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Cover photo is 'Lost Time' by Geraldas Galinauskas.

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Guest Chair's Report

Looking at the lessons from the audit, in many ways there is nothing new; but it does highlight in some measure that the profession may be a victim of its own successes, as rapid transfer to major centres can be vital. Undoubtedly, the cases reported often highlight ineffective communication between regional hospitals and specialist centres. Perhaps more than ever before, given the complex nature of the patients that are being referred, it is imperative that the relevant consultant is involved early in the care of these patients and all relevant information is provided. The same applies to patients who develop new symptoms while hospitalised.

It is important to acknowledge that the cases reported were all complex. In such situations it is important that registrars should not feel uncomfortable in contacting the appropriate consultant. Equally, consultants need to be prepared to see the patient for themselves, as often the registrar may be relatively inexperienced and it becomes an extremely valuable learning experience for the trainee.

It is always important to remember the concept of first do no harm. In examination of the cases it seems that in some instances this concept may have been forgotten, as it was not possible to determine whether the likelihood of success was discussed in detail with the patients and their family members.

Professor Villis Marshall AC

Case Studies

Case 1: Simple surgical issue made complex by a late referral to surgical team

General Surgery

CASE SUMMARY

A 74-year-old female with a history of Charcot-Marie-Tooth disease and previous laparoscopic tubal ligation presented to the emergency department (ED) of another hospital with epigastric pain. Liver function tests were normal. An ultrasound demonstrated a gallbladder with a single stone as well as a dilated 11 mm common bile duct (CBD) with a single stone. The surgical team referred the patient to the gastroenterology unit at a tertiary referral centre for endoscopic retrograde cholangiopancreatography (ERCP), which took place 2 days later.

The first ERCP failed, presumably due to stenotic ampulla. The second ERCP was undertaken by a different gastroenterologist. This procedure also failed, despite extending the pre-cut on the ampulla, and there was also mention of wire cannulation perforation into the retroperitoneum. The notes did not indicate a referral to the surgical team. The gastroenterology team then arranged for a percutaneous transhepatic cholangiogram (PTC) with radiology, presumably to try wire cannulation of the bile ducts, to pass into the CBD and through the ampulla, to perform a rendezvous ERCP. This attempt at PTC failed, and a third ERCP was undertaken by yet another gastroenterologist, who recognised that it would not be possible to cannulate the ampulla and then made the referral to the hepatopancreato-biliary (HPB) surgical team.

The surgeons took the patient to the operating theatre 2 days later for a laparoscopic cholecystectomy and transcystic CBD exploration with the use of a SpyGlass choledochoscope. The operation report indicated that it was a straightforward procedure without any intraoperative issues. The operative drain was removed the following morning; however, the patient developed increased upper abdominal pain and a slight drop in haemoglobin (Hb). An emergency computed tomography (CT) scan in the early hours of the morning demonstrated a large subcapsular haematoma. The patient was taken to the operating theatre very shortly after with no delay, and laparoscopy confirmed the large subcapsular haematoma. There was no significant bleeding from the surgical site. On retrospective review of the CT scan, a vascular blush was noted, probably representing an intrahepatic vascular injury from the previous PTC,

which only manifested itself a few days later. The patient also developed an upper gastrointestinal (GI) bleed from an ulcer at the ampulla, likely related to previous pre-cuts made from the initial ERCPs. Unfortunately, the patient developed progressive multiple organ failure (renal, hepatic) and passed away.

DISCUSSION

This case highlights a failure of the medical team to communicate early on with their surgical colleagues, especially in the setting of a tertiary hospital with sub-specialist HPB expertise. This may have been compounded by different gastroenterologists looking after the patient on each occasion. An early referral, after 2 failed ERCPs (and before the decision to perform PTC in a patient with neither jaundice nor sepsis), would have almost certainly avoided the subsequent complications and eventual death of the patient. There were no concerns regarding the care provided by the surgical team in the postoperative setting.

CLINICAL LESSONS

The gastroenterology teams involved should be made aware of the outcome of this case and be encouraged to involve the surgical teams in these complicated cases (the surgery may not necessarily be complicated).

Case 2: Patient with chronic mesenteric ischaemia

Vascular Surgery

CASE SUMMARY

A 53-year-old patient with significant history of smoking and severe weight loss was admitted to a peripheral hospital with abdominal pain. Five days into the admission, a CT scan of the abdomen was performed, which showed an occlusion of the superior mesenteric artery (SMA), a high-grade stenosis of the coeliac axis, a patent inferior mesenteric artery (IMA) and an occluded left common iliac artery (CIA). The diagnosis of chronic mesenteric ischaemia was made, and the Vascular Surgery team of a tertiary centre was contacted. The vascular team advised transfer but admission under General Surgery. The General Surgery team at the same hospital then re-advised that the patient should be admitted by Vascular Surgery. A transfer did not take place. The home team continued to pursue the transfer, and Vascular Surgery once again recommended admission by General Surgery. After 2 days, Vascular Surgery accepted care and the patient was transferred another day later to the tertiary hospital. The overall stay in the peripheral hospital was 9 days.

After transfer, the vascular team confirmed the diagnosis of chronic mesenteric ischaemia and also diagnosed right-sided critical limb ischaemia with rest pain but without tissue loss. A discussion about the patient was held at the multidisciplinary team (MDT) meeting; however, there was no documentation available. The patient was then operated on 2 days later; kissing iliac stents were inserted with the 'intention to open up collaterals', according to the audit form entry. No digital subtraction angiography (DSA) imaging of the visceral vessels was performed during the procedure. The rationale behind this procedure was to improve collateral flow in order to allow time for total parenteral nutrition in preparation for bypass surgery in the future as the malnourished patient was deemed unfit for open surgery at that time.

The patient initially settled postoperatively but then continued to have abdominal pain. On postoperative day 2, a further CT scan of the abdomen was performed, which showed extensive pneumatosis throughout the intestines and liver. This presented an inoperable finding. The patient was palliated and passed away on the same day.

DISCUSSION

There was a significant delay in diagnosis in the peripheral hospital. The patient was there for 5 days before a CT angiogram was performed. Given the patient's classic history, a CT would have been a logical part of the initial work-up plan.

Post-diagnosis, there was a significant delay in transferring the patient to an appropriate tertiary centre. This was the result of a disagreement between General Surgery and Vascular Surgery about who should take primary responsibility for the patient. This disagreement resulted in a further delay of 3 days. A timely transfer to the tertiary centre and review of the patient by both specialities would have been the appropriate action.

The documentation was incomplete. The audit form suggests a discussion in the MDT meeting; however, there was no documentation in the notes.

It was appropriate not to offer open surgery to the malnourished, unfit patient in the first instance. The decision to proceed with left common iliac stenting to open collateral supply (according to the audit form), however, is surprising. The IMA is patent on CT and therefore increased flow through the internal iliac branches (mainly inferior and mid-rectal arteries) would not have contributed to increased bowel perfusion as they overlap with IMA territory. Also, the operative report documents 'critical limb ischaemia' as the indication. Possibly, the limb ischaemia was given priority over the mesenteric ischaemia.

On the CT angiogram performed at the peripheral hospital, the SMA has a long occlusion without realistic endovascular management options. The coeliac axis has a severe long stenosis but is still patent. It looks amenable to endovascular treatment. There are large collaterals originating from there supplying the gut, suggesting a potential significant improvement of visceral perfusion after successful revascularisation. This would have been the more rational approach.

While the stenting of the CIA was performed, no DSA imaging of the visceral segment was performed. At a minimum, the visceral arteries should have been imaged at the time to see whether the coeliac axis was suitable for stenting. If that was the case, this should have been performed during the same procedure as this would have been the only realistic option to improve the visceral blood supply.

The original audit form mentions that a postoperative assessment by a junior registrar may have caused a delay in finding the ongoing mesenteric ischaemia. If there was a concern about the seniority level of the on-call registrar looking after a complex, freshly operated patient on the weekend, it would have been advisable for the operating consultant to perform a personal postoperative review. The registrar assumed that maximum treatment was pursued, and the patient did show some signs of improvement. Once the patient continued to deteriorate, the CT scan was ordered, which then showed the non-salvageable ischaemia. This is

the typical pattern for mesenteric ischaemia and by the time the deterioration becomes clinically manifest, it is too late to act. Continuous consultant involvement is advisable in complex cases like this.

CLINICAL LESSONS

In summary, there are several areas of concern outlined above that can be improved.

Delaying the transfer of a critically sick patient secondary to a disagreement about admission responsibility between specialties must be avoided in the future. Furthermore, MDT meeting discussions and outcomes need to be documented.¹

The review of the notes raises the impression that treatment of the rest pain was given priority over the mesenteric ischaemia, which consequently was not addressed adequately and has contributed to the patient's demise. Additionally, continued consultant input when there is only junior cover for complex/sick patients is desirable. It is acknowledged, however, that this was a severely sick and deconditioned patient. Even if coeliac stenting had been performed, the outcome may have been the same.

REFERENCES

1. Royal Australasian College of Surgeons: Research, Audit and Academic Surgery. *Guideline reference document for conducting effective morbidity and mortality meetings for improved patient care*. Melbourne: Royal Australasian College of Surgeons; 2017. p 18.

Case 3: Multiple failures in an elderly patient undergoing emergency laparotomy

General Surgery

CASE SUMMARY

An 86-year-old female with significant comorbidities (renal impairment and paroxysmal atrial fibrillation [AF] on novel oral anticoagulants [NOACs]) presented with a large bowel obstruction (LBO) secondary to a sigmoid malignancy and a competent ileocaecal valve (ICV). The patient underwent resuscitation and, with advice from haematology, had their NOACs withheld. Surgery was undertaken after discussion with the patient and her family nearly 24 hours following presentation. A total colectomy with ileorectal anastomosis and defunctioning loop ileostomy was undertaken. The patient was placed on inotropes intraoperatively and was admitted postoperatively to the intensive care unit (ICU) for vasopressor and ventilatory support.

During a postoperative incident in ICU, the patient became non-responsive and experienced hypoventilation and respiratory acidosis likely secondary to opiates. This resolved with steady improvement, but fatigue and paroxysmal AF were noted. The ileostomy was working, and the patient started on nourishing fluids. The patient was transferred to the ward on day 2 postoperatively.

On postoperative day 4, the patient was hypertensive and drowsy but rousable. During the first medical emergency team (MET) call, asymptomatic hypertension was ongoing and the patient was vomiting copiously. The patient was treated for hypertension and medications were restarted. A nasogastric tube (NGT) was considered but not placed. The patient was reviewed overnight and experienced ongoing nausea, but oral intake was encouraged. A dietitian review showed concern regarding inadequate intake for 5 days. There was low activity from the stoma. Ileus was noted on abdominal X-ray.

During postoperative day 5, three further MET calls were made overnight for hypertension, respiratory distress and wheeze. A diagnosis of acute pulmonary oedema (APO) was made, and the patient was transferred to ED for bilevel positive airway pressure (BiPAP). The patient became unresponsive after a further large vomit. As per previously established goals of care, the patient was not for resuscitation and passed away.

DISCUSSION

An unwell elderly patient with medical issues presented with a surgical emergency and after adequate care and counselling a decision was made to operate. There are concerns regarding the perioperative resuscitation (antibiotics and nutrition), a delay to senior review and theatre (allowing for the need for resuscitation and management of NOACs therapy) and a delay in the recognition and adequate management of postoperative ileus. In terms of hospital management, there was an issue with critical care resources given the patient could not access an ICU bed when required.

CLINICAL LESSONS

There was a delay of 24 hours due to the patient being stable despite documentation of LBO with a competent ICV and grossly distended large bowel loops. The consultant review occurred in the afternoon following the evening admission (19 hours post admission). The patient's NOACs and risk of bleeding may have impacted the decision to delay surgery to allow adequate resuscitation and bleeding risk reduction; however, this was not documented.

Antibiotics were not given in the 24 hours preoperatively despite identification of LBO and the need for emergency surgery plus the risk of translocation. Serosal tears and impending perforation were confirmed at the time of surgery, which raises concerns for possible sepsis and translocation prior to surgery, especially taking into consideration the need for inotropes during surgery. Intravenous (IV) antibiotics were continued postoperatively.

Despite inability to establish full alimentation of any volume and a history of obstruction and poor nutrition, consideration was not given to parenteral nutrition, even when postoperative ileus was diagnosed.

NGT placement did not occur despite ileus and vomiting. During and between the multiple MET calls, the patient was noted to have large vomits and was diagnosed with ileus (or small bowel obstruction) on X-ray. Despite this, oral intake was encouraged. This lack of decompression may have contributed to ongoing vomiting, ileus, loss of respiratory volume due to distension and even possible aspiration leading to respiratory arrest.

In an elderly patient with poor mobility and renal impairment, and who has already had a delay to surgery and who is on vasopressors intraoperatively, an ileorectal anastomosis with loop ileostomy may not be the best choice of operation. Ileorectal anastomosis has a slightly higher rate of leak than colorectal anastomosis. A loop ileostomy to mitigate this risk may end up with higher output due to the proximity, which could be an issue in an elderly comorbid patient (American Society of Anesthesiologists ASA 4E: A patient with a severe

systemic disease that is a constant threat to life (emergency surgery)) with renal impairment. In addition, the patient is committed to further surgery to reverse the ileostomy. Long-term, an ileorectal anastomosis with its attendant bowel frequency could have a negative effect on the quality of life of someone who is already known to have poor continence and mobility issues. This should have been considered. Finally, this operation would have increased the length of time of surgery in an unwell patient on inotropes, although in this case the entire operation is recorded as taking 2 hours, so time may not have been a factor here.

Despite failure to progress following major bowel surgery and concerns regarding hypertension, paroxysmal AF and ileus, consideration was not given to cross-sectional imaging of the abdomen to rule out sepsis either from collections or a leak. In elderly patients, sepsis does not always present in the most typical way.

The patient was taken to ED for BiPAP ventilation to help with presumed diagnosis of APO due to lack of beds in ICU where this patient would have been best served. This is unfortunate given the ultimate outcome; more importantly, the patient should have been flagged for critical care earlier instead of following several MET calls.

Case 4: Delayed surgical management of a critical coronary artery disease with evolving shock: missed opportunities to intervene leads to a fatal outcome

Cardiothoracic Surgery

CASE SUMMARY

This 69-year-old male presented to hospital A with a delayed presentation non-ST-elevation myocardial infarction (NSTEMI) after experiencing neck pain and dyspnoea the day before. The patient had a significant elevation in both his troponin and creatine kinase (CK) levels at the time of admission. This was his first presentation with cardiac symptoms. The patient's electrocardiogram (ECG) showed inferior Q waves and marked ST depression in V4–V6, I and aVL. The ST depression resolved within 24 hours. The patient was symptom free, haemodynamically stable, on no supports and was oxygenating well on room air at hospital A. His renal function was normal. The patient was an active, independent person with a remote smoking history but was otherwise well.

A coronary angiogram was performed, and this showed critical distal left main (LM) coronary artery disease along with ostial left anterior descending (LAD) and ostial left circumflex (LCX) disease and a chronic total occlusion (CTO) of the mid-right coronary artery (RCA). Ventriculogram showed moderate-severe left ventricular (LV) systolic dysfunction. The patient required urgent inpatient surgical revascularisation and was correctly referred urgently to a surgical centre. This is when his care started to falter.

The patient was transferred a day later, and during transport he had dynamic ST depression in the lateral leads, as seen before. These ECG changes were present on arrival at hospital B. There is no record of his troponin after arrival at hospital B. The patient remained relatively asymptomatic, and no further action was taken. The patient continued on a heparin infusion.

It is not clear who accepted the patient at hospital B, nor what their plan was regarding timing for surgery. No echocardiogram was performed preoperatively, which is to be considered an oversight. There is one note saying 'awaiting surgery next week'. It is not clear why he was waiting or whether this was considered safe. Given the patient's critical anatomy and ongoing ECG changes, an operation should have occurred within 24 hours (which would have given him a safe time of 48 hours off ticagrelor, if in fact this was a factor, but it is not recorded anywhere).

On day 3 of admission to hospital B, the patient had significant dyspnoea with minor mobilisation and repeat ECG again showed ST depression in V4–V6, I and aVL. The inferior Q waves were present throughout. This was considered significant as the patient was commenced on tirofiban at that time, but there was no escalation in his plan to proceed to surgery. There was still no documented troponin request or level despite dynamic ECG changes. Unfortunately, the patient became increasingly unstable from here and the window of opportunity was lost.

Overnight, the patient had a MET call for dyspnoea, neck tightness (the same symptom he had at presentation) and hypotension. ECG again showed dynamic lateral ST depression, which was again similar to before, but now there was also a degree of ST elevation in V1–V3. The patient settled with sitting out of bed and no further intervention was ordered. His chest X-ray at that time showed evidence of fluid overload and congestion. Again, no blood results were recorded to support or refute the ECG changes. No further diuresis was given despite the findings on chest X-ray.

DISCUSSION

It is not clear whether the consultant surgeon in charge of this patient's care was notified at the time of the ECG on day 3, but if not, why not? If they were notified, then why was the patient's care plan not escalated? There was an opportunity to escalate this patient's care with transfer to ICU, invasive monitoring plus or minus inotropic support, and possibly an intra-aortic balloon pump (IABP). The patient also should have been considered for surgery that night or first thing in the morning.

On day 4, the overnight events were reviewed by the surgeon who subsequently operated on the patient the next day. It appears they were not the surgeon on call that weekend but realised that the patient had become unstable and the situation more urgent. As identified in the report, a discussion should have occurred between the on-call surgeon and the operating surgeon to decide the correct timing of this patient's operation. The patient was scheduled for surgery the next morning; however, the patient remained unstable with ongoing tachypnoea and dyspnoea at times during the evening.

By the time the patient arrived in the operating room on Monday morning, he was extremely symptomatic and in cardiogenic shock. While the opportunity to operate on him when he was stable had been lost, there was still an opportunity to improve his outcome.

In the first instance, this unstable patient should have gone on to cardiopulmonary bypass (CPB) at the earliest opportunity, prior to conduit harvesting, in order to rest the heart and improve systemic perfusion. Secondly, the finding of moderate-severe mitral regurgitation, under anaesthesia, at the commencement of the case

should have prompted the surgeon to consider mitral valve intervention as part of the primary operation. There was no transoesophageal echocardiogram (TOE) report supplied by the anaesthetist, so it is unclear what discussion occurred with the surgeon in relation to this pathology. If there was some doubt about the need to do the mitral procedure, then a further consultation with either cardiology or another surgeon should have occurred.

The patient clearly struggled to cope after the initial coronary artery bypass graft (CABG), and this required a second CPB and cross clamp (XC) run to perform a mitral valve replacement (MVR). It appears there was no Swan-Ganz catheter or other measurement of cardiac output until late in the procedure; that is, closing after the CABG. From the outcome, it appears this patient was struggling significantly at this time and a degree of end-organ ischaemia had already set in and subsequently sealed this patient's fate. The lactate at 12:30, shortly after the XC had been reapplied, was 6.4 mmol/L and it never improved from here, even with veno-arterial extracorporeal membrane oxygenation (VA ECMO) post-CPB. If the cardiac output had been known earlier with the first wean from CPB and acted upon, then it is possible that the severe lactaemia, ischaemic hepatitis and renal failure that rapidly ensued postoperatively may have been more manageable and the outcome may have been prevented. He may have gone on to VA ECMO earlier.

CLINICAL LESSONS

In summary, this patient's surgery was delayed for unknown reasons. The delay was not with the referring hospital but occurred at the accepting surgical hospital. This was unacceptable. The patient had critical coronary anatomy as well as ongoing symptoms and ECG changes that required urgent surgery. The window to operate on this patient when stable was lost and most probably cost him his life. When he became more unstable over the weekend, the seriousness of the situation was not realised and not acted upon soon enough. Communication between the clinical team should have been improved during this time and this contributed to the poor outcome.

Further steps in the operating room should have been taken to improve the possible outcome. These include:

- establishing CPB as soon as possible, prior to conduit harvesting
- consideration of MVR as part of the primary procedure
- earlier use of cardiac output monitoring to assess patient's overall condition, rather than after significant end-organ ischaemia had set in.

There was an unacceptable delay in taking this patient to surgery once transferred. The mitral regurgitation was known about intraoperatively, at the commencement of the procedure prior to any surgical intervention. An echocardiogram should have been performed preoperatively to establish this

and assist with the intraoperative decision-making, and probably the timing of surgery given that the patient became dyspnoeic while awaiting surgery. The exacerbations in his clinical status while awaiting surgery were not properly communicated and contributed to delayed surgery and a poor outcome.

Case 5: A job half done is as good as none: critical ischaemia after aortic graft explantation

Vascular Surgery

CASE SUMMARY

A 55-year-old patient presented with an infected aorto-bifemoral bypass graft one year following implantation. Signs and symptoms of graft sepsis had been present for 6 months and the patient had been treated with intermittent courses of antibiotics. The patient's general condition deteriorated over this time and culminated in a prolonged admission over 4 weeks to optimise their physical condition before graft explantation and revascularisation. The graft was explanted without revascularisation, resulting in profound ischaemia of the lower limbs. The treating team decided against revascularisation in favour of bilateral above-knee amputation, which the patient refused. The patient developed severe pain in the abdomen and legs with clinical and haematological evidence of sepsis and an acute abdomen. There is documentation in the record of the recognition of evolving septicaemia. The decision was made to palliate without evidence in the notes of consideration of faecal peritonitis, even after faecal material began draining from the groin wound. The patient died 8 days later in palliative care.

DISCUSSION

This case was of a relatively young patient with severe vascular occlusive disease in the setting of type 1 diabetes since age 7 and heavy smoking. Their medical history included hypothyroidism, ischaemic heart disease, acute myocardial infarction with 3 cardiac stents 2 years prior, cardiac ejection fraction 60% on transthoracic echocardiography at last admission, and chronic obstructive pulmonary disease (COPD).

The patient had an aorto-bifemoral bypass graft a year before, complicated by rectus sheath haematoma and sepsis. There had been multiple presentations subsequent to the graft implantation that were suspicious of graft infection although no operative intervention was considered. An opportunity may have been missed for earlier operative intervention. Antibiotic treatment was given and eventually investigations clearly established the diagnosis. The patient developed recurrent episodes of abdominal pain (most severe on the last admission) as well as a left common femoral false aneurysm.

The patient re-presented to hospital 4 weeks before their operation. They were admitted and treated with intravenous antibiotics and nutritional support to

improve their physical condition prior to major abdominal surgery. This was a reasonable approach. The patient developed acute hepatitis due to a reaction to the antibiotics, which was recognised, and appropriate changes were made to the antibiotic therapy.

As the graft sepsis progressed, the patient became more deconditioned and pain increased, with eventual development of junctional false aneurysms at both femoral anastomoses.

Operative intervention was performed when the patient was significantly compromised and in poor condition. The operation revealed septic collections around the aortic component of the graft and septic collections around the femoral anastomoses bilaterally with disruption of the anastomoses. The aortic stump was oversewn as were the common femoral arteries. This was consistent with standard operative management for this condition although the abdominal approach was by transverse incision. This may have compromised the ability to tunnel a graft from the axilla to the legs for revascularisation. Due to the sepsis at the femoral sites, the decision was made not to perform an axillo-bifemoral bypass as had been planned. There was no discussion regarding tunnelling the grafts laterally and anastomosing to the superficial femoral or profunda femoral artery away from the septic field.

Postoperative medical notes documented increasing abdominal pain and rigidity. The patient became febrile. Blood investigations revealed an increasing white cell count (WCC), and blood gases showed an acidotic state. Lactate was normal or slightly elevated. Profound ischaemia of the legs, pelvic and buttock areas was noted to develop a day after surgery. This significant amount of tissue ischaemia was not likely to be survivable unless revascularisation or major amputation were performed. At this point, the patient was palliated as operative treatments were deemed futile.

CLINICAL LESSONS

Operations to salvage patients with aortic graft sepsis have a high mortality rate and this outcome is not entirely unexpected. These cases are complex due to multiple pre-existing comorbidities and multiple complex active medical issues including diabetes, multi-resistant organism infections and cardiac issues. Operative interventions are difficult due to scarring from previous surgery, adhesions and septic friable tissues. Adding deconditioning to this situation dramatically reduces the chances of a successful outcome.

This being said, outcomes can be improved with a multidisciplinary team. There is good documentation here that the appropriate teams were involved, including infectious disease, endocrinology, General Surgery, anaesthetics and intensive care.

At several points, there may have been missed opportunities to improve the patient's chance of survival. Firstly, the diagnosis of graft infection was delayed with the outpatient record documenting strong clinical suspicion and referral for multiple investigations. Earlier operative management of graft infection months before the last presentation when the patient was in better physical condition would have improved chances of a better outcome.

Secondly, revascularisation at the time of explantation would have avoided the lower limb ischaemia. An efficient way to perform this surgery is with a second vascular surgeon present and to perform bilateral axillo-femoral (or in this case, to avoid the septic field in the groin, axillo-superficial femoral artery [SFA]/profunda) bypasses as a first step before laparotomy and graft explantation.

This leads to the third point that major surgery such as this is beyond the capacities of a single surgeon most of the time. A second vascular surgeon should have been involved.

The fourth point is the recognition of a possible bowel injury at the time of laparotomy and explantation. The working diagnosis of the faecal discharge was of bowel perforation due to ischaemia. Faecal peritonitis was not considered despite documentation of a rigid and very painful abdomen, and fever with raising WCC. As there was already occlusive disease of the iliac arteries, the ligation of the distal aorta is less likely to cause general gut ischaemia although this should always be considered. The lactate was not elevated to any considerable degree although this does not exclude gut ischaemia. It is far more likely that there was a direct bowel injury or devascularisation of a bowel segment leading to perforation and faecal peritonitis. Either way, a laparotomy to salvage the situation should have been considered.

COMMENT

This scenario has the hallmarks of a futile operation. It is a major undertaking to explant an aortic graft and to complete it without revascularisation in a patient who is severely deconditioned from chronic sepsis, and it had an extremely low chance of success. The use of neoortoiliac reconstruction with deep femoral vein, use of bovine pericardium tubular graft or rifampicin-soaked polyethylene terephthalate (Dacron) in situ replacement with omental wrapping intra-abdominally and tunnelling via obturator to the SFA in the thigh would all have been acceptable alternatives.

Case 6: Missed diagnosis and delayed transfer of a patient with intestinal infarction

General Surgery

CASE SUMMARY

This case involved a 77-year-old male transferred from a regional hospital to a major city hospital with a diagnosis of small bowel obstruction. The patient eventually underwent laparotomy at which extensive, non-survivable ischaemia of small and large bowel was encountered. The patient was transferred postoperatively to ICU for end-of-life care.

First-line assessment raised concerns regarding management of this patient in the setting of incorrect diagnosis and delay in surgical assessment.

It was noted that the patient lived at home with comorbidities including chronic obstructive airway disease (COAD) from a lifelong smoking history, however, had recently stopped smoking. The patient presented to his regional hospital at 18:00 on the day prior to his death with a 6-hour history of severe abdominal pain. A diagnosis of small bowel obstruction was made; this was supported by a CT scan with a report suggesting distal small bowel obstruction in a virgin abdomen. Given that the peripheral hospital did not have surgical services available, transfer was arranged. The hospital notes record that 3 hospitals were contacted before transfer could be confirmed.

The patient arrived at the tertiary hospital ED at 01:30 and was, at that stage, said to be confused and had a low-grade fever. The patient was treated as an under-resuscitated small bowel obstruction. The first note from a surgical registrar was not recorded until 06:30. This was some 12 hours after the patient's initial presentation to hospital. The diagnosis of small bowel obstruction was not questioned and a plan for theatre later that day was formulated. At 08:00, review of the CT scan increased the urgency of the surgical plan, and the patient was transferred to theatre at 09:00.

At operation, extensive, non-survivable small and large bowel ischaemia was found.

DISCUSSION

Concern in this case centres on the delay in transfer and availability of surgical assessment. Acute presentation of abdominal pain necessitates early surgical assessment and management. The initial referring hospital appears to have had

difficulty finding a surgical bed with 3 hospitals contacted. Transfer then occurred in the middle of the night. Surgical assessment was further delayed until 06:30. A diagnosis of a mesenteric ischaemia was not entertained although serum lactate on admission to the tertiary hospital was elevated. Once surgical assessment had occurred, the patient was treated expeditiously, and was in theatre within 2 hours.

Given that there was extensive ischaemia of the entire small bowel and colon (to rectosigmoid), it is unlikely this was a survivable situation, even with immediate surgical intervention. The case does, however, raise 2 important points for consideration.

CLINICAL LESSONS

The first point was the difficulty in transferring the patient from a regional hospital to the city in a timely fashion. The patient's pain started suddenly at 11:30 the day prior to his surgical admission. The patient presented 6 hours after onset, but it was a further 12 hours before he had surgical review. His operation was some 20 hours after the onset of pain. It is unlikely that mesenteric ischaemia would be survivable in this setting. It does raise serious concerns regarding availability of beds to transfer patients to a major city hospital and, in a busy receiving hospital, the surgical resources to examine ED patients overnight. It is unclear why, with the patient arriving at 01:30 with an acute abdomen, surgical review was not undertaken until 06:30.

The second area of concern regards diagnosis of mesenteric ischaemia. This diagnosis can be missed unless specifically considered in the setting of acute abdominal pain. CT angiography is the most reliable investigation along with serum lactate level. If any doubt exists, laparoscopy or laparotomy should be undertaken. In this case, the initial CT report of small bowel obstruction was not challenged nor alternative diagnoses entertained. Given that the patient was severely unwell, confused and had been unwell for some hours, expeditious surgical assessment should have been undertaken on arrival at the second hospital. Ischaemia in an obstructed loop was not considered as a differential diagnosis. Unfortunately, however, in this case with very extensive ischaemic intestine, earlier surgery is unlikely to have improved the outcome.

Case 7: Lost opportunity to determine the presence of a possible common bile duct obstruction at the time of surgery by not doing an intraoperative cholangiogram

General Surgery

CASE SUMMARY

A 70-year-old male was admitted to hospital with septic shock. His background included recent lower lobe pneumonia, chronic AF and heart failure. After appropriate resuscitation in the ED, the patient was transferred to the ICU for ongoing care. His condition in the ICU worsened and he became anuric requiring dialysis. It was also noted that the patient had cardiomegaly and pulmonary oedema.

In the clinical record, an ultrasound was reported as showing a thickened gallbladder wall with no stones but sludge in the CBD; no comment was made as to the degree of wall thickening or whether the CBD was of normal diameter. Unfortunately, no formal ultrasound report was included in the clinical record. Liver function tests were also reported as being abnormal (with raised bilirubin), but no formal pathology report was available in the clinical record at the time of this review. The international normalised ratio (INR) at that stage was noted to be 1.5. A diagnosis of acalculous cholecystitis was made and surgeons were contacted for an opinion. The surgical opinion at that stage was for nonoperative management (but no justifications were given). Daily surgical review continued and the decision for conservative management was maintained; however, cholecystectomy was proposed prior to the patient's discharge from hospital.

On the second day of admission, the clinical record noted a rapid worsening of the patient's liver function tests (alanine transaminase [ALT] is noted at 3000 U/L) and a presumed diagnosis of liver ischaemia was made. The INR rose to 3.0. A CT was noted to show an 'oedematous gallbladder; liver no abnormality detected'. Again, no formal CT report was available in the notes. The ICU note recorded a decision for acute cholecystectomy; however, this was to be delayed until the INR was corrected.

The patient began to improve with correction of the INR, and liver function tests were said to be improving (but again no values were listed). On the fifth day of admission, the patient underwent laparoscopic cholecystectomy. An oedematous gallbladder containing thick bile was found. No intraoperative cholangiogram was done. Enterococci were cultured from the bile. The gallbladder was inadvertently opened and bile spilled out. A drain was left in situ postoperatively. A small tear

was made in the liver bed and subsequently controlled by packing with absorbable haemostat.

Postoperatively, the patient was noted to have large volumes of fluid discharging from the drain (150–450 ml/day). The clinical record varies as to the exact nature of this fluid. On several occasions it was noted to be bile, on others haemoserous and on one entry blood.

The patient was transferred to the ward. Given the concern about a bile leak, a further ultrasound was obtained, and a comment was made about a possible CBD stone. No radiology report was available for review.

Subsequently, the patient developed pulmonary oedema and the medical team was contacted for management of this. The patient was later found in cardiac arrest overnight by the nursing staff. A code blue was called but the patient was not able to be resuscitated.

DISCUSSION

This case highlights the issues of diagnosing a source of sepsis and controversies in management of acalculous cholecystitis and the use of intraoperative cholangiograms (IOC). Assessment of this case was hampered by the lack of availability of imaging and pathology reports. Without these, it was difficult retrospectively to assess the treating teams' decision-making throughout the admission. The first-line assessment noted concerns about the initial diagnosis of acalculous cholecystitis and raised the possibility of ascending cholangitis rather than acalculous cholecystitis as the cause for sepsis. Certainly, the chart comment about sludge in the CBD would lend support to this idea; however, without the formal ultrasound report it is not possible to comment further.

The second concern raised in the first-line assessment was the delay to definitive surgery. Management of acalculous cholecystitis is controversial; traditional teaching is that early cholecystectomy is preferred. In patients deemed unfit for surgery, drainage of the gallbladder by percutaneous cholecystostomy is the safer option. In this case, the patient initially may have been too unwell to tolerate cholecystectomy (heart failure and coagulopathy), and consideration of a percutaneous cholecystostomy tube should have been made.

In the light of sludge observed in the CBD on the initial ultrasound, an IOC would have been beneficial. This would have confirmed the presence of a possible CBD stone (which was found later on the postoperative ultrasound) and thus altered management of the subsequent bile leak and ongoing sepsis. An IOC may have led to intraoperative CBD exploration (depending on the local surgeon's experience) or plans for an ERCP postoperatively.

Fault cannot be found regarding the management of the patient's heart failure, fluid overload and subsequent cardiac arrest.

CLINICAL LESSONS

In summary, the issues arising for this case are related to:

- establishing a clear diagnosis of the source of sepsis (cholecystitis vs cholangitis)
- definitive and timely control of the source of sepsis (either early cholecystectomy or cholecystostomy)
- lost opportunity to determine the presence of a possible CBD obstruction at the time of surgery by not doing an IOC.

Case 8: The dangers of a primary arterial infection

Vascular Surgery

CASE SUMMARY

A 69-year-old male died from complications relating to bleeding and repeated operations for an infected vein graft and stent used to treat occlusive iliofemoral arterial disease. The patient had significant comorbidities: myocardial infarction and coronary stents a year prior and COPD with previous left upper lobe pneumonectomy 2 years prior for lung cancer. The patient was an active smoker and a heavy drinker, who was known to have peripheral vascular disease, having undergone left iliac stent, left common femoral artery (CFA) endarterectomy and left SFA directional atherectomy a year prior for chronic critical ischaemia.

The initial admission was medical for altered sensorium following a fall and features of sepsis of unknown origin. The patient's blood cultures grew methicillin-sensitive *Staphylococcus aureus* (MSSA). The source was found to be the right knee, and the patient underwent appropriate surgical and medical treatment.

Two weeks later, a positron emission tomography (PET) CT scan showed fat stranding around the right CFA and SFA along with an increased uptake activity. Vascular opinion was sought; however, the vascular team did not think that this was of concern. The patient was also noted to have developed multiple necrotic/gangrenous patches on the right foot, and was treated as critical limb ischaemia of the right leg. A CT angiogram done prior to the hospital admission had shown stenotic right external iliac artery (EIA), right CFA and proximal SFA, distal SFA occlusion and tibial artery disease.

The patient underwent a 6-hour operation 24 days post-admission for a right CFA endarterectomy with a vein patch, right EIA stent and a femoropopliteal bypass to the below-knee segment using reversed long saphenous vein. During the surgical exploration, the patient was noted to have scarred right groin with distorted planes and thickened CFA with friable medial wall of CFA post endarterectomy. These are all the features of an infected arterial wall consistent with the preoperative PET CT findings. It does not appear that this was recognised or considered, and a long operation was performed including deployment of a bare metal stent through the surgical field into the EIA.

The patient was readmitted 6 days later with haemorrhage from the right groin due to vein patch disruption and stent erosion through the anterior wall of distal EIA. Another 6-hour operation was performed involving excision of the vein patch

and construction of an EIA to CFA/femoropopliteal bypass hood graft using a contralateral superficial femoral vein. The metal stent that was already eroding through the anterior arterial wall was not removed.

The surgical specimen from the site grew *Candida*.

During this time, the patient sustained a fall in the ward and broke the neck of right femur for which an orthopaedic procedure was performed one week later.

The patient once again bled from the anastomotic line of the EIA-CFA vein graft. A 3-hour operation ensued with resection of the entire vein graft and removal of the stent. The arterial ends were oversewn. The surgical specimens grew *Candida* and *Klebsiella* species. Subsequently, the right leg became progressively ischaemic, and the patient's medical condition deteriorated further. This was exacerbated by decompensated heart failure. The patient was eventually put on a palliative care pathway and transferred to a hospice care where he passed away 3 weeks later.

DISCUSSION

This case highlights the dangers of not recognising an infected arterial wall and the subsequent dangers of operating on it and deploying implants into an infected artery. Concerns about an infected arterial wall were rightly raised with a CT scan showing perivascular fat stranding and a PET CT showing increased uptake activity in the native right femoral arterial wall in a patient with MSSA bacteraemia. The medical physicist who reported the PET CT reiterated the concern about the increased activity in the native arterial wall.

Intraoperative findings during the first operation were consistent with the PET CT findings of a primary arterial wall infection. Had this been recognised, perhaps a lesser operation involving CFA endarterectomy and an iliac angioplasty and avoidance of a stent would have been considered. The addition of a surgical bypass prolonged the operation significantly.

At the second operation, it was obvious that the findings were secondary to an infective process. The indwelling metal stent that was already eroding through the anterior arterial wall was not removed. A chance to remove the metal stent, excise the vein patch and resect part of the vein femoropopliteal bypass graft and leave things alone for the infected field to recover was missed.

The third operation was necessitated by inadequate local control of sepsis and retention of the stent at the second operation. Thereafter, the clinical deterioration and the eventual outcome was predictable.

CLINICAL LESSONS

Primary infection of a native arterial wall in the absence of an implant/graft is rare. Clinical/radiological signs before an arterial blowout are often subtle. A high index of suspicion in a patient with systemic sepsis and suggestive local signs is the only way to recognise them. The radiological and clinical signs in this patient were recognised, but there was a failure to react to these findings as a matter of clinical concern.

Deployment of a metal stent in an infected artery and the subsequent failure to recognise it as an ongoing septic focus and remove it caused patient harm. While the patient had significant comorbidities, the likelihood of the patient surviving the initial operation was high. Ongoing sepsis and the subsequent events led to his clinical deterioration and death.

The surgical case form filled by the treating surgeon identified no areas of consideration, concern or adverse event and the surgeon did not think that anything could have been done differently. This is either an oversight or a demonstration of a lack of reflection and insight into the events that led to this patient's death; therefore, the issues highlighted here should be discussed at a local multidisciplinary mortality meeting.

Case 9: Preventable death can occur for want of a nasogastric tube

General Surgery

CASE SUMMARY

A 61-year-old Indigenous female underwent surgery in a major city hospital for an ileal stricture causing low-grade small bowel obstruction and chronic abdominal pain. The stricture was the result of a previous bowel injury at the time of a hysterectomy. The patient's comorbidities included cigarette smoking, ischaemic heart disease and mild COPD.

The 5-hour laparotomy included a full small bowel adhesiolysis, repairs of iatrogenic enterotomies, a limited ileocolic resection to include the stricture, with stapled anastomosis. Postoperative Enhanced Recovery After Surgery (ERAS) protocol was prescribed, including free oral fluids. An NGT was not placed.

Pain and nausea control were difficult, and a ketamine infusion and regular narcotics were required. After being allowed free fluids from postoperative day 1, the patient was commenced on a diet on day 3 after apparent passage of flatus but developed increasing abdominal pain, tachypnoea and drowsiness. A medical assessment was requested in the early hours of day 4; the patient's abdomen was noted to be tender but not grossly distended, and a chest X-ray was ordered and assessed as satisfactory.

Later on the morning of day 4, the patient had a large bilious vomit witnessed by nursing staff, with gross pulmonary aspiration and cardiac arrest. The patient was resuscitated with all appropriate measures and transferred to ICU intubated and ventilated. An NGT was placed delivering large amounts of bilious fluid. CT scanning of head, chest and abdomen was performed showing gross pulmonary infiltrations consistent with aspiration and 'mild ileus' but no obvious anastomotic leak or intra-abdominal collection. Despite intensive management, death occurred on the night of day 4.

DISCUSSION

This 61-year-old patient died of gross pulmonary aspiration secondary to a large gastric bilious residue almost certainly from an unrecognised postoperative paralytic ileus.

There were strong predictors of paralytic ileus in this case:

- pre-existent chronic incomplete small bowel obstruction
- prolonged (5-hour) laparotomy with full small bowel adhesiolysis, repair of enterotomies, ileocolic resection and anastomosis.

Paralytic ileus is common after laparotomies involving prolonged bowel exposure and handling and may not be evident immediately. Vomiting may not occur initially because of the capacity of the small bowel to distend and accommodate large amounts of fluid. The stomach fails to empty and eventually small intestinal fluid tracks proximally to further distend it, exacerbated by oral fluid intake. Diagnosis is both clinical (painful distended abdomen, minimal bowel sounds) and radiological (dilated small bowel loops with fluid levels, no gas 'cut-off', some gas in the colon). It can be effectively managed by NGT drainage, optimisation of fluid/electrolyte balance and minimising oral intake until it resolves.

Supine and lateral decubitus abdominal X-rays performed at the time of the chest X-ray on day 4 would have almost certainly revealed the diagnosis, and an NGT placed at this point could have prevented vomiting and aspiration.

Elective ERAS protocols avoid NGTs and encourage early feeding, but conditions must be favourable. This was not a suitable case for the ERAS protocol and an NGT should have been placed at the time of surgery. Additionally, the patient was unwisely allowed free oral fluids.

The CT scan appeared to rule out a major abdominal complication of the surgery, such as a mechanical obstruction or an anastomotic leak, so it is likely that this was just a postoperative paralytic ileus that could have resolved spontaneously if managed correctly.

CLINICAL LESSONS

In summary, this was a preventable death occurring for want of an NGT, which ideally should have been placed at the time of laparotomy and certainly later when concerns arose. It also illustrates the dangers of routinely following protocols such as ERAS, which may not be appropriate in all cases.

COMMENT

ERAS protocols have been established in the elective setting. There is interest in extrapolating ERAS management to the emergency setting. Consensus guidelines discuss the perioperative care of emergency laparotomy patients (Part 1), including the preoperative placement of nasogastric tubes:1

As reported in Peden et al. 2021:

‘The use (of NGT) in the emergency setting is very different with a risk–benefit ratio depending on the clinical circumstances and cause of abdominal pathology and patient factors.’

Recommendations:

- Preoperative nasogastric tube insertion should be considered on an individual basis assessing for the risk of aspiration and gastric distension depending on the pathology and patient factors.
- Level of evidence: Moderate (extrapolation from elective surgery).
- Recommendation grade: Strong (aspiration can be life-threatening and its reduction by NGT insertion outweighs the risk of short-term use).¹

The guidelines for postoperative care (Part 2) are not published. In the emergency setting, a high probability of postoperative ileus should guide the surgeon to place an NGT as part of postoperative care.

REFERENCES

1. Peden CJ, Aggarwal G, Aitken RJ, et al. Guidelines for Perioperative Care for Emergency Laparotomy Enhanced Recovery After Surgery (ERAS) Society Recommendations: Part 1 – Preoperative: Diagnosis, Rapid Assessment and Optimization. *World Journal of Surgery*. 2021 May;45(5):1272–1290. DOI: 10.1007/s00268-021-05994-9. PMID: 33677649; PMCID: PMC8026421.

Case 10: Left internal mammary artery graft dysfunction causing postoperative myocardial ischaemia and multiorgan failure

Cardiothoracic Surgery

CASE SUMMARY

This case relates to the management of a 58-year-old Indigenous male who underwent cardiac surgery for severe in-stent stenosis. The patient presented with NSTEMI on a background of unstable angina of recent onset. The patient presented at a peripheral hospital and was transferred to a tertiary centre on day 4 of admission. Coronary angiography found severe proximal LAD disease with mid-LAD lesion, severe disease involving left-sided posterior descending artery (PDA) and left ventricular ejection fraction (LVEF) 50% with mild to moderate mitral regurgitation (MR). His history included cerebrovascular accident (CVA), hypertension, type 2 diabetes and 2 previous percutaneous coronary interventions (the latest one in March 2020 to LAD). Preoperative evaluation demonstrated complete occlusion of left internal carotid artery (ICA). The patient had ongoing ischaemia despite being on aspirin and heparin infusion, requiring admission to ICU for cardiac monitoring. There were no intraoperative issues until the point the pericardial window closure was done around the left internal mammary artery (LIMA) graft. The latter led to haemodynamic instability requiring surgeon 2 to scrub in and remove the suture, which apparently resolved the situation.

After transfer to ICU, the patient developed haemodynamic instability later that day and in the night. The patient showed clinical features of myocardial ischaemia in LAD territory. TOE demonstrated significant regional wall motion abnormality involving LAD territory, with mild to moderate pericardial effusion. It seems some short-lasting stability was achieved in the early hours of day 5 post original admission. Following the discussion between ICU and Cardiothoracic Surgery teams, it was decided to persist with conservative management. There was further haemodynamic instability causing an increase in the requirement of vasopressors/inotropes on the morning of day 5. There was an apparent plan to take the patient to the cardiac catheterisation laboratory (cath lab) for graft evaluation; however, it was decided to take the patient to the operating room (OR) instead due to haemodynamic instability. The patient arrived in the OR after midday on day 5. By this time, the patient was on noradrenaline of 40 mcg/min with systolic blood pressure (BP) of 80 mm Hg with graft and LAD artery appearing to be in possible spasm. The patient had severe LV systolic dysfunction with moderate ischaemic MR. No apparent problem with LIMA or the graft anastomosis

was found. The patient was managed by surgeon 3 who anastomosed a saphenous vein graft to replace the LIMA graft by taking down the old anastomosis.

An IABP was inserted intraoperatively. There was no improvement in the patient's LV function, and haemodynamic instability continued due to cardiogenic shock and significant lactic acidosis. The patient deteriorated further on return to ICU and developed multiple organ failure. His haemodynamics could not be sustained, and it became clear that any further attempts at supporting the patient were futile.

Supportive measures were withdrawn, and the patient passed away on day 6.

DISCUSSION

This case represents the surgical management of an Indigenous male patient with double-vessel coronary artery disease following his presentation with in-stent restenosis of LAD disease with preoperative ongoing ischaemia. There was evidence of deterioration in LV systolic function leading up to the operation. The procedure was complicated by intraoperative myocardial ischaemia, believed to be caused by kinking of the LIMA graft, which resolved in OR. This patient continued to have features of anterior wall myocardial ischaemia and cardiogenic shock overnight following surgery; however, it is not clear what exactly the issue was with the LIMA graft. It appears that by the time the patient was taken back for regrafting, myocardial infarction was already established. LV function did not improve despite the revascularisation and use of IABP.

Several issues and learning points are evident from the case review.

The patient had ongoing ischaemia despite being on aspirin and heparin infusion. There was no discussion around preoperative insertion of IABP and taking the patient to OR sooner. The patient's LVEF had already deteriorated from 50% to 30%.

It appears that the LAD may have been poor quality. It might have been better if the consultant scrubbed in for this case (ungraftable PDA, ischaemic MR, LVEF 30%). There is no explanation in the notes as to why the left posterior descending artery (LPDA) was not grafted. One must assume it was ungraftable (RCA small as per cath report). Similarly, no explanation has been offered regarding management of ischaemic MR as to whether the patient would have benefited from intervention on the mitral valve.

LIMA graft kinking would not explain his ongoing ischaemia on day 4 and the next morning. Poor LIMA flow due to vasculopathy (patient had blocked carotid), or due to intraoperative injury, anastomotic problems or poor run-off into the LAD could all have caused anterior wall ischaemia. Why was the patient not taken to the cath lab overnight when all clinical evidence had pointed to LAD graft malperfusion?

Prompt return to the cath lab would have allowed the identification of the problem and its correction. An IABP would have also been useful in this setting.

It appears that by the time the patient went back to the OR, he had already developed an established and extensive anterior wall myocardial infarction (MI). This explains the development of multiorgan injury from which no recovery was made. Use of ECMO support at this stage possibly would not have made any difference.

CLINICAL LESSONS

Involvement of multiple consultants can complicate patient management especially in complex situations (on detailed review, it seems 4 cardiac surgeons were involved during his hospitalisation).

Case 11: Multiple serious failures to diagnose cancer and manage a terminal course

General Surgery

CASE SUMMARY

This case is that of a 73-year-old female who died of metastatic endometrial adenocarcinoma. The patient had been referred to the gynaecologists at her local hospital for postmenopausal bleeding 15 months prior to her terminal admission. Endometrial cancer was confirmed by dilatation and curettage (D&C); however, the histology result was not reviewed, and the patient was lost to follow-up. Eventually, the patient presented to ED at the same hospital with flank pain and constipation, and on CT was found to have a bulky pelvic mass causing bilateral ureteric obstruction. The CT scan also showed ascites, omental caking, peritoneal nodules and multiple large retroperitoneal nodes. Importantly, it noted 'variable small and large bowel distension without definite obstruction'.

Two weeks later, the patient presented to ED with a week of constipation and was admitted. CT 24 hours later showed a high-grade closed-loop LBO from metastatic disease. Bloods at this time showed the patient was in poor condition and significant renal failure (GFR 23 mL/min, albumin 24 g/L). The thought processes at that time were not entirely clear from the notes. Mention was made of a colonic stent, but it is not clear whether this was discussed with the interventional gastroenterologist. Plain X-ray showed progressive LBO.

By day 3, worsening abdominal pain and distension led to the decision to operate over the weekend. The patient underwent bilateral ureteric stent change, laparotomy and colostomy. There was gross malignant disease burden noted, with large volume ascites, peritoneal disease, mesenteric infiltration and sigmoid involvement. Colon mobilisation was extremely difficult and serosal tears occurred. Operative blood loss was 600 mL, indicating the difficulty of dissection. The patient required ICU and vasopressor support postoperatively.

On day 4, a note stated that the 'goal of therapy is palliative' and 'if recovered from recent surgery and good performance status, recommend treating team consider referral to medical oncology to discuss role of systemic therapy'.

The postoperative course was a downhill journey. The patient was shocked, possibly from fluid loss or sepsis. Unfortunately, her demise appeared inevitable despite receiving good care. An acute resuscitation plan (ARP) was eventually signed on day 7. The patient was subsequently stepped down from ICU to the

surgical ward and the palliative care team contacted. Despite good postoperative care, the patient's condition declined and her death was associated with significant pain.

DISCUSSION

Failure to check histology:

Not all details about what happened in the year prior to admission were available, but the failure to have a sound mechanism for ensuring signing off and follow-up of histopathology reports is regarded as extremely serious. What happened was totally unacceptable and fulfilled Medical Board requirements for mandatory reporting.

MDT delay:

The gynaecology oncology MDT clinic that discussed this case was dated 2 weeks after the CT scan that showed widespread and inoperable disease. It was discussed by phone with oncology at that time, and there were multiple other phone calls. The patient always had a high chance of developing a bowel obstruction (given the bowel distension seen on the CT). It is disappointing that the formal MDT opinion did not occur earlier to have a plan arranged (in conjunction with General Surgery) so when the patient inevitably became obstructed an ARP was ready to be activated.

Failure to see a consultant surgeon:

The surgical case notes indicated that the patient was admitted from ED under General Surgery, but for the first 4 days there was no evidence that the patient was seen by a consultant surgeon. If this is true, then that is completely unacceptable. Given the diagnosis of a high-grade LBO, which was not going to resolve spontaneously (due to malignancy), this presented as a dangerous condition. This case fulfils Medical Board mandatory reporting requirements.

Decision to operate:

The weekend surgeon was faced with a no-win situation. The patient was never going to do well. The CT scan demonstrated inoperable disease. The presence of omental caking often precludes laparotomy, other than omental biopsy, as dissection is impossible and dangerous. The pathway to manage the patient's terminal situation should have been anticipated, thus avoiding the significant angst the weekend surgeon would have faced. Had an ARP been organised, it would have been reasonable to be seen by a consultant general surgeon after the CT scan and go straight to palliative care. That did not occur. Consideration was given to a palliative colonic stent to avoid laparotomy, but the outcome of a discussion with gastroenterology was not documented.

CLINICAL LESSONS

Surgery in these cases is always exceedingly difficult. Ideally, 2 or more specialists at the hospital should have made a joint decision before the weekend and instituted an ARP rather than leave the decision two days later (Sunday) to someone previously uninvolved who is confronted with a patient in terrible pain and clearly dying.

Case 12: High cost of ignoring a painful umbilical hernia in the setting of chest trauma admission

General Surgery

CASE SUMMARY

An 84-year-old male was admitted to hospital at approximately 20:30 on day 1 via ED after being involved in a motor vehicle accident (MVA). Airbags had been deployed, and the patient was able to be extricated from the car. The patient appeared confused, with GCS 14/15, and had pain in the right side of his chest. Significant medical history included smoking, possible malignant lung nodule, AF (on apixaban), diabetes, peripheral vascular disease (PVD) and hypertension (HT).

Initial imaging demonstrated a fractured right second rib and a possible fractured right seventh rib. Abdominal CT showed no sign of intra-abdominal trauma. Clinically, the patient had reduced air entry in the right lung base and an irregular pulse of 95 beats per minute.

On day 2 at 03:08, in ED, there is documentation of discussion with the surgical team (intern) about the patient's lungs and fractures. There is no documented discussion of the hernia being reduced by the patient, but there is documentation that there was no evidence of free fluid or gas in the abdomen. The surgical intern stated the 'lung findings would be due to his known lung pathology and that the patient could eat and drink and be seen on the ward'. The patient was admitted awaiting surgical review the following morning, without the umbilical hernia being communicated to the surgical team.

Over the subsequent hours, the patient's saturation levels dropped, and he developed an oxygen requirement. The patient's BP also dropped to under 100 mm Hg and he developed fast AF to 160 beats per minute, treated with beta blockers. Nursing concerns led to the surgical team being contacted a number of times, with the records stating the registrar and Fellow were in the operating theatre with a complex case, and the other registrar could not see the patient until midday (well over 8 hours from the time of initial referral). During this time, there are nursing reports of a longstanding umbilical hernia 'popping out'.

The first record of surgical review, by the surgical intern, was at 11:46 on day 2, more than 12 hours from the patient's presentation to ED and more than 8 hours from the time of initial surgical referral. A large reducible umbilical hernia was noted. The intern's impression was that it was unclear whether surgical admission was required.

The surgical registrar entered a note following this, without a time. There is no documentation of any chest examination findings, and the registrar states 'obs stable'. The abdomen was found to be 'soft, non-tender' with a large reducible abdominal hernia.

On day 3 at 02:40, the patient had a large 'coffee ground vomitus' (approx. 800 ml) and was found to have a tender large umbilical hernia (this is in contrast with the previous entry of a soft non-tender reducible abdominal hernia). The patient was reviewed by the surgical intern who diagnosed an upper GI bleed, thought to be related to an ulcer +/- his anticoagulation. A proton-pump inhibitor infusion was started. Further registrar review at 04:00 documented rebound epigastric tenderness and noted the Hb to be 131 g/L 'inconsistent with an upper GI bleed', yet the plan remained to arrange an upper GI endoscopy.

Documentation from the morning reviews noted scant bowel sounds and continued abdominal pain 'around the hernia' with documentation of an abdominal examination by the trauma team. The surgical team did not document any abdominal examination or escalation to a surgical consultant. A gastroenterology registrar review found the Hb to be stable and therefore suggested deferring any endoscopy, starting free fluids and considering restarting apixaban.

At 11:00, a medical review documented an 'irreducible umbilical hernia with associated pain'.

A surgical resident review at 12:30 documented an irreducible umbilical hernia and stable Hb of 124 g/L, with the plan to discuss with the registrar.

At 18:00, a surgical review (intern and registrar) documented the hernia as 'soft and tender' but remaining irreducible, and now erythematous, yet the impression appears to remain of an upper GI bleed, with the plan to proceed as per the gastroenterology registrar. There is no evidence of this being discussed with the consultant.

At 01:00 on day 4, the patient has another large 'faeculent' vomitus. Surgical review noted increased tenderness and erythema over the irreducible umbilical hernia.

At 04:45, a surgical principal house officer (PHO) review noted ongoing faeculent vomiting, with severe abdominal pain and an irreducible umbilical hernia. At that stage, the first diagnosis of a strangulated umbilical hernia was made, with a plan for NGT decompression. The patient was initially given 100 mg of subcutaneous fentanyl, then a nurse attempted to place an NGT. This failed, the patient aspirated due to ongoing vomiting, and the PHO was called, who found the patient unresponsive in cardiorespiratory arrest. Cardiopulmonary resuscitation/intubation was performed with restoration of pulse and saturations, but a significant inotrope requirement followed.

The patient was then transferred to ICU with a plan for a CT abdomen from the surgical registrar. The patient was reviewed by the surgical Fellow at approximately 07:00 with the plan for surgery. The family agreed with this. The surgical record keeping around these events and decisions was poor.

The patient underwent an open umbilical hernia repair with sutures, with 'strangulated but viable small bowel' documented – further details are lacking in the report. Minimal anaesthetic was required. Postoperatively, the patient developed gram-negative bacteraemia and increasing inotrope requirement and unfortunately did not wake. A decision was made for a palliative extubation after discussion with the family. The patient passed away on day 6.

DISCUSSION

Elderly patients' rib fractures in the setting of blunt trauma are associated with high morbidity and mortality, and multidisciplinary management is often required. Early surgical review was mandatory but did not happen.

It does not appear that the patient was discussed or reviewed by a surgical consultant. He was reviewed by the Fellow on day 4, by which time the delay to diagnosis and treatment meant the outcome was already predictable.

There appears to be a lack of recognition of the high-risk nature of an irreducible hernia with potential strangulated bowel in this trauma presentation and a lack of importance placed on the changing observations that the nursing staff were concerned about.

Faeculent vomiting from a small bowel obstruction can appear to be coffee ground vomiting related to an upper GI bleed. There appears to have been a failure to consider the alternate diagnosis, particularly when doctors even documented that the findings were inconsistent with an upper GI bleed. The consistent, repeated findings of an irreducible umbilical hernia and abdominal tenderness appear to have been either ignored or not considered as a clue to what was actually happening.

It is suspected that a review by a more senior surgical doctor would have led to an earlier diagnosis of a strangulated umbilical hernia and small bowel obstruction, potentially leading to earlier surgical intervention and the patient surviving this illness (accepting he was a high-risk patient with this degree of trauma).

CLINICAL LESSONS

There was a clear delay to diagnosis of this patient's umbilical hernia strangulation and small bowel obstruction. ED admission under interim care plan and subsequent surgical reviews did not identify the hernia as clinically relevant. For over 24 hours, vomiting was misdiagnosed as an upper GI bleed despite a

painful irreducible umbilical hernia (later with surrounding erythema) pointing to the correct diagnosis of a strangulated umbilical hernia. With earlier diagnosis and an earlier surgery, this patient may well have survived.

This 84-year-old trauma/MVA victim, with a fractured second rib, was not reviewed by a surgical doctor until well over 8 hours from the earliest documented time of initial surgical referral, and this initial assessment was by an intern. The registrar review was later (time unknown as not documented). This is despite clearly documented concerns from nursing staff regarding the patient's observations and low saturations.


Early consultant discussions should happen when irreducible hernias with tenderness are diagnosed.

Abdominal CT is contraindicated in the setting of a clinically strangulated umbilical hernia.

Abbreviations

AF	atrial fibrillation
ALT	alanine transaminase
APO	acute pulmonary oedema
ARP	acute resuscitation plan
BiPAP	bilevel positive airway pressure
BP	blood pressure
CABG	coronary artery bypass graft
CBD	common bile duct
CFA	common femoral artery
CIA	common iliac artery
CK	creatine kinase
COAD	chronic obstructive airway disease
COPD	chronic obstructive pulmonary disease
CPB	cardiopulmonary bypass
CT	computed tomography
CTO	chronic total occlusion
CVA	cerebrovascular accident
DSA	digital subtraction angiography
D&C	dilatation and curettage
ECG	electrocardiogram
ECMO	extracorporeal membrane oxygenation
ED	emergency department
EIA	external iliac artery
ERAS	enhanced recovery after surgery
ERCP	endoscopic retrograde cholangiopancreatography
GI	gastrointestinal
Hb	haemoglobin
HPB	hepato-pancreato-biliary
HT	hypertension
IABP	intra-aortic balloon pump
ICA	internal carotid artery
ICU	intensive care unit
ICV	ileocaecal valve
IMA	inferior mesenteric artery

INR	international normalised ratio
IOC	intraoperative cholangiograms
IV	intravenous
LAD	left anterior descending artery
LBO	large bowel obstruction
LCX	left circumflex
LIMA	left internal mammary artery
LM	left main
LPDA	left posterior descending artery
LV	left ventricular
LVEF	left ventricular ejection fraction
MDT	multidisciplinary team
MET	medical emergency team
MI	myocardial infarction
MR	mitral regurgitation
MSSA	methicillin-sensitive <i>Staphylococcus aureus</i>
MVA	multiple vehicle accident
MVR	mitral valve replacement
NOAC	novel oral anticoagulants
NGT	nasogastric tube
NSTEMI	non-ST-elevation myocardial infarction
OR	operating room
PDA	posterior descending artery
PET	positron emission tomography
PHO	principal house officer
PTC	percutaneous transhepatic cholangiogram
PVD	peripheral vascular disease
RCA	right coronary artery
SFA	superficial femoral artery
SMA	superior mesenteric artery
STEMI	ST-elevation myocardial infarction
TOE	transoesophageal echocardiogram
VA ECMO	veno-arterial extracorporeal membrane oxygenation
WCC	white cell count
XC	cross clamp



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