gall bladder appeared dilated and necrotic, and there was faeculent fluid throughout the abdomen. No palpable pulse was identified in the superior mesenteric artery or its branches. It was determined that the situation was not salvageable, and the abdomen was closed. The patient passed away that afternoon with his family in attendance.

DISCUSSION

This patient presented with a probable embolus to the mesenteric arteries. This diagnosis is very difficult to make in the early stages as it often presents with generalised symptoms such as hypertension and tachycardia and very little in the way of abdominal signs. This is a grave condition and if the patient is to survive it is important that the diagnosis be made as soon as possible.

Two days after presentation, the patient had six doses of morphine for abdominal pain plus a further eight intermittent doses the following day. The higher CRP and WCC, and the ongoing requirement for pain relief, should have alerted the surgical team that there may be a more serious diagnosis than an ileus following an infective enteritis.

The admission of this patient under a medical unit for a presentation with primarily abdominal pain meant that the surgical team was not the main decision-maker and did not adopt primary responsibility. If the patient had been admitted under the surgical unit, there would have been more regular review by a senior surgeon, potentially reaching an earlier diagnosis with the laparotomy performed sooner—prior to perforation and possibly prior to the development of bowel ischaemia. It should be noted, however, that this condition carries a high mortality even if surgery is performed at any early stage.

In summary, this patient succumbed to mesenteric embolus resulting in small and large bowel ischaemia and perforation. It appears that this diagnosis was not entertained until the patient had perforated and developed peritonitis. Laparotomy at that late stage was unable to save this patient.

CLINICAL LESSONS

A high clinical index of suspicion should be taken in patients who have severe abdominal pain in the absence of any significant abdominal findings. Regular clinical review by a senior surgeon is required.

Case 8: Delayed laparotomy in deteriorating cardiothoracic patient

Cardiothoracic surgery

CASE SUMMARY

A male patient aged 70 was transferred to a tertiary hospital after an unconscious collapse assessed as being secondary to severe aortic stenosis. His aortic valve was replaced on day 11 of his hospital admission, the delay being due to lack of operating theatre time. The procedure and initial recovery were satisfactory.

On the second postoperative day the patient's oxygen saturation levels began to deteriorate. This was initially ascribed to hypoventilation secondary to pain and a history of asbestosis.

On the fourth postoperative day, after two MET calls for tachypnoea, the patient was transferred to ICU. His abdomen had become distended. The surgical team was called, and the possibility of ischaemic bowel was raised. The patient's condition declined steadily. He was assessed by the surgical team several times but not considered in need of intervention. A CT scan was initially thought to show ileus only, however a subsequent report mentions pneumatosis coli—a sign of ischaemic colitis.

By the fifth postoperative day, the patient was tachycardic, febrile and on a low dose of noradrenaline to maintain BP, with worsening respiratory failure and evidence of acute kidney injury. Laparotomy was still not considered to be indicated.

On the sixth postoperative day, the patient underwent a laparotomy. The findings were underwhelming (no evidence of full thickness infarction) given the gravity of his condition at this time, possibly because he had either colonic mucosal ischaemia or venous ischaemia of the small and large bowel (or both). He underwent a right hemicolectomy and ileostomy.

The patient deteriorated rapidly after this procedure, requiring increased inotropes and dialysis. He died of multiorgan failure the following day, one week after his aortic valve replacement.

DISCUSSION

Ischaemic bowel can be notoriously difficult to diagnose, particularly in a postoperative patient when the main symptom—pain—can be masked by

analgesia. Non-occlusive ischaemia of the bowel also has a very poor prognosis. There is no certainty that this patient would have survived even if the case for laparotomy had been made earlier. Nevertheless, there are several concerning aspects to this case.

Documentation of a deteriorating patient was first class, but the necessary intervention to reverse the situation was too little, too late. There were subtle early signs that all was not well with the desaturation on days two and three. It is understandable that these were observed rather than taken further, but by the time of the MET calls and ICU transfer on day four, it should have been clear that there was an undiagnosed cause of rapid deterioration, with the abdomen as the focus. That the patient should wait another 48 hours (with multiple clinical reviews) before undergoing laparotomy in a moribund state, is hard to fathom.

It is unclear when the surgical team became aware of the pneumatosis coli on CT. It should have been reported by the radiologist directly to the general surgical team. In a deteriorating patient, this is an indication for surgery.

The surgery, when it did occur, was a five-hour right hemicolectomy by a Fellow, with no consultant input. It is recommended that a consultant surgeon always be involved in such cases, even if just to keep the operation moving so that as little time as possible is spent in the operating theatre.

Finally, a right hemicolectomy, whilst it removed the area of the pneumatosis, was likely to be inadequate in such an unwell patient. A total colectomy and ileostomy would be the procedure of choice in an unwell patient with ischaemic gut and no evidence of small bowel infarction¹.

CLINICAL LESSONS

This patient may have died even in the best of clinical circumstances, but there is a lot to learn from this case. Above all, it strongly reinforces the message that surgical decision-making in the deteriorating patient is about intervention – at the right time, with the right procedure, and with the appropriate personnel.

REFERENCES

¹ Tilsed JV, Casamassima A, Kurihara H, et al. ESTES guidelines: acute mesenteric ischaemia. *Eur J Trauma Emerg Surg*. 2016;42(2):253-270. doi:10.1007/s00068-016-0634-0

Case 9: Elderly patient with ischaemic volvulus

General surgery

CASE SUMMARY

A female patient in her early 80s, with history of previous resected renal tumour and colon cancer, arrived by ambulance at a peripheral metropolitan centre at 03:30. She was in extreme pain and correctly assessed as likely to have ischaemic bowel.

The patient was transferred to the nearest tertiary centre with surgical services. She was given IV fentanyl at 07:30 and admitted under general surgery at 11:00. A CT scan reported a poorly perfused small bowel volvulus, but also a significant superior mesenteric artery (SMA) stenosis, although distal run-off was noted. Discussion with a vascular consultant concluded that the SMA stenosis was not acute or relevant to the surgery, but further discussion would occur if required.

The patient arrived in theatre at 12:00, some nine hours after presenting at the peripheral site. She was given a preoperative national emergency laparotomy audit (NELA) score of 24%, which was documented on her initial consent. She was noted to be for full resuscitation and ICU on her anaesthetic chart.

The patient underwent division of a band adhesion, and some small bowel with questionable viability was recovered via reperfusion as a result. The two-hour operation was performed by a registrar with a Fellow and consultant scrubbed in. The patient was assessed in recovery six hours postoperatively, and, secondary to improvement of the arterial blood gas and short time off inotropic medication, she was admitted to the ward instead of to ICU.

The next morning, there was a MET call for hypotension and rectal bleeding. The patient was returned to theatre for surgery undertaken by the same team but this time with the Fellow as the surgeon. There was blood in the peritoneal cavity, and a portion of the small bowel was ischaemic and resected. It is not known if this was the same small bowel of concern in the first operation. The operation report states there was some 'unhealthy' small bowel (length unstated) proximal to the anastomosis. The abdomen was intentionally packed for a planned relook the following day. The patient went to ICU intubated, requiring inotropes and with worsening renal function.

She deteriorated the next day and was returned to theatre for the planned relook. This third operation was undertaken by a different Fellow. There was no consultant in theatre. The small bowel distal to the anastomosis was dusky and

the proximal bowel was pale but not dusky. An intraoperative vascular opinion was again sought regarding SMA revascularisation. This was provided by an on-site registrar with a consultant on the phone. Stenting of the SMA stenosis was suggested, but after discussion between the surgical team, ICU and family, the patient was palliated and passed away that night.

DISCUSSION

No adverse event contributed to this patient's death nor could any different care have prevented death in this very high-risk patient. However, several points are worthy of mention.

There was a nine-hour delay from the time of the diagnosis of ischaemic bowel at the peripheral hospital to the time of surgery. This is not ideal. However, even in a perfect world, the necessity for transfer would make it difficult to deliver a patient to theatre in less than six hours. Given what followed, it is unlikely the additional three hours had any impact on the outcome. Nevertheless, referrals between these two hospitals are common and this case suggests that this is not a robust transfer process for very urgent cases and should be reviewed.

This was a high-risk patient who struggled in recovery for six hours after the first laparotomy and was sent back to the ward late in the evening, as opposed to being admitted directly to ICU. The reasons for this are unclear and, given the high NELA score, was probably not appropriate for surgery. Although unrelated, the deterioration prior to the MET call and collapse with per rectal bleeding may have been managed in a timelier fashion with the resources of ICU.

In retrospect, a small bowel resection at the first operation or resection of the dubious bowel proximal to the anastomosis at the second operation might have been preferable. There appears to have been sufficient small bowel remaining to do that. However, this was a considered decision by experienced surgeons so was probably reasonable.

Some surgeons might be critical of constructing an anastomosis at the second operation; however, it was likely irrelevant to the outcome as the patient was going to be returned to theatre the next day.

CLINICAL LESSONS

A nine-hour delay from the time of diagnosis of ischaemic bowel to the time of surgery is not ideal.

As a matter of principal, it is recommended that a consultant should be present when a high-risk patient is being returned to theatre for the third time in less than 72 hours. That stated, the absence of the consultant was not material.

Case 10: Postoperative ischaemic gut

Urology

CASE SUMMARY

A woman in her early 80s, a heavy smoker with a history of hypertension, appendicectomy, and gastrectomy for stomach cancer 40 years ago with multiple revisions for dumping syndrome, had a CT urogram showing an obstructed non-functioning right kidney. She had a cystoscopy, right retrograde pyelogram, ureteroscopy and biopsy four months later when a high-grade obstructing urothelial carcinoma of her distal right ureter was confirmed.

Five months later, she had an eight-hour operation with robotic-assisted laparoscopic right nephrectomy, with removal of the kidney, ureter and bladder cuff through a lower midline abdominal incision. The procedure was very difficult because of retroperitoneal desmoplastic fibrosis but no surgical complications were reported. She had intraoperative pneumatic calf compression and subcutaneous heparin (5,000 units bd) postoperatively as thromboembolic prophylaxis.

After an uneventful early postoperative recovery, on the evening of the third day she developed abdominal pain and had a large vomit, followed by clinical deterioration. An electrocardiogram (ECG) recorded supraventricular tachycardia and she had a MET call for tachypnoea, tachycardia and desaturation when another ECG recorded rapid atrial fibrillation (AF).

The patient was transferred to ICU several hours later, with a differential diagnosis of sepsis or pulmonary embolism. CT pulmonary angiogram excluded pulmonary embolism. CT abdomen showed an SMA occlusion with small bowel and proximal colon infarction. The diagnosis was discussed with the patient and family and the decision was reached to provide comfort care only and she died five hours later.

DISCUSSION

Despite this patient's age, surgery was appropriate for her high-grade invasive and apparently localised obstructing urothelial carcinoma of distal right ureter. The long delay in diagnostic biopsy and subsequent surgery was not ideal, but with an obstructed non-functioning kidney the tumour had been there a long time and it is unlikely these delays contributed significantly to the surgical difficulty or her death. There was no prolonged hypotension to contribute to SMA thrombosis. SMA thrombosis, rather than embolism, is thought more likely as she was in sinus

rhythm until supraventricular tachycardia was documented (at which time she likely already had SMA occlusion), after which rapid AF was observed during her MET call.

The lengthy surgery could have contributed to the SMA occlusion though there is no evidence for this. The occlusion was likely related to her age and smoking related atherosclerosis. She may have been hypercoagulable in association with her malignancy, but she had no episodes of prolonged hypotension to contribute to this. An open nephroureterectomy with one or two incisions would have been much quicker, usually less than half the time. Palliative care after the diagnosis of SMA occlusion and ischaemic bowel was appropriate.

CLINICAL LESSONS

Patients with malignancy are known to have a hypercoagulable state contributing to thromboembolic conditions in the postoperative phase. This is generally linked to venous thromboembolism not arterial, and most studies implicate gastrointestinal, pancreatic, breast, gynaecological, melanoma and some haematological cancers, rather than urological malignancies. A sudden onset of severe abdominal pain, often with vomiting and clinical deterioration, is expected with SMA thrombosis and infarction of small bowel and proximal colon.

Case 11: Septic shock from perforated duodenal ulcer – delays in ED

General surgery

CASE SUMMARY

A male in his mid-50s was admitted to hospital with septic shock. He presented to ED via ambulance at 17:30 and was noted to have new onset AF (PR 120 BPM), hypotension (BP 80/50 mm Hg), anuria and confusion for two days. He had a background history of treated hypertension and excess alcohol intake and was a heavy smoker. His general practitioner had diagnosed a chest infection two days earlier and prescribed oral antibiotics.

A nursing note indicates he was seen by an ED consultant 90 minutes after arrival and commenced on IV fluids. He responded poorly to fluid resuscitation but experienced significant delay to escalation in treatment. By 20:18, new onset rapid AF, hypovolaemia, acidosis, cough and acute kidney injury were noted by an ED registrar. A chest X-ray failed to demonstrate consolidation. No abdominal examination findings were recorded. A provisional diagnosis of chest infection with exacerbation of chronic obstructive pulmonary disease was made, and he was referred to the general medical team.

Throughout the night, the patient had persistent tachycardia, hypotension, tachypnoea and anuria. An indwelling urinary catheter was inserted only at 03:56, despite severe acute kidney injury, acidosis and anuria. When the ICU registrar saw the patient an hour later, it was noted that medical staff in ED had not reviewed the patient for more than eight hours.

The ICU registrar noted tenderness to palpation in the right upper quadrant of the abdomen. Invasive monitoring started and the patient was given inotropic support and transferred to ICU, where he remained on inotropic support and required intubation. A CT of the chest and abdomen requested at 13:36 was not performed until 15:00 hours.

These investigations organised from ICU identified a perforated duodenal ulcer as the septic source. The patient was referred to surgery, where management consisted of a laparotomy with repair of perforated anterior duodenal ulcer with omental patch, commencing at 21:00 hours—more than 24 hours after the patient first presented to hospital. Despite the technical success of the procedure, he had ongoing multiorgan dysfunction with impaired cognition, leading to aspiration pneumonia and death.

DISCUSSION

This man was inadequately assessed in ED with a significant underestimation of the gravity of his presentation. Failure of adequate response to resuscitation should have led to regular review and timely escalation of care. There is little evidence of this in the medical notes and no note in the medical record of the patient ever being seen by the medical team in ED. Once ICU was consulted, his care was escalated but earlier investigation to identify the septic source would have been appropriate.

It is unclear when a surgical team was requested to assess the patient. ICU and surgical management were appropriate, with belated surgical management of a perforated duodenal ulcer. However, the patient had ongoing multiorgan dysfunction and died with aspiration pneumonia.

CLINICAL LESSONS

Prompt and active treatment of septic shock, with earlier investigation and management of the source, may have made a dramatic difference in this man's outcome.

Case 12: Undue surgical delay for fractured femur

Orthopaedic surgery

CASE SUMMARY

A male patient in his early 90s was brought to ED after a fall the previous evening that caused a proximal femur fracture. He had spent approximately 12 hours on the floor at home prior to being discovered by a neighbour, who called the ambulance. Medical history included AF, Parkinson's disease and previous transient ischaemic events. He described a shooting pain in his head when getting up, which had led to his fall.

The patient had high lactate and was adequately resuscitated in ED. He was seen by both the orthopaedic and medical teams and was investigated for subarachnoid haemorrhage with a CT brain scan followed by magnetic resonance imaging (MRI). No acute pathology was found. At 17:30, the patient was sent to the ward and fasted for surgery the next day. He had an elevated international normalised ratio (consistent with AF treatment), which was reversed with vitamin K in preparation for surgery and was proactively prescribed enoxaparin.

Despite the patient fasting during day two of admission, surgery did not take place. The reason why the surgery was delayed was not recorded in the clinical record.

At 22:00 that night—more than 48 hours since the fall—the patient was reviewed by the resident for hypoxia, thought to be caused by the patient sleeping. At 04:40, a MET call occurred for ongoing hypoxia (saturation at 86% on 4 L of oxygen per minute). A chest radiograph revealed acute pulmonary oedema and the patient was started on frusemide. After review by the medical team, the orthopaedic geriatric team and the anaesthetics team, and discussion with the family, the patient was taken to theatre and had a long intramedullary nail inserted in his femur.

Postoperatively on the ward, the patient remained delirious and required increasing amounts of oxygen. He was reviewed by the appropriate teams, and discussions with the family led to the decision to palliate and withdraw active treatments. He died on the sixth day of hospital admission, three days after the operation.

DISCUSSION

The decision to operate or not can be difficult in a patient with multiple medical comorbidities, including a long period of bed rest prior to surgery and increasing oxygen supply preoperatively. A multidisciplinary decision-making approach (including multiple medical teams, anaesthetics and orthopaedics), including

discussions with the family, was employed. With the patient living independently alone in his own home prior to admission, it was appropriate to proceed with surgery in keeping with the wishes of the patient and family.

The patient appears to have been well managed from a medical perspective, including the general physician on admission, orthopaedic geriatrics during admission and palliative care during end of life. Anticoagulation was appropriate. The patient was on warfarin on admission, which was reversed, and the patient was covered with enoxaparin. Mechanical prophylaxis was charted, although twice daily checks were not signed by the nursing staff.

The choice of surgery—a long intramedullary nail—was appropriate treatment for this fracture. However, surgery was delayed for more than 48 hours after presentation to hospital.

The exact reason for surgical delay was not clearly documented. The patient was fasted and ready for surgery on day two, but the operation did not proceed. He began to deteriorate on the evening of his second night in hospital prior to surgery. Ideally, surgery should have occurred within 48 hours, especially when the patient had experienced a 12-hour delay to hospital. The delay to theatre is likely at a hospital and theatre-access level, but the exact cause could not be determined.

CLINICAL LESSONS

This patient represented a high risk of death during admission and the treatment choices were appropriate. The timing of surgery could have been improved, and the reason for delay of surgery should have been better documented in the clinical record.

Case 13: Accumulation of delays in pericardial drainage leads to fatal outcome

Cardiothoracic surgery

CASE SUMMARY

A female patient in her early 60s arrived by ambulance to ED shortly after midnight (00:43). She presented with a three-day history of increasing lethargy and dizziness. She was an active marijuana user. Medical history included chronic myelogenous leukemia under remission with chemotherapy, prior stroke and schizophrenia.

She was hypotensive in ED, with BP 70–90 mm Hg. A rapid CT scan reported a pericardial effusion. A bedside echocardiogram (echo) was not done until 04:00, which confirmed a large pericardial effusion with characteristics of tamponade. Ninety minutes passed before the cardiac surgery team attended, and a further hour before the anaesthetist arrived. One hour later, the patient arrived in theatre—approximately seven hours after presentation at hospital.

The patient was thought to be too uncooperative for preliminary relief of tamponade by aspiration under local anaesthetic. General anaesthetic induction occurred after 30 minutes of preliminary prepping and draping whilst the patient was still awake. She had a cardiac arrest shortly after induction. A sub-xiphisternal window was performed whilst closed massage progressed. Despite evacuation of 800 ml of blood-stained fluid, there was no improvement in haemodynamics. A full sternotomy and open massage, plus high inotropic support, resulted in restoration of circulation.

Over the subsequent days in ICU, haemodynamics continued to improve but the patient failed to wake up. An MRI, performed on postoperative day four, demonstrated severe hypoxic brain injury. A decision for palliation was made and the patient died the following day.

DISCUSSION

The delays to pericardial drainage are a concern. More than seven hours passed from presentation to the evacuation of the effusion. A vital component of this appears to be an unexplained interval of more than three hours in ED, between the diagnosis of a pericardial effusion on CT scan and the echo confirmation of not only a large effusion, but also of tamponade physiology.

A further four hours of delay occurred between the echo confirmation and evacuation of the effusion. This was a combination of delays to the surgical team notification, arrival and assessment, followed by the anaesthetic team arrival and assessment, and subsequent transfer to theatre. Even in theatre there was a delay of an hour between arrival and induction of anaesthesia.

Tamponade is a time-critical diagnosis and it is very likely that this cumulative delay contributed significantly to the patient's poor outcome.

Preparedness for surgical drainage is another area of concern. It is well known that patients with tamponade can deteriorate suddenly with anaesthetic induction. It was noted that the patient was too uncooperative for preliminary needle drainage under local anaesthetic. However, given the severity of the haemodynamic parameters and accumulated significant delays, it may have been worthwhile persisting with that approach.

It is commendable that the patient was prepped and draped prior to induction. However, it appears that not all the instruments were checked in advance, as there was mention of difficulties in assembling the sternal saw, with significant delays, while the patient was in cardiac arrest.

CLINICAL LESSONS

It is important not to fall into the trap of accounting for a patient's significant symptoms and impaired haemodynamics as being due to recreational drug effects, before excluding organic problems.

Prompt response to suspicious test findings is required. A three-hour delay in obtaining an echo, after a positive CT scan finding in a sick patient, is excessive.

Prompt referral, attendance and mobilisation of surgeon, anaesthetist and theatre is mandatory for time-critical processes such as tamponade.

To ensure rapid deployment of surgical manoeuvres, adequate preparation and anticipation for acute decompensation on anaesthetic induction is essential for surgical, anaesthetic and theatre team members.

Abbreviations

AF	atrial fibrillation
AKA	above knee amputation
BKA	below knee amputation
BP	blood pressure
BPM	beats per minute
CRP	C-reactive protein
CT	computed tomography
CVA	cerebrovascular accident
DM	diabetes mellitus
ECG	electrocardiogram
ED	emergency department
GCS	Glasgow coma scale
Hb	haemoglobin
ICU	intensive care unit
IV	intravenous
MET	medical emergency team
MRI	magnetic resonance imaging
NELA	National Emergency Laparotomy Audit
PR	pulse rate
SMA	superior mesenteric artery
WCC	white cell count

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