



PRIVATE & CONFIDENTIAL



Case Note Review Booklet

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Information is obtained under a quality assurance activity.

Case study 1: Futile care when operating in advanced malignancy

Case summary

A late middle-aged patient was admitted for epigastric pain. The patient had no vomiting but was constipated. The history included renal carcinoma that had metastasised to the lung, liver and bone, with earlier chemotherapy having been ceased and palliation introduced. Medications included Oxycontin and Endone. The surgical team promptly reviewed the patient who was febrile with a tachycardia of 100 beats per minute (bpm) and low blood pressure (BP). The abdomen was noticed to be tense with guarding and rebound with scanty bowel sounds. There was a tender, irreducible inguinal hernia.

Investigations revealed a white cell count (WCC) of 17, haemoglobin (Hb) of 100g/dL and lactate of 2mg/dL. Abdominal x-ray did not reveal any dilatation of bowel. The consultant surgeon suggested to the patient that a laparotomy was needed but then appears to have had 'second thoughts' and ordered an abdominal computed tomography (CT). This was done within 30 minutes and the consultant surgeon documented that there was loop of bowel in the hernia and proceeded to laparotomy. At laparotomy, there was ascites and the inguinal mass was found to be a metastatic node. The patient discharged against medical advice on the first postoperative day and subsequently died.

Comment

Although stable, the patient had abdominal peritonism; what was perceived to be an irreducible inguinal hernia prompted the consultant surgeon to suspect bowel ischemia and the need for a laparotomy. Realising that the patient had advanced malignancy, a CT was ordered preoperatively and interpreted as showing incarcerated bowel in the hernia sac. It is unclear if the consultant surgeon conferred with the radiologist or had come to this conclusion.

While the operation was unlikely to have caused the patients' eventual demise, it was unnecessary. The history of metastatic cancer to multiple visceral sites and palliation initiated by the medical oncologist would make most consultant surgeons hesitate to operate. The CT was subsequently reported by the radiologist to show ascites, enlarged metastatic retroperitoneal nodes, subcapsular liver metastasis and extensive omental and peritoneal metastatic deposits. In particular, it reported that the 'right direct inguinal' hernia contained enhancing soft tissue likely to represent metastatic peritoneal tumour deposit (not bowel). It is likely that the consultant surgeon mistook this for bowel⁽¹⁾.

A learning point would be that in difficult cases, it is prudent to discuss imaging findings with a radiologist if at all possible, before proceeding to surgery.

WAASM comments

One of the quality standards in the United Kingdom National Emergency Laparotomy Audit is the time to reporting by a consultant radiologist.

¹ Cognitive Biases Associated with Medical Decisions: A Systematic Review. G Saposnik, D Redelmeier, C Ruff, PN Tobler.. *BMC Inf and Dec Making* (2016) 16:138

Case study 2: Multiple management errors in a patient with gallstones I

Case summary

An elderly patient on immunosuppression for a renal transplant had an endoscopic retrograde cholangiopancreatography (ERCP) for cholelithiasis 12 months earlier. There were known residual stones in the gall bladder. This was discussed in the surgical outpatients, but was not followed up further.

The patient attended the local emergency department (ED) during the morning with an acute abdomen and sepsis. Investigations revealed pneumobilia from a probable ruptured gall bladder. Although the hospital had a general surgical service that could have managed the surgery, the patient was transferred to a tertiary institution. This was apparently because of a directive to manage 'renal' cases at a tertiary hospital. When the consultant surgeon at the tertiary hospital spoke to the consultant surgeon at the initial hospital, the details provided related to another, less acute patient. So the tertiary hospital consultant surgeon commenced a long operation on another patient. On arrival at the tertiary hospital the patient was virtually moribund. There was a further delay because another operation had commenced. The patient's progress in the intensive care unit (ICU) postoperatively was unrewarding and the patient died four days later.

Comment

This patient attended the initial hospital ED after a night of pain, temperature elevation and tremors. Investigations showed abnormalities in the biliary system and an accurate diagnosis of gall bladder perforation and peritonitis was made. The ED staff did not fully appreciate the severity of the sepsis and although they correctly contacted the surgical team in their hospital, the patient was transferred without being assessed by a consultant surgeon, apparently because of the 'renal' directive.

This was compounded by a serious and significant communication issue, with the consultant surgeon at the initial hospital providing incorrect information.

The past history of the patient also indicates shortcomings in the surgical management. Following an ERCP that leaves gallstones, a planned cholecystectomy is indicated. Although elderly and with some comorbidities, it is likely an elective laparoscopic cholecystectomy could have prevented the (inevitable) recurrence of the cholecystitis that resulted in the patient's demise.

WAASM comments

Problems related to the interface between consultant surgeons and gastroenterologists have been reported in previous WAASM Case Note Review Booklets. This case (as well as case study 3) illustrates that potentially avoidable deaths are still occurring. As in previous reports, they demonstrate both clinical and service failures. Attention to this is now overdue.

A number of case reports related to septic cholangitis have been previously included in WAASM Case Note Review Booklets. Concerns around the management crossover between gallstone disease, which is managed by consultant surgeons, and ERCP, which is most frequently undertaken by gastroenterologists, have been expressed.

Delay in the decompression of a sigmoid volvulus has also been previously reported by the WAASM. Traditionally, these were immediately decompressed by consultant surgeons with a rigid sigmoidoscope, often in the ED. Now they are more frequently managed by a gastroenterologist with a fibre-optic scope.

Consultant surgeons recognise that in both clinical scenarios time is of the essence. It appears the urgency of the situation is not always appreciated by others.

Case study 3: Multiple management errors in a patient with gallstones II

Case summary

A normally fit, elderly patient was admitted to a metropolitan hospital with four days of confusion and abdominal pain. For five days the patient was managed in a general medical ward, but following a medical emergency team (MET) call, was admitted to the ICU where the patient was deemed septic. On arrival in the ICU, the patient required considerable support including ventilation and inotropic drugs. Despite extensive investigation, the source of the presumed sepsis was not found. After 10 days, a consultant surgeon was consulted.

The patient was known to have had an ERCP four months previously and, although normal on admission, the liver function tests (LFTs) progressively deteriorated – the bilirubin was normal on hospital admission, but 75mmol/L on the ICU admission and 125mmol/L when referred for an ERCP. The C-reactive protein (CRP) was 50mg/L on hospital admission, 200mg/L on the ICU admission and greater than 300mg/L when referred for an ERCP. The lactate was 2.5mg/dL on the ICU admission and 5.0mg/dL two days later.

Although an abdominal CT scan was normal, an ultrasound suggested there was a ductal stone. On the afternoon of the fourth day following the ICU admission, the patient was referred to the tertiary hospital that undertook the original ERCP. They declined to accept the patient as the tertiary hospital had no ICU beds available.

The following day, the patient was transferred to a different tertiary hospital and had an ERCP in the early evening. Sludge and pus were removed from the common bile duct (CBD) and the report noted 'likely purulent cholangitis'. Following this, the LFTs improved but never returned to normal. The patient remained in the ICU and slowly deteriorated from resistant multiple organ failure thought to be secondary to sepsis and died 19 days after the ERCP.

Comment

There are a number of issues that merit consideration:

The initial ERCP was not followed by a cholecystectomy. From all accounts, the patient was fit enough for this. The clinical source of referral for the initial ERCP is not clear. The discharge summary to the general practitioner (GP) relating to the ERCP was written three months after discharge, and indeed only two weeks before the final admission noting '*patient not known to author*'. There were no instructions in the discharge summary regarding referral to a consultant surgeon. If the patient was initially referred for an ERCP by a consultant surgeon, then post-ERCP follow up does not appear to have been arranged.

The patient was clearly septic on admission to the metropolitan hospital and given the background and deterioration, septic cholangitis was by far the most likely diagnosis. A consultant surgeon did not review the patient until nine days after hospital admission, and four days after the ICU admission, and immediately recommended an ERCP.

Although a decision for an ERCP was made, it still took more than 24 hours for the ERCP to be completed. Septic cholangitis is a true surgical emergency and delaying an ERCP by greater than 24 hours for 'service' reasons must be considered a material adverse delay. As it happened, the delay of 24 hours in obtaining the ERCP was material given the previous delay of some days as the sepsis was by then well established. That stated, the patient survived 19 days suggesting that with timely intervention the outcome might have been different.

If a laparoscopic cholecystectomy had been performed shortly after the initial ERCP, the patient would almost certainly not have developed septic cholangitis. There was a clear failure of post-ERCP care by those managing the patient. Given the background, the diagnosis of septic cholangitis should have been entertained much earlier. An earlier ERCP may have changed the outcome.

Overall, it is difficult to avoid the conclusion that this patient could have been managed better and, if that had occurred, the outcome in all probability would have been different.

Case study 4: Delayed recognition of severe necrotising fasciitis following ERCP

Case summary

A middle-aged patient living independently was admitted with acute cholecystitis and had a laparoscopic cholecystectomy one day later. An unexpected CBD stone was found and retrieved by an ERCP the following day by the same consultant surgeon. Shortly after, there was severe abdominal pain, backache and vomiting heralding confirmed acute post-ERCP pancreatitis. A CT showed free gas around the second part of the duodenum and fluid around the right kidney. The patient was treated appropriately with support in the ICU and the next day a laparoscopic washout with drains placed was undertaken.

The patient's progress was steady for five days, with fluctuating progress and continuing pain. Severe scrotal oedema, anaemia, fluid balance issues and groin bruising occurred. Several CT scans were done, consistent with pancreatic phlegm.

By two weeks, right flank and thigh cellulitis developed and a CT confirmed much necrotic tissue and fluid in paracolic gutters and the pancreatic bed, with gas in the head of pancreas. In the absence of the first consultant surgeon and the second consultant surgeon, who was minding the patient with the ICU support, a third consultant surgeon reviewed the patient and, 15 days after the first operation, undertook a laparotomy with the intention to debride the gross sepsis. This was not possible to do adequately and the patient died shortly afterwards.

Comment

Acute cholecystitis can co-exist with an undiagnosed CBD stone. The choice of management is operator dependant and an ERCP postoperatively is a non-controversial choice (although the patient was not jaundiced and the liver function was normal). The complication rate for acute pancreatitis is 1-3 per cent after sphincterotomy and balloon dilation, and for necrotising pancreatitis it is 0.3 per cent. The stone was retrieved while the patient had postoperative pain the day after surgery and it is a difficult time to acquire consent, but is largely implied under broad operative consent and consultative advice

The pancreatitis was managed appropriately with support. A CT scan showed 'considerable' free gas around the second part of the duodenum and anterior to the right para-renal space. The consultant surgeon intervened appropriately one day later, washing out 300mL of haemoserous fluid with washout and drainage. No bowel content was seen and this was performed laparoscopically.

It is contentious however, to declare no duodenal leak without mobilising (kocherising) the duodenum (a difficult manoeuvre laparoscopically except for frequent laparoscopic gastric resectors), so there may have been incomplete assessment for duodenal perforation at this early stage.

It would also have been valuable to measure the amylase in the haemoserous fluid and culture it for microorganisms. The Atlanta Classification of acute pancreatitis makes reference to 'monomicrobial disease versus microbial disease' as seen in necrotising pancreatitis and duodenal perforation. This may give early warning of the severity of impending illness.

The patient improved for five to six days but, despite this, continued to have bad pain, fever to 39 degrees, severe back and scrotal oedema, high CRPs, increasing WCC, anaemia requiring transfusion (despite no diagnosis of haemorrhagic pancreatitis on CT and no blood in drains) suggesting sepsis. Eventually marked bruising occurred in the groin. Feeding was poor and mobility was not possible.

Remarkably, no system failure ensued as would be expected in a bad pancreatitis. However, the notes state repeatedly 'looks very unwell', pale and has severe diarrhoea. Several further CT scans showed localised fluid, phlegm and gas collection and worsening anal area of the back region.

There is no recrimination about the diagnosis of pancreatitis or its conservative management, but the subtle deterioration in a previously operated patient is not consistent with "non-intervention" and a sad end point for this deceased patient.

Case study 5: Delay to definitive surgery

Case summary

A middle-aged patient presented with acute on chronic cholecystitis, with a CRP of 170mg/L together with an obstructive jaundice on LFTs. The patient was in end stage renal failure and also suffering from hypertension and hypercholesterolemia. The patient had previously been admitted two months prior with acute cholecystitis and choledocholithiasis and was treated with a percutaneous cholecystomy plus an ERCP and biliary stenting. On this admission, the patient presented with an overall clinical picture of cholecystitis and possible cholangitis with suspected bile duct stones.

Being a renal patient, treatment was by the hepatobiliary specialist unit and nephrology. The patient was initially managed medically and an ERCP was arranged for the first day after admission, however this was cancelled. At that time, the patient was tachycardic at 144bpm with ongoing abdominal pain and tenderness. The CRP was 240mg/L and WCC was 23.

The next morning the patient was still septic though the clinical picture had improved. An ERCP was performed late in the afternoon, however no duct stones were found. Over the next five days the patient was treated in the high dependency unit (HDU) with intravenous (IV) antibiotics and did improve clinically, although repeated blood tests continued to show inflammatory markers with significantly elevated white cells, CRP and an ongoing obstructive picture with the LFTs. During this period, the decision was made to proceed with a cholecystectomy and removal of the patient's peritoneal dialysis catheter. This procedure occurred on day seven following the initial admission.

A laparotomy was performed, but a cholecystectomy was not possible due to an extremely thickened and inflamed gallbladder being densely adherent to surrounding structures. Instead, the gallbladder was divided and the cystic duct was controlled and closed with sutures. The peritoneal dialysis catheter was removed and the abdomen was washed.

Immediately following surgery the patient became overtly septic, hypotensive and acidotic. The patient was re-intubated and went to the ICU in liver failure with an International Normalised Ratio (INR) of 3.6 and an activated partial thromboplastin time of 180 seconds. Hb was 66g/dL and WCC was 25.

Over the next 36 hours the patient continued to deteriorate and went into multiple organ failure. Despite all medical management in the ICU, no further surgery was attempted and the patient succumbed to multiple organ failure and sepsis.

Comment

This patient was a very high risk surgical candidate, deemed to have an American Society of Anesthesiologists (ASA) grade 4 on admission. The preoperative management was of a good standard, the only question being whether the patient should have undergone definitive treatment by way of cholecystectomy very early in this admission rather than seven days later. Although the patient was a very high risk candidate for surgery, more conservative means had already been attempted two months earlier; namely cholecystostomy and CBD stenting. These measures had obviously failed to definitively treat the biliary sepsis. The high risk was no doubt the driving factor for a second attempt at non-operative management.

On the other hand, the patient had failed this management once and the ability to survive major surgery was only likely to deteriorate with the ongoing presence of a septic focus. Had the patient been operated on within 48 hours of admission following aggressive resuscitation, antibiotics and dialysis, there may have been a better chance. However there is also a very good chance that the outcome would have been the same given the patient's significant comorbidities.

Case study 6: Delay in return to theatre

Case summary

An elderly patient being prepared for a colonoscopy to investigate per rectal bleeding developed prolapsed thrombosed haemorrhoids. The colonoscopy was abandoned and the patient was transferred to a tertiary hospital where the haemorrhoids were reduced. The continued pain was managed with analgesia.

There was no significant past medical history.

After six days, there was a MET call for hypotension and abdominal pain. This led to a CT of the abdomen which showed features of bowel perforation with diffuse inflammatory changes and a small pelvic collection.

At surgery, a perforation from a rectal adenocarcinoma was managed with a Hartmann's procedure. Collections were percutaneously drained on the eight and tenth postoperative days. A CT scan on postoperative day 12 showed a few residual inter-loop collections. The patient continued to be septic, requiring inotropes, and was ventilator dependent due to acute respiratory distress syndrome. Requests by the ICU team for the surgical team to take the patient back to theatre for a washout was declined.

The patient finally died on postoperative day 22.

Comment

The case really represents a couple of missed opportunities. Firstly, the patient got as far as the endoscopy unit, having been admitted the night before for pain relief and urinary retention, before having the colonoscopy cancelled by the consultant gastroenterologist after a rectal examination was done. There is a partially filled pre-anaesthetic record in the notes, so presumably there was an anaesthetist present for the colonoscopy and, if the colonoscopy had gone ahead, the rectal tumour would have been found before it perforated.

Secondly, there appears to have been multiple opportunities to take the patient back to the theatre for a washout but, instead, percutaneous drainage was attempted on a couple of occasions, although still leaving multiple inter-loop collections. The patient's respiratory compromise was probably secondary to the intra-abdominal sepsis and once again this would probably have been helped by a washout.

There is usually little to lose by taking a septic patient back to theatre. This is especially true if the ICU team is requesting for this. The intensivists are usually able to support the patient through the re-look laparotomy and washout; they would tend not to request one otherwise.

It is, of course, hard to say whether this would have changed the overall outcome, but taking the patient back to theatre for washout(s) as needed would be regarded as the more traditional and accepted approach in this situation.

Case study 7: Delay in managing sepsis secondary to anastomotic leak

Case summary

A young patient with obesity and sleep apnoea was admitted for an elective proctectomy and ileoanal pouch with a defunctioning loop ileostomy. The previous history included an emergency colectomy for severe ulcerative colitis.

It does not appear that the patient was on medication at the time of admission to hospital. Following surgery, the initial postoperative course was unremarkable, apart from a spike in temperature two days following the surgery. However this seemed to be an isolated event.

Four days following surgery, there was a wound discharge and the patient was noted to be somewhat dehydrated with a fairly high stomal output. IV Tazocin was commenced, presumably for ongoing wound discharge. By 20:00 on the fourth postoperative day, a MET call was placed because of the hypotension. The patient was hypotensive, febrile and turbid fluid was noticed in the pelvic drain. In addition, the patient was oliguric, and had a distended and tender abdomen with ooze from the wound. The clinical assessment was that of septic shock. Bloods included a CRP of greater than 500mg/L.

After discussion with the consultant surgeon, the patient underwent an urgent CT scan at 20:45. This showed a collection and an anastomotic leak. The patient was transferred to the ICU at 22:00 and was commenced on Noradrenaline. The consultant surgeon and intensivists discussed the CT scan and clinical condition and decided to continue with medical management.

The following day, the surgical team and intensivists decided a laparotomy was required. The BP had returned to 110mmHg systolic, pulse rate was approximately 120bpm and the patient was in atrial fibrillation (AF). The operation commenced at 15:00, approximately 18 hours following the patient's MET call and CT scan confirmation of an anastomotic leak.

At laparotomy there was purulent material throughout the abdomen. The drain was removed and replaced with Yates drains in both paracolic gutters and pelvis and the abdomen lavaged. The patient was taken back to the ICU, was ventilated and on inotrope support. Two days later, a further lavage was undertaken. Minimal further contamination was noticed. However that evening the patient died in the ICU.

Comment

The laparotomy could possibly have been performed on the night of the diagnosis of the anastomotic leak and the MET call diagnosis of septic shock. If a patient has a confirmed anastomotic leak and septic shock requiring Noradrenaline in the ICU, then a laparotomy seems to be an emergency requirement.

No doubt in this case things did progress rapidly. IV antibiotics were commenced the day before the MET call and were not having an impact on the progression of the patient's sepsis. Early surgery was required.

Case study 8: Delay in treatment of sigmoid colon volvulus

Case summary

A very elderly patient had gradual onset of severe abdominal pain, vomiting and constipation for one day. The patient was a new resident in a nursing home, having recently been discharged from a tertiary hospital after a four month stay for treatment of pulmonary embolism and retroperitoneal haematoma. The latter was a complication of anticoagulant therapy. Comorbidities included Parkinson's disease, ischaemic heart disease and AF. The patient had been able to walk with a frame until recently.

The patient had a home visit by a doctor who diagnosed intestinal obstruction. That same evening the patient was assessed by the ED medical team at the local non-metropolitan hospital and arrangements were made to transfer the patient to the surgical department of a tertiary hospital. There the patient was given analgesic, IV fluid and a nasogastric tube (NGT). Blood test results were normal except for mild leucocytosis and neutrophilia. The patient remained comfortable and stable.

The patient was assessed by the surgical registrar the following morning. A diagnosis of volvulus of the sigmoid colon was made. Rigid sigmoidoscopy was performed and a rectal tube was inserted. However a subsequent CT abdomen showed no improvement of the condition. At 09:31 the registrar recorded a consultation with the gastroenterologist on duty who agreed to do a flexible sigmoidoscopy that same morning. Consent for 'flexible sigmoidoscopy and bowel decompression' was signed by the patient and three doctors apparently from both the surgical and gastroenterology teams. Significant risks were listed on one of the two consent forms.

At 17:45 nursing staff recorded 'abdomen very distended, small amount of pain, waiting for flexible sigmoidoscopy'. At 20:45 nursing staff recorded 'abdomen distended and hard'. The anaesthetic record showed a start time of 21:00. It also recorded 'ASA 4, frail, not for cardiopulmonary resuscitation (CPR), yes for MET call'. Vital signs remained stable before and during the procedure, as well as at the post-anaesthetic care unit.

Reduction of the volvulus was unsuccessful. Frank necrosis of the sigmoid colon mucosa was noted. A surgical registrar was present during the procedure and recorded 'patient currently anaesthetised, not consented for laparotomy'. The situation was discussed with the patient's daughter, who decided against surgery. Palliative care was commenced, the patient died peacefully two days later.

Comment

There was a 12 hour delay in performing the flexible sigmoidoscopy. No cause of the delay could be found in the hospital record. Theatre availability was the most likely explanation.

During the informed consent process for flexible sigmoidoscopy, the clinical team had missed the opportunity of discussing the need for a laparotomy if the endoscopic treatment was unsuccessful. With the consent for a laparotomy (if necessary) included on the consent form, the theatre staff would have been alerted to the urgency of the patient's condition and this might have avoided delay in treatment.

Case study 9: Unreasonable delay managing a bowel perforation following laminectomy

Case summary

An elderly patient with a history of connective tissue disorder (scleroderma – on Plaquenil) had a longstanding history of back issues. A consultant neurosurgeon in a private hospital undertook a decompression laminectomy and vertebroplasty for a lumbar vertebrae 4/5 stenosis and osteoporotic fracture. The operation took just over two hours.

The initial postoperative recovery was uncomplicated, apart from some constipation which was treated with aperients. On the fourth postoperative day, the patient developed abdominal pain and was assessed by the resident medical officer (RMO) at 19:20, with the clinical findings of a distended abdomen and generalised tenderness. No imaging was requested and the patient was diagnosed with constipation. A fleet enema was prescribed. There is no record of the RMO discussing this with the consultant neurosurgeon. At 20:52 the rehabilitation physician was also contacted, and an abdominal x-ray was recommended. No further advice was given regarding laxatives.

The medical records indicate that the abdominal x-ray was only performed the following morning at 11:45, where free subdiaphragmatic gas was seen. Due to a lack of surgical cover, the patient was transferred to a tertiary hospital. The patient was seen by the surgical team at 21:30, and taken to theatre within the next 90 minutes for a laparotomy.

At laparotomy, there was faecal contamination secondary to a perforated caecum with patchy necrosis – a right hemicolectomy with primary anastomosis was performed. The patient required inotropic support and was managed in the ICU. The patient returned to theatre the following day due to compartment syndrome. Although the anastomosis was viable and intact, it was taken down with end-stomas brought out and a laparostomy to leave the abdomen open. Unfortunately, the patient developed progressive multiple organ failure, with a progressively ischaemic small intestine seen during vacuum dressing changes. Treatment was withdrawn and the patient passed away four days after the transfer.

Comment

The delay in managing the patient probably made a significant contribution. When the patient was assessed on the fourth postoperative day, there was evidence of peritonitis and yet the abdominal x-ray ordered that night was not done until the following day - a delay of 15 hours. Once reported, there was at least another nine hour delay before being seen by the surgical team. So there was a greater than 26 hour delay in a patient with a distended abdomen and generalised tenderness. It is quite possible the outcome may have been different had it not been for these delays.

The surgical treatment was appropriate and the decision to perform a primary anastomosis did not affect the ultimate outcome.

Case study 10: Elderly patient with obstructive jaundice – prompt treatment and adequate fluid monitoring are paramount

Case summary

This very elderly patient was admitted to a tertiary hospital with obstructive jaundice and suspected acute cholangitis, for consideration of an ERCP. The patient was initially treated at a small local hospital with symptoms of epigastric pain and hypotension, and then transferred to a secondary hospital for further care. At the secondary hospital, the patient was afebrile, with non-elevated inflammatory markers, but with deranged LFTs (bilirubin peaked at 94mmol/L; raised alkaline phosphatase and transaminases).

Consideration for a magnetic resonance cholangiopancreatography was given but it was deemed to be incompatible with the pacemaker. A CT scan of the abdomen was reported, stating 'there is a small density at what may be the junction of CBD and second part of duodenum and the possibility is that this may represent a non-obstructing calculus. There is no accompanying CBD dilatation or intrahepatic biliary dilatation'. The patient was transferred to the tertiary facility on the fifth day.

Upon arrival to the tertiary hospital on Friday evening, the patient was systemically well and pain free, with yellow sclera, and thought to be responding well to the IV antibiotics commenced in the secondary hospital. Comorbidities included a previous open cholecystectomy; AF on Warfarin (withheld); first degree heart block with pacemaker in situ; renal impairment; hypertension; groin hernia repairs bilaterally; left hip replacement; smoking history (50 packs per year). Medications included Metformin and diuretics.

The treatment plan included the continuation of IV antibiotics, fluid resuscitation, complete reversal of anticoagulation, pacemaker check and preparation to proceed to an ERCP. This could not be performed on the day of admission, Friday, and therefore was postponed until the following Monday. Over the following two days the patient remained afebrile, although it was noted that the patient had 'significant cardiac history' and plans were made to obtain the last echocardiogram report performed elsewhere before proceeding to an ERCP.

On Sunday evening, the nurses noted that the patient was 'drowsy' and had a poor urine output. Six hours later, a junior doctor ordered more IV fluids, saline nebulisers, and observation. Four hours after this, early in the morning, the patient became unresponsive after returning from the toilet and all resuscitative measures failed.

Comment

One can only speculate that this is likely to be of cardiac origin, due to the poor functional reserve which was further compromised by acute illness. There are, however, several areas that deserve further consideration and comment:

- This patient attended three different hospitals in at least nine days. Failure to progress favourably over four days in the secondary hospital should have prompted an earlier transfer to the tertiary facility.
- Consideration should be given as to the processes in place in the tertiary facility to accommodate emergency ERCP requests to enable timely treatment of sick patients, including a weekend service for those patients deemed at risk of deterioration due to delays in treatment. In this particular patient, it is not clear that an urgent ERCP was warranted (afebrile, stable bilirubin, haemodynamically stable), although a delay of a further four days when known to have been jaundiced for five days prior was not ideal.
- It is not clear from the scanned records whether or not IV fluid replacement was a factor contributing to the acute deterioration of this patient. The nurses noted, and later the junior doctor, that the patient was '*rattly*' in the chest; this raises the possibility and concern of fluid overload.
- In relation to the above point, it is concerning that several hours passed before a junior doctor acted on the concerns of the nurses and that, after this, no further escalation of care occurred. The patient may have benefitted from transfer to a high dependency area for accurate determination of intravascular fluid volume and fluid management.

There is no evidence from the medical records to point to a specific contributory cause of death. Even if an earlier transfer to a tertiary facility had occurred, with a prompt ERCP and adequate fluid management, this patient's death could perhaps not have been prevented.

Case study 11: Inadequate management of a bleeding duodenal ulcer

Case summary

This was an elderly patient with a past history of peripheral vascular disease, left above knee amputation, dyslipidaemia, heavy smoking (100 packs per year), asthma and osteoarthritis (was taking Meloxicam).

The patient presented by ambulance to an outer-metropolitan hospital in a very physiologically compromised state (pH 7.148, lactate 13mg/dL, Hb 92g/dL, systolic BP 60-80mmHg). The patient was seen by a doctor, no time was recorded and the doctor's designation was not stated. The patient gave a history of falls and chest pain with shortness of breath. The ED observations record a compromised patient - poor peripheral circulation, diaphoresis, and oxygen saturation of either 82 per cent or 92 per cent (illegible) on room air, with increased respiratory effort using accessory muscles.

The doctor's notes appear to be the initial assessment and gave a differential diagnosis of sepsis (pulmonary or urosepsis) or upper gastrointestinal (GI) bleed. The plan of management was to follow the sepsis pathway with a blood culture and proton pump inhibitor. Antibiotics were recorded as the treatment plan.

Whilst in the ED, the patient passed 300mL of melaena (dark red/black stool). Subsequent to this, the patient was transferred to the radiology department for a chest x-ray where the patient was said to have a possible vasovagal episode and seizure. The patient had a further episode of melaena in the ED and was transferred to a resuscitation cubicle.

The patient's Hb was 76g/dL from a venous blood gas sample taken at 17:00 (and 55g/dL on arterial blood gas sample at 17:15). The patient was given the first unit of blood at 17:15, some three hours after arrival. The patient was then transfused five units of packed red blood cells.

An arterial line (inserted at 17:00) was consistent with hypotension (systolic BP 56–70mmHg). There was borderline tachycardia in the last three recordings and also increasing supplementary oxygen requirement. Arterial blood gases (printed at 18:04) showed a pH of 7.161 and base level of -16.5. At 18:28 the oxygen saturation was 84 per cent with 15L of oxygen supplementation.

There are no notes to indicate who made the decision to transfer the patient to a tertiary hospital or what factors influenced this decision. There was also no note indicating whether there was any consultation with the receiving hospital.

The transfer was given a 'Priority 2' and the ambulance attended the referring outer-metropolitan hospital ED within 5 minutes and departed within 35 minutes of the call being received. The journey took approximately 45 minutes. A doctor and nurse from the referring hospital accompanied the patient during the transfer. The patient was documented to have a systolic BP of 60mmHg (two recordings) whilst on route. The heart rate was within normal limits. The blood oxygen saturation level was 96 per cent on room air. There is no documentation of any treatment given or initiated during the transfer.

On arrival at the receiving tertiary hospital ED, the systolic BP was 60mmHg. Soon after arrival, the patient had a cardiorespiratory arrest requiring CPR and inotropic support. The patient was transferred to the operating theatre within 60 minutes of arrival. A gastroscopy showed a large duodenal bulb ulcer with arterial bleeding. This could not be controlled endoscopically.

A laparotomy and under running of the bleeding gastroduodenal artery was performed. Consultant surgeons were directly involved during both procedures. Of interest was a recorded pH of 6.65 (anaesthetic record). Postoperatively, the patient was managed in the ICU but developed multiple organ failure and was declared deceased the following day.

Comment

The management at the outer-metropolitan hospital was below the level of the standard of care expected. It is clear from the initial hospital ED notes that this patient, who was known to be using Meloxicam for osteoarthritis, now presented with recent abdominal pain and melaena - enough to make the patient unstable, acidotic and to require five units of blood. The only possible diagnosis was a substantial GI bleed.

The patient's age and past medical/surgical history indicated the need for aggressive and prompt intervention, urgent gastroscopy and possible surgical intervention.

Yet the primary diagnosis was sepsis. It seems the respiratory status was interpreted as a chest infection, rather than a physiological compensation state. The designation of the doctor is not clear but it seems ED staffs at all levels were very slow to appreciate the diagnosis. On the initial observation, there was clear evidence of a compromised physiologic state with poor peripheral circulation. Despite that, the patient was not closely monitored in a resuscitation bay until two hours post-arrival. The observations were sparse with no urinary measures recorded, even though an indwelling catheter was inserted.

There is no note from the referring hospital to indicate who made the decision for transfer and on what basis. There is no documentation of a consultation with either the gastroenterology or surgical services. The documentation generally was very sketchy and poor.

If a patient is haemodynamically unstable from haemorrhage it may not be appropriate to transfer the patient to another medical facility, especially one that requires an hour of transportation. The initial hospital has an ED that is supported by a number of general surgeons. The patient should have had definitive management at that hospital.

There is no doubt the delay secondary to the transfer further compromised this patient, as evident by the cardiopulmonary arrest on arrival in the receiving hospital ED. The pH recorded at the initial stages of the operation was 6.65 - a level of acidosis not compatible with survival. The gastroscopy and surgery were unlikely to alter the prognosis, though no criticism can be levelled at this particular decision.

Except for the very brief notes written by the ambulance personnel, there was no note to indicate the management instituted during the transfer. On arrival in the tertiary hospital there was very poor documentation in the ED notes. Only the resuscitation process note in the ED chart was found. There was no clinical note from the ED doctors or the surgical team.

Case study 12: Death following appendicectomy

Case summary

An elderly patient was admitted with right lower quadrant abdominal pain, vomiting and diarrhoea. The patient had multiple comorbidities, including diabetes, and was immunosuppressed. The patient was febrile and underwent an abdominal CT scan which showed no cause for the sepsis or abdominal pain. The patient became increasingly febrile and hypotensive.

The patient was admitted to the ICU and the next day had further medical, surgical and orthopaedic review seeking the cause for the sepsis. Due to worsening sepsis, a diagnostic laparoscopy was performed. An inflamed tip of the appendix was identified and the appendix was removed. The liver, gallbladder, stomach, colon and terminal ileum were normal but some adherent fibrinous exudate was noted and thought to be due to generalised peritonitis, although no cause of generalised peritonitis was documented.

Extubation was attempted on the second postoperative day but the patient was re-intubated. On the third postoperative day, the patient had a significant troponin leak and was discussed with Cardiology but no intervention was deemed necessary.

On the fourth postoperative day, dark fluid discharged from the surgical drain site. By the next day there had been 600mL of bilious/purulent discharge from the drain site and a CT was performed. This showed a tiny amount of free gas and small amount of fluid overlying the bladder. Three days later the patient returned to theatre for a laparotomy.

There was a punch perforation 25cm from the terminal ileum which was repaired. The appendiceal stump, stomach, gallbladder and duodenum all looked healthy. Over the next eight days the patient had ongoing sepsis and further failed extubation. After discussion with the family regarding the poor prognosis, treatment was withdrawn and the patient passed away.

Comment

It is most likely that a partial thickness tear or diathermy burn occurred at the first operation and later perforated. The terminal ileum was commented on as being normal at first laparoscopy, so was unlikely to have been missed at this time.

Bile was noted in the drain on the fifth postoperative day but the laparotomy only occurred three days later. It is not clear why the laparotomy did not occur early or if that was the final precipitator for the return to theatre.

The following are cause for concern:

- A note was made with regard to the stoma being healthy when the patient did not have a stoma. This suggests the person documenting the team review was not sufficiently aware of the patient's condition.
- With regard to the documentation of the procedures, an indication for the cause (or lack of identifiable cause) for generalised peritonitis at the first operation and the perforation at the second operation would have provided a more complete record of the findings.

As an iatrogenic injury, this is by definition an adverse event. How preventable it was is debatable. The delay to surgery was preventable.

Case study 13: Sudden intraoperative death during laparoscopic hiatus hernia repair

Case summary

An elderly patient was admitted for routine laparoscopic hiatus hernia repair. The clinical indications were correct, imaging demonstrated low lower oesophageal sphincter resting pressure and significant reflux on barium swallow.

The patient had not reported comorbidities other than hypertension and reflux. Based on this history, no preoperative cardiac evaluation was considered appropriate.

There were no issues regarding informed consenting. No technical issues arose during surgery. It seems like it was a straightforward (even easy) procedure. There were no problems or issues with the anaesthetist's preoperative assessment or consent for anaesthesia. The ASA 3 grading by the anaesthetist is probably appropriate.

However, the patient was hypertensive towards the end of the procedure. Hydralazine was given to lower the BP. Shortly thereafter, the pneumoperitoneum was deflated. These two factors may have combined to cause a sudden drop in BP. If the patient had occult ischaemic heart disease, the sudden drop of BP may have contributed to a myocardial ischaemic event.

The response of both the consultant surgeon and the anaesthetist to this event was entirely appropriate and timely. Involvement of multiple additional anaesthetic specialists was entirely appropriate. Involvement of a cardiologist during the resuscitation was commendable.

Comment

Despite the use of hindsight speculation above, the patient's pre- or intraoperative care did not contribute in a substantial way to the death. Based on the available information, the true cause of death remains unknown.

Case study 14: Inadequate preoperative diagnosis and technical errors leads to death

Case summary

This middle-aged patient suffered from severe shortness of breath (New York Heart Association Class 4). The patient had previous aortic valve surgery (size 21 bioprosthetic valve) for severe aortic stenosis. Other medical problems included ankylosing spondylitis, psoriasis, hypertension, fatty liver and chronic obstructive pulmonary disease.

The patient was investigated and found to have severe recurrent aortic stenosis on a transthoracic Electrocardiogram (ECG). However, an angiogram done preoperatively reported normal coronaries, prosthetic valve and aortic root. The pullback gradient on this report could not be found (an ECG done previously reported mid-cavity left ventricle obstruction and normal aortic valve function). This placed a doubt about the authenticity of the preoperative diagnosis.

The patient was taken up for a redo aortic valve replacement. Anaesthesia, re-entry and cardiopulmonary bypass (CPB) was safe. After the transverse aortotomy valve was explanted, the consultant surgeon was satisfied that leaflets of the prosthetic valve were diseased.

The consultant surgeon chose a size 23 bioprosthesis and implants using multiple everted mattress-pledgetted sutures. A transoesophageal echocardiogram suggested a paravalvular leak. The consultant surgeon went back and fixed the leak and after that, the right heart was not behaving well. The consultant surgeon put a vein graft to the right coronary artery and weaned the patient off CPB with an intra-aortic balloon pump and high inotropic support.

The patient remained in a low cardiac output state in the ICU and suffered a complete heart block with loss of capture of epicardia wires. A permanent pacemaker was placed in emergency. A repeat angiogram was performed which confirmed a right coronary ostial block and stenosed vein graft to the right coronary artery at anastomosis. Thereafter an angioplasty was performed.

The patient remained in a low cardiac output state and passed away shortly afterwards.

Comment

There are issues with the preoperative diagnosis (the angiogram done preoperatively suggested a normal prosthetic valve and root). There was a mid-left ventricle cavity obstruction reported in one of the previous ECGs.

Oversizing of the valve: The consultant surgeon chose to replace the valve using size 23, previously the size was 21. There is no mention of annular enlargement in the operative report. As a result, there was:

- Paravalvular leak.
- Right coronary artery ostial occlusion.
- Postoperative complete heart block needing proton pump inhibitor.

On the repeat angiogram there was severe stenosis at the distal anastomosis of the vein graft going to the right side (early graft failure).

There is an issue with the preoperative diagnosis which places the indication for surgery in doubt. There were also multiple technical errors at the time of operation, potentially resulting in the death of this patient.

Case study 15: Prevention of hypertension after aortic dissection repair is essential

Case summary

A middle-aged patient presented with severe chest and upper abdominal pain that started suddenly during exertion. The ECG was normal. There was no response to antacids and significant doses of Morphine were required to control the pain.

Eight hours later, the patient suddenly became severely hypotensive. After resuscitation, the patient responded to fluid loading and underwent an urgent CT scan which showed an extensive Type A aortic dissection with cardiac tamponade.

An urgent operation commenced just before midnight. It seems the repair was initially attempted with the aorta cross clamped. There must have been problems with bleeding at the distal anastomosis because the anastomosis was redone under circulatory arrest. The patient was then able to be weaned from bypass and returned to the ICU after six hours.

Initially the patient's progress was satisfactory and thus the patient was extubated. Then the BP started to rise and it was documented at times to be over 180mmHg systolic. There were some problems with the drugs used to control the BP.

The patient suddenly arrested with pulseless electrical activity and increased drainage from the chest drains. Despite rapid fluid administration and CPR there was no return of circulation. The chest was re-opened and a large amount of blood was found in the pericardium with active bleeding from the graft anastomosis. The situation was deemed irretrievable and the patient died.

Comment

This patient presented with a fairly typical history and clinical findings of acute aortic dissection. It was a concern that this diagnosis was missed until the patient developed cardiac tamponade. This delay meant that the patient went emergently to the operating theatre late at night necessitating operating throughout the night. This may have contributed to the decision to attempt the repair with the cross clamp on and without circulatory arrest.

In the setting of acute dissection, it is recognised that the distal anastomosis is safer and more secure when performed on the open aorta, which of course necessitates circulatory arrest. The operation report was a brief handwritten document which did not explain the intraoperative problems. However, as it was necessary to cross clamp a second time and then use circulatory arrest, there must have been a problem with the distal anastomosis.

In the ICU, the patient became increasingly hypertensive and despite the BP being difficult to control the arterial line was removed. The BP was recorded in excess of 180mmHg systolic. Some oral agents - Amlodipine, Prazosin and Metoprolol - were given with little effect (enteric absorption can be poor and unpredictable in these patients).

The patient arrested on the night after the operation due to a rupture of the anastomosis, massive blood loss and tamponade.

The aorta is very fragile after acute aortic dissection and it is essential that the BP be assiduously controlled in the postoperative period. IV agents with continuous BP monitoring should be used in this setting until the BP is controlled.

Case study 16: Non-operative management appropriate for subdural haematoma

Case summary

A very elderly patient presented with a head injury following a fall. Although a relatively frail patient who used a walking frame for long distances, the patient was otherwise self-caring. The patient was taking Rivaroxaban for AF.

The initial CT scan confirmed the presence of bilateral acute subdural haematomas. The patient was managed conservatively. Unfortunately, the patient subsequently deteriorated and repeat imaging showed extension of the subdural haematoma. A decision was made at this stage not to proceed with surgical intervention and the patient subsequently passed away.

Comment

From a neurosurgical view point, the initial management of the patient was appropriate. To evacuate these haematomas would have required bilateral craniotomies and for a patient in this age group, on irreversible antiplatelet agents, this would have been hazardous. Patients can survive with non-operative management but operative intervention would be very invasive and, whilst it may be life preserving, it is highly likely that this patient would have had a significant deficit. The most sensible course of action was to manage the patient conservatively with a view to the patient recovering as the haematoma slowly resorbed.

This case confirms the hazardous nature of antiplatelet agents in patients of this age group who are prone to falls and frequently suffer life threatening injury. The patient died as a result of the subdural haematoma but surgical intervention was not indicated.

Case study 17: Fatal stroke following cessation of Warfarin for cataract surgery

Case summary

A very elderly patient underwent routine elective right cataract surgery. There was a significant medical history of a previous stroke involving the left middle cerebral artery following cessation of Warfarin for left knee surgery some eight years previously. This occurred two weeks after ceasing the Warfarin. There was also a history of AF, hypertension, dyslipidaemia, type II diabetes mellitus and osteoarthritis.

The cataract surgery was conducted under local anaesthesia with a peribulbar block. Warfarin was ceased three days prior to the cataract surgery and the patient was bridged with Clexane.

According to the GP, the patient recommenced Warfarin after surgery without any further Clexane. Six days after the surgery, the patient was found to be unresponsive, with weakness of the left arm and left facial droop secondary to a massive right middle cerebral artery stroke. The patient died two weeks later.

Comment

It is widely considered unnecessary to cease Warfarin prior to cataract surgery and to prevent life-threatening thromboembolic events in the operative or postoperative periods (as long as the INR is within the desired therapeutic range). Temporary cessation of Warfarin may have been recommended because of the consultant surgeon's perceived risk of retro-orbital haemorrhage due to the choice of anaesthetic technique (peribulbar block) and/or to prevent risk of supra choroidal haemorrhage, which is a very rare event.

Adequate consideration might not have been given to the fact that the patient suffered a thromboembolic stroke within three weeks of ceasing Warfarin on the previous occasion of knee surgery. There was not sufficient evidence of premature stopping or continuation of Clexane following the previous knee surgery.

With the benefit of hindsight, an alternative technique - such as sub-tenon's block/topical anaesthesia/general anaesthesia - could have been used, which carries a significantly lower risk of retrobulbar haemorrhage. However, the choice of anaesthetic technique depends on the proficiency, preferred technique and comfort level of the consultant surgeon/anaesthetist. Given the patient's age and comorbidities, a general anaesthetic might not have been appropriate.

The patient and the GP, more than anyone else, must have been fully aware of the risk of ceasing Warfarin, which caused a right sided stroke following previous knee surgery.

The main area of concern is the deficiency in the postoperative care and communications wherein Clexane was not continued in the postoperative period until the patient's INR was in the desired therapeutic range after restarting Warfarin.

Case study 18: Aortic stenosis leads to death

Case summary

This was a very elderly patient with a host of medical problems - including hypertension, hypercholesterolaemia, non-insulin dependent diabetes, and aortic stenosis recorded as moderate to severe with an aortic valve grading of 0.9 but good ventricular function. The patient was slim and very active.

The patient had an uncemented total hip replacement by an experienced consultant orthopaedic surgeon. It is clear that the patient's quality of life was being interfered with due to the hip pain. The patient died shortly thereafter.

Comment

The decision to operate does not seem unreasonable. The experience of the consultant surgeon operating was adequate and there was an experienced anaesthetist present.

Retrospectively, it is clear that the moderate to severe risk of aortic stenosis resulted in a period of hypotension/unrecognised ischaemia and the patient succumbed to cardiorespiratory failure in the postoperative course, despite the valiant efforts of the ICU. The only consideration in this case may be given to the decision to operate. There was no access to the echocardiogram report, or any indication of whether there was communication between the consultant orthopaedic surgeon and the cardiologist.

If consideration was given to endovascular repair or reconstruction of the aortic stenosis, with hindsight it is clear that optimising the aortic valve function may have resulted in the patient surviving the hip replacement.

If consideration had been given preoperatively to assessment and management of the severe aortic stenosis, then clearly nothing further could have been done. There was no access to the consent form in order to ascertain what was discussed with the patient and family preoperatively.

Case study 19: Postoperative DIC in conservative multiple organ failure of the open AAA repair

Case summary

An elderly patient was admitted for an elective open repair of a 5.2cm infrarenal aortic aneurysm. Comorbidities included Crohn's disease and ischaemic heart disease with previous coronary artery bypass graft.

Preoperatively the patient was assessed by the operating consultant surgeon as well as the anaesthetist. An endoluminal aneurysm repair was not feasible secondary to the lack of an adequate proximal landing zone, as well as heavy calcifications in the access vessels. The patient was on dual anti-platelet therapy, however the Clopidogrel was stopped five days prior to surgery.

The aneurysm repair was performed via a midline laparotomy. Intraoperatively there seemed to be three issues:

- A sudden drop in BP to around 15mmHg during cross clamp time. This went along with ST depressions in the ECG. However, the patient made a spontaneous recovery.
- The top anastomosis had to be redone due to insufficient haemostasis.
- During mobilisation of the renal vein, there was a tear in one of the small lumbar tributaries. This was over-sutured and in due process there was bleeding from two further tributaries which were also over-sutured.

The total amount of saved blood was approximately 700mL. At the end of the procedure, no focal bleed out was identified; however, diffuse ooze from the retroperitoneal dissection plan was acknowledged. The patient was closed and transferred to the ICU and received platelets and clotting factors. After one hour in the ICU, the patient suffered a cardiac arrest and had to be resuscitated. The patient was returned to the theatre for an exploratory laparotomy. There was continued diffuse ooze, however no significant surgical bleed could be identified.

The patient was returned to the ICU and went into consecutive multiple organ failure and passed away during the night.

Comment

There has not been any adverse management in this case which contributed to the ultimate outcome. It is well known that open aneurysm repair carries significant perioperative mortality. The numbers in the literature suggest five per cent. However in modern times, this probably underestimates the actual risk as only cases that are unsuitable for endoluminal surgery are performed openly. These cases then naturally fall into a technically very difficult category.

In aneurysmal disease, especially in combination with severe peripheral arterial disease, it is not uncommon that an anastomosis has to be redone. Although it does add to operative time and prolonged cross clamping, it should not significantly contribute to adverse outcome.

In general, there were two main contributing factors to the patient's demise. Firstly, it seems that the patient suffered a cardiac event during the surgery with a sudden drop in BP as well as the ST segment depressions in the ECG. The second contributing factor is the continued retroperitoneal ooze that can drive disseminated intravascular coagulation (DIC). Usually, these are self-limiting by auto-tamponade after closure. However, in cases where the DIC progress, then a vicious cycle is entered that can hardly be broken through.

At 5.2cm, the aneurysm was slightly smaller than the commonly postulated operative threshold of 5.5cm. However, this patient was small of stature and, as such, at a higher risk of rupture.

The only procedure that may have been considered as an alternative is a fenestrated endoluminal repair. Having said that, very specific anatomical prerequisites are necessary for these grafts and sometimes an open procedure with suprarenal clamp is preferable.

In summary, the patient's demise is obviously the most unfortunate outcome. However, the patient management was sound and safe and unfortunately in vascular surgery - general and open aneurysm surgery in particular - severe adverse outcomes do exist.

Case study 20: Another death from aspiration

Case summary

An elderly patient underwent an open right hemicolectomy with end to end anastomosis for an obstructing carcinoma of the distal transverse colon. The operation was performed by a consultant surgeon with a registrar as the assistant.

There was a history of hypertension, heavy smoking (20-25 cigarettes per day), chronic obstructive airway disease and heavy alcohol intake (a third of a bottle of whisky per day). There was a preoperative workup by the respiratory physician with an ECG, a CT of chest and abdomen and an anaesthetic consult.

The patient was transferred to the HDU postoperatively with only a concern of catheter irritation. The patient was transferred to the ward after the first day. There was reported to have been a small vomit but the patient was able to continue with oral intake. The patient continued to smoke. On the second postoperative day, the patient remained stable and only complained of nausea but refused antiemetic. On the third postoperative day there were further small bouts of vomiting. It was noted that the patient developed blood stained discharge from the wound that soaked through the dressing and required frequent changes. The lower end of the wound was observed to be bruised and tender. The patient was reviewed by the junior doctor who reported to the consultant surgeon.

On the fourth postoperative day, the patient was reviewed by another consultant surgeon. It was recorded that the patient complained of worsening breathing. Later on that day, the junior doctor was informed that the patient had coffee ground vomit. About 90 minutes later, a MET call was made as the patient's heart rate had increased to 120bpm, systolic BP was 90mmHg, oxygen saturation was 88 per cent on air and respiratory rate was 24 breaths per minute. The patient was then sent for a CT scan which reported a large volume of fluid within the upper gastrointestinal tract. The patient was ordered to have an NGT inserted. This was done and there was dark fluid coming through the NGT. The patient began to vomit large amounts of fluid for a prolonged period and developed cardiorespiratory arrest. CPR was performed but failed and the patient died. The ICU consultant recorded that the patient had massive aspiration with hypoxia.

Comment

There was no major adverse event in the management of this case which contributed to the ultimate outcome. Earlier abdominal x-ray and insertion of the NGT might have prevented the dilatation of the stomach, as it was noted that the patient continued to have a small amount of vomit each day and the bowel did not open until the third day. There was no mention of wound dehiscence, although the patient was noted to have a copious amount of blood stained discharge from the wound on the third day.

This could possibly have resulted in obstruction of the small bowel, through the wound dehiscence leading to gastric distention. As there was no postmortem carried out, it is not known whether the patient possibly could have ruptured the oesophagus from the continuous vomiting - which could have contributed to the sudden demise. In the absence of a postmortem report, the death was most likely due to massive aspiration from the prolonged vomiting which occurred on the fourth postoperative day.

WAASM comments

The WAASM has previously published several cases of toxic gastric dilatation. In the past this was a well-known complication of abdominal surgery and a frequent cause of death. In the era of fast track surgery, NGTs are infrequently used routinely. At least 20 per cent of patients need one placed postoperatively. Small herald vomits are a frequent warning of toxic gastric dilatation that, as here, is typically associated with hypotension secondary to the vagal stimulation from the gastric dilation. Unless an NGT is immediately inserted, the herald vomits are likely to be followed by a major vomit that risks aspiration. The interns who are normally the first to see the patient do not recognise the cause of the vomiting and so do not insert an NGT immediately, but often arrange an x-ray or scan, as is the case here.

SHORTENED FORMS

AAA	abdominal aortic aneurysm
AF	atrial fibrillation
ASA	American Society of Anestheologists
BP	blood pressure
bpm	beats per minute
CBD	common bile duct
CPB	cardiopulmonary bypass
CPR	cardiopulmonary resuscitation
CRP	c-reactive protein
CT	computed tomography
DIC	disseminated intravascular coagulation
ED	emergency department
ECG	electrocardiogram
ERCP	endoscopic retrograde cholangiopancreatography
GI	gastrointestinal
GP	general practitioner
HDU	high dependency unit
Hb	haemoglobin
ICU	intensive care unit
INR	International Normalised Ratio
IV	intravenous
LFTs	liver function tests
MET	medical emergency team
NGT	nasogastric tube
RMO	resident medical officer
WAASM	Western Australian Audit of Surgical Mortality
WCC	white cell count