NATIONAL CASE REVIEWS VOLUME 5 JAN 2014

Australian and New Zealand
Audit of Surgical Mortality

Royal Australasian
College of Surgeons

Contents

DISCLAIMER: This booklet is produced for Fellows of the Royal Australasian College of Surgeons. Information is obtained under a quality assurance activity. Detail that may identify individuals has been changed although the clinical scenarios are based on real cases.

Chairman's report

This is the 5th national Case Note Review Booklet of the Australian and New Zealand Audit of Surgical Mortality (ANZASM). It provides important lessons for all surgeons that, if learnt, can lead to better outcomes for our patients. The cases come from both the private and public systems across Australia. ANZASM is proud of the expansion of the audit into the private hospital system and is pleased that the forward-looking hospitals see this as a useful tool in their quality control systems. A large number of cases still come from the public hospital system as this is where elderly patients with acute surgical problems are often treated. A theme that emerges from many of these cases is the need to have in place systems that provide adequate handover of care, as well as prompt notification of problems or a change in the condition of the patient.

ANZASM now covers all States and Territories in Australia, and New Zealand also seems close to embracing the concept. Each state has its own audit office to keep the process local; however, cases from each region are pooled in this National Case Note Review Booklet. The Royal Australasian College of Surgeons (RACS) has made participation in the audit (where it is available) mandatory as a part of the Continuing Professional Development (CPD) requirements for all surgeons. The Medical Board of Australia similarly requires that all registered medical practitioners participate in an appropriate CPD program. The Commonwealth Qualified Privilege legislation ensures that the data can only be used for the purposes of the audit so contributions from treating surgeons and assessors are absolutely confidential and privileged.

I trust you find this Booklet an educational opportunity and welcome any constructive feedback.

Guy Maddern

Chair, ANZASM Steering Committee

ANZASM Clinical Editor's report

The fifth booklet includes cases from all States and Territories and forms part of the feedback process that is seen as essential in the quality improvement processes of the audits of surgical mortality.

A national booklet is produced to assist smaller states who do not have enough cases to produce their own, and particularly to assist in the de-identification process. The smaller states (including South Australia) do not publish their own booklet. Some of the larger states will continue to publish their own case note review booklets as well as contributing to the national booklet.

The cases in this book are from various states and territories and from a variety of specialties. Some have been edited to focus on a few points in a complex story or to reduce the length of the report.

As the ANZASM office is in the same building as the South Australian Audit of Perioperative Mortality (SAAPM) office, it seemed logical that the final clinical editing process would be done by the Clinical Director of SAAPM on behalf of ANZASM. I must emphasise that I did not write this booklet. The real authors are the treating surgeons, the Clinical Directors, and the First- and Second-line assessors of the various States and Territories. The astute reader may notice quite a variation in writing styles in the various cases as the text has been written by a variety of persons. To the assessors and the treating surgeons we all owe a debt of gratitude as this publication would not be possible without them.

Glenn McCulloch
Clinical Director, SAAPM
Clinical Editor, National Case Note Review Booklet, ANZASM

Overall recommendations

- In complex cases, there needs to be clear demonstrable leadership in patient management. There should be regular team meetings with all disciplines involved to ensure the treatment plan is understood by all.
- Communication is one of the most essential points in good patient care. This includes communication between surgeons and their junior staff, between disciplines, and between nursing and medical staff. If you do not tell others what you are thinking or what is happening, everyone will be functioning in isolation.
- The surgical case form (SCF) record must contain good, accurate documentation. It should be filled out by a team member who was involved in the care of the patient and has sufficient experience to contribute in a useful fashion to the audit process. If junior staff members complete these reports, they must be checked by a consultant or the junior staff must be informed in advance on the salient points to record.
- Where clinical deterioration occurs in a patient with no clear cause, it is important to remember that the cause may be related to something outside of your specialty knowledge base.
- An acute abdomen in an elderly patient is a very dangerous condition and needs careful management to avoid missing visceral perforations, leaking anastomoses and ischaemic gut.
- Consultants should be actively involved in the care of their patients, including the decision-making process.

Case study 1: Fluid balance issues lead to death

Case summary

This case is that of an elderly patient admitted from home, dependent on home oxygen due to emphysema. The patient was also on Warfarin for two previous spontaneous pulmonary emboli. The patient was admitted via emergency following a fall at home, when a fracture of the neck of the right femur was sustained.

A right hemiarthroplasty was performed the next day after reversal of the patient's Warfarin—this was appropriate treatment. The patient went into rapid atrial fibrillation (AF) day one postoperatively, and also had large bilateral effusions which were treated with Lasix and antibiotics. The patient was reviewed by the orthopaedic team at this stage—no other team was involved. The patient did improve, but on day three postoperatively a medical emergency team (MET) call occurred where the patient was reviewed by both medical and intensive care unit (ICU) teams. The rapid AF was finally treated with Digoxin.

Day four postoperatively, the patient developed a pseudo-obstruction and was reviewed by both the cardiology and general surgical teams. The Warfarin was withheld and the patient was treated with intravenous (IV) fluid and a nasogastric tube. Day six postoperatively, blood was noted in the nasogastric tube which was thought to be due to a traumatic insertion of the nasogastric tube. IV Pantoprazole was commenced and, due to ongoing abdominal distension, the general surgical team referred the patient to the gastroenterology team who performed an endoscopic decompression on day eight post hip fixation.

The patient was commenced on clear fluids the next day but was noted to have an international normalised ratio (INR) of 5.7 despite the Warfarin being withheld five days prior. A Sodium of 157 was noted on day ten. The haematology team were involved because of a persisting high INR. Vitamin K had been given. The cause of the high INR was attributed to the patient's prolonged fasting status, inadequate intake of vitamin K and a possible side effect of the antibiotics being prescribed.

Day twelve post-operation, the patient was reviewed by the ICU team again because of marked tachypnoea and was considered to be overloaded. The next day, there was another MET call when the patient was found on the floor. Sodium was 160, but the patient was saturating adequately at 90% on two litres of oxygen. The patient was reviewed again by the respiratory team because of type 2 respiratory failure with CO^2 retention. Unfortunately, the patient couldn't tolerate Biphasic Positive Airway Pressure (BIPAP) and more Lasix was given.

Day fifteen post-operation, the patient deteriorated further. The palliative care team was consulted and, with the patient and their family, it was agreed to palliate. The patient died day sixteen post-operation from respiratory failure.

Clinical lessons

The major area of concern was that there was no consistent plan of fluid management. It was an extremely difficult problem to manage—hypernatraemia and fluid overload. The pleural effusions were not drained and the patient had little respiratory reserve. The mainstay of the IV therapy was crystalloid's solution with minimal colloid and there was no mention as to the albumin or protein levels. Pathology was also not available within the notes. Strict fluid balance charting was inadequate and there were no daily weights clearly recorded.

This patient was an extremely difficult patient to manage postoperatively and may well have benefitted initially from high dependency unit (HDU) care. It did not appear as though there was a consistent medical team involved daily with the patient's management; this too may have benefitted the patient. It is unclear whether either option would have changed the overall outcome, however.

Case study 2: Death of a patient from sepsis following complex spinal decompression

Case summary

This man in his 60s was admitted to hospital to the Palliative Care Unit via the Urological Team who had been caring for his prostate cancer, diagnosed initially in 2008. He was admitted with significant signs of leg weakness, numbness, back pain, and signs of spinal cord compression consistent with a large metastatic lesion at the T10 level. Other lesions throughout the skeleton were noted on bone scan, including his pelvis, femora, left shoulder, and multiple levels in the spinal canal. He had deranged liver function and was relatively malnourished, with advanced malignancy. He was also on Dexamethasone.

A review by the Spinal Team at that hospital identified impending paraplegia, incontinence, and anticipated rapid deterioration. A decision was made, after informed consent, to perform a decompression surgery as well as fixation of the thoracic spinal column between T8 and T12. Decompression of the T9/10 level was included with debulking of the tumour. Intraoperatively, a dural tear occurred, with leaking of spinal fluid.

He was returned to the operating theatre five days later because of deteriorating neurological status. His postoperative neurological status

included Medical Research Council (MRC) Power Grades of at least IV/V. His wound also demonstrated signs, radiologically, of a fluid collection. A Magnetic Resonance Imaging (MRI) scan confirmed a large fluid collection likely to be related to the collection of blood and probably spinal fluid. Intraoperative findings included a dural tear which was not directly repairable though patched with various agents.

Over the following days, the patient developed signs of infection, sepsis, and meningitis leading to an overwhelming infection and death. Intraoperative antibiotics were provided appropriately at the first surgery and specimens were collected at the second surgery. Consultation with the Infectious Diseases Team included tailoring of his antibiotics. He was also covered appropriately with Deep Vein Thrombosis (DVT) prophylaxis.

Clinical lessons

This case highlights the fragility of patients who have advanced metastatic disease. The patient presented in a severe situation with spinal cord compression and impending paraplegia. It was a difficult decision for the spinal team. Should they have performed a decompression and fixation of the spinal pathological fracture and metastatic lesion at the T10 level? Should they, at an earlier stage, have accepted palliation as the best option?

There appeared to be good communication between Urology, Palliative Care, and the Spinal Team as well as appropriate informed consent to this patient and his relatives. What appears more obvious, in retrospect, is that this patient was profoundly unwell with a deconditioned and malnourished state preoperatively. His impending paralysis would have advanced reasonably rapidly, in my opinion, had it not been for the decompression surgery. The decompression surgery was complex with regards the advanced tumour bulk and the relatively poor condition of soft tissue that is present in advanced metastatic cancer patients.

The dural tear may have been avoidable; however, in the context of a complex operative field, soft and poor tissue quality, and the complexity of the instrumented spinal surgery, it is not unreasonable to expect a relatively high chance of a dural tear. The fact that a dural leak occurred is not surprising and it was identified with subsequent imaging and required further surgical treatment.

Presumably, the wound haematoma and fluid collection became infected and this extended to the meningeal space with meningitis becoming part of the diagnosis, leading to his death in an overwhelmed septic state. I would highlight that this patient was on Dexamethasone (steroid) pre-surgery which does also increase the potential risk of infection in an already malnourished and deconditioned patient.

In summary:

- An advanced metastatic prostate malignancy patient with impending spinal cord

compression presents a difficult surgical decision. The correct answer and correct treatment is not always obvious—even in retrospect.

- The complexity of such a spinal surgery is not to be underestimated and must be attended to by experienced personnel, as was the case in this situation.

Case study 3: Multiple organ failure and sepsis after skin cancer surgery

Case summary

This patient in their 70s had yearly in-patient surgery for the removal of multiple ongoing skin cancers to the face and limbs. On this occasion, the patient was scheduled for removal of eleven lesions including skin grafting under general anaesthetic (GA).

Past history included two renal transplants following immunoglobulin A (IGA) nephropathy. Current renal status was satisfactory. There were cardiac comorbidities with ischaemic heart disease, having had coronary artery bypass graft (CABG) surgery, transient ischaemic attacks (TIAs) and ongoing atrial fibrillation necessitating Clopidogrel and Aspirin administration. Other medications included Prazosin, Metoprolol, Cardizem, Calcitriol, Cyclosprorin, Cellcept and Neotigason.

Clopidogrel was ceased one week prior. Routine surgery and general anaesthetic were performed without incident. However, 18 lesions were removed in the end, the total intraoperative time being approximately four hours. Surgery was at registrar and resident level.

Initial postoperative course was complicated by the early and relentless development of ileus and obstruction of varying intensity, further complicated by initial dehydration and prerenal renal failure. Medical management at consultant level was early and ongoing. Oral immunosuppressives and IV access were troublesome.

The patient continued to deteriorate slowly, with the development of sepsis involving bladder, gut, donor sites and IV access lines. Bacterial sepsis was followed by fungaemia of lung with Candida Albicans. The patient's cardiac condition deteriorated with episodes of rapid atrial fibrillation and cardiac ischaemia. In spite of wide clinical consultation and involvement, organ systems did not respond, the patient succumbing nearly a fortnight after surgery.

Clinical lessons

This case highlights the known association of operative morbidity and operation length. While surgery and anaesthetic were uneventful, one has to question the wisdom of four hours of elective surgery in a patient with significant known multiple morbidities.

The major adverse advent in this patient's case was the development

of ileus and obstruction. One has to wonder if operative and, therefore, anaesthetic length may have contributed to its development. Otherwise, management of this patient with a challenging clinical scenario could not be criticised.

In summary, the issues that have arisen form this case are:

1. Multiple morbidities developed by long-term renal transplant patients.
2. Consideration of operation length for elective surgery in these patients.

Case study 4: Aspiration after humeral internal fixation.

Case summary

This patient in their 80s was taken to hospital for treatment of hypoglycaemia and a right neck-of-humerus fracture sustained in an unwitnessed fall at home. The fall was presumed to be secondary to hypoglycaemia; the patient had type 2 diabetes. There was evidence that on going to bed at around 2000, the blood sugar level (BSL) was 8.4. The ambulance team found the BSL to be 2.0 when they attended to the patient around 2200 that day.

The patient received appropriate and prompt medical treatment on arrival at hospital and was admitted under an acute medical unit with orthopaedic consultation. The medical treatment throughout was timely and appropriate. In consultation with the family, it was decided that the patient was "not for extraordinary measures" in terms of resuscitation.

The initial orthopaedic treatment was for non-operative management, with a hanging cast and serial x-rays, while the patient was an inpatient under the medical team. This was trialled for two weeks, at which time the treating orthopaedic consultant determined the fracture position was unacceptable and would be unlikely to heal. Despite this, it is repeatedly documented that the patient was comfortable and would be likely to need placement in a residential care facility.

The patient then underwent an open reduction with internal fixation (ORIF) of the fracture; the surgery was performed by a different, yet very senior and experienced, orthopaedic consultant. Surgery was uneventful, with a good immediate recovery period.

Over the next week, the patient slowly "went off" medically, developing hepatic encephalopathy and acute on chronic renal failure. In the early hours of the morning, the patient vomited and was noted to immediately increase their respiration rate. Coincidentally, the ward call doctor was on the ward and attended within one minute. Appropriate resuscitation techniques were used but were unsuccessful.

Clinical lessons

The question, in this case, is whether the patient should have been operated on at all. A patient

in their 80s, with a large number of seemingly poorly-controlled medical problems, with no real prospects of living independently regardless of treatment outcome, and who only seemed to have mild pain (on my reading of the chart) would be a candidate for ongoing conservative measures.

With the benefit of hindsight, I would question whether the decision to operate was in the patient's best interests.

Case study 5: Acute cholangitis due to gallstones—a life threatening condition

Case summary

A patient in their late 80s had been admitted two months previously with gallstone pancreatitis and cholangitis. An Endoscopic Retrogade Cholangiopancreatography (ERCP) was performed with incomplete clearance of the common bile duct stones; a biliary stent was inserted. The patient was discharged to a rehabilitiation hospital with a planned readmission for repeat ERCP and clearance of the biliary stones. There was a past history of hypertension, diabetes and recurrent urinary infections for which the patient was taking Norfloxacin.

At repeat ERCP on the first day of this admission, the previously inserted stents were removed and five large stones extracted. There appeared to be one remaining stone in the proximal end of the common bile duct, but this was not removed as the patient desaturated and required intubation at that stage. The patient was transferred to ICU following ERCP but was extubated after three hours and returned to a ward bed. The patient was seen that night by a resident who addressed concerns regarding urine output. It was decided to continue IV fluids overnight with a bolus of fluid given.

The patient was again seen on a ward round the following morning and appeared to be well; the intravenous cannula and catheter were removed. Arrangements were being made to transfer the patient back to the rehabilitation hospital.

A few hours later, the patient was found to be febrile and non-responsive with low oxygen saturations. Blood cultures from the previous day were found to be Vancomycin-Resistant Enterococci (VRE) positive and the patient was commenced on IV fluids and antibiotics. A discussion was held with the infectious diseases team and the antibiotic treatment was altered. A subsequent MET call was made for continuing sepsis associated with hypotension and it was decided to send the patient back to Intensive Care. A computed tomography (CT) scan was ordered which showed evidence of common bile duct dilation and a large retained stone in the common bile duct. There were no signs of pancreatitis or perforation.

The patient remained septic, and it was felt the cause of the sepsis was cholangitis with a retained stone in the common bile duct. A

further ERCP was performed on day three and demonstrated a dilated common bile duct with a large calculus. The stone was not removed as there were anaesthetic concerns with hypotension, but two plastic stents were inserted with a request that they be removed in appoximately six weeks. The patient remained in a poor condition following the ERCP and required continuing ventilation and inotrope support. Despite this, urine output was poor and failed to respond to Frusemide infusions.

The patient's condition did stabilise and the patient was extubated the following morning with reasonable saturation post-extubation. The patient required small doses of inotrope to maintain blood pressure, but the urine output was minimal. Liver function tests were improving and despite the renal failure, the patient was discharged to the ward on day five.

Whilst in the ward, the patient's condition did not improve, and the renal failure worsened. After a family discussion, it was decided the patient was to have some haemoflitration but that the patient would need to go back to Intensive Care for this to be given as inotrope support would be required during the haemofiltration. At this stage, a chest x-ray suggested acute pulmonary oedema.

The patient's condition continued to deteriorate and a decision was made to treat the patient palliatively. The patient died shortly afterwards.

Clinical lessons

Acute cholangitis due to gallstones is a very significant and life-threatening condition, particularly in elderly patients with medical comorbidities. I totally agree with the first-line assessor's comments that the patient should have been given a full anaesthetic for the ERCP rather than sedation. The patient may have tolerated the procedure much better and may not have suffered an episode of collapse during the two procedures.

I am unaware from the notes whether the patient was given any prophylactic antibiotics with the procedure, but the patient should certainly have had some for the first procedure. The patient was placed on antibiotics when there was an MET call following that first procedure and the blood cultures were found to be positive.

At the ERCP, the stents were removed prior to incomplete clearance of the common bile duct. In the presence of a retained large stone, I felt the stent should have been reinserted to prevent further episodes of cholangitis and septicemia. Following the second admission to Intensive Care with septicemia, treatment seemed to be adequate, but the patient was discharged from Intensive Care with worsening renal failure.

In 48 hours, the patient was transferred back to Intensive Care as it was decided to have some haemofiltration and this would require a stay in Intensive Care and appropriate nephrology treatment for the renal failure. The patient's

fluid management during the stay in hospital seemed less than ideal, and the obvious cause of the renal failure was due to pre-existing renal problems as well as sepsis and hypovolaemia.

Case study 6: Deterioration following elective resection for a carcinoma

Case summary

A patient in their early 80s underwent an elective resection for a carcinoma of the transverse colon. The case file has no information about how the diagnosis had been reached or the preoperative investigations performed. The patient was recorded as being a healthy 83-year-old with an American Society of Anesthesiology (ASA) score of 2 and was seen in a pre-admission clinic eight days prior to the procedure, although I can see no medical note at this stage. The planned operation was colonoscopy and bowel resection.

A colonoscopy was performed which confirmed a colon carcinoma. A laparotomy was then performed. The findings were of a large mass in the proximal transverse colon with some features of obstruction and a dilated caecum. The mass was recorded as invading into the mesocolon, the head of the pancreas, and the liver and was obviously close to the inferior vena cava and the aorta. The operation consisted of a resection of the mass with what was recorded as a difficult dissection of the tumour from the head of the pancreas, although the tumour was reported to be dissected off the pancreatic tissue. A major bleed occurred from the inferior vena cava requiring suture repair and a portion of the right lobe of the liver was removed by wedge excision. A primary anastomosis was performed. Subsequent histology confirmed a poorly differentiated adenocarcinoma with one positive lymph node. Two drains were placed at the end of surgery.

Postoperatively, the patient's progress was initially satisfactory but three days postoperatively, the patient had episodic atrial fibrillation which persisted intermittently over the next 24 hours. I gather there were no ICU facilities at the original hospital and the patient was transferred to another hospital for ICU care. The transfer appears to have been organised at resident medical officer (RMO) or registrar level, with no direct contact between referring and receiving consultant.

After transfer, the patient was found to be in sinus rhythm, was generally in a satisfactory state and was discharged from intensive care within 24 hours. The patient's course remained slow and the drains remained in situ. There was persistent drainage out of both drain tubes. Thirteen days after the operation (eight days after the inter-hospital transfer), measurement of lipase and amylase in the drain fluid revealed high levels and the diagnosis of pancreatic fistula was made. The patient had a CT scan showing features of an ileus but no suggestion of an anastomotic leak. It

was apparently decided to transfer the patient again to a tertiary-level hospital for management of the pancreatic fistula.

It is recorded that two hospitals accepted the patient but neither had any beds and, therefore, the patient was not transferred. Sixteen days after the original operation, the patient was reported as being distended and a CT scan showed pleural effusions, ascites and an ongoing ileus. Later that day, a family meeting was held and the family requested no further treatment and withdrawal of care for palliation. The patient died within 48 hours.

In summary, this patient underwent an elective resection of a large proximal transverse colon tumour with local spread involving the front of the pancreas, liver and the inferior vena cava. Postoperatively, the patient developed a pancreatic fistula. This took a long time to be recognised and by the time it was recognised, the patient's general state had deteriorated and the family requested withdrawal of care.

Clinical lessons

There are several concerns:

Preoperative planning

There is little information in the hospital notes. However, it is likely that a CT scan would have been performed. The size of the tumour should have been apparent on the scan. It should have been clear that this was unlikely to be a routine right hemicolectomy. The decision to proceed with what was likely to be a difficult right hemicolectomy in a hospital with no ICU facilities is highly questionable.

Conduct of the operation

The tumour was fixed to the liver, pancreas and involved retroperitoneal structures. The decision to go ahead and resect this tumour caused an injury to the pancreas which caused the pancreatic fistula. It also resulted in an injury to the inferior vena cava that was managed appropriately. I believe it would have been better to regard this tumour as irresectable, leave it in situ and perform a side-to-side bypass.

Postoperative care

This patient had abdominal drains remaining in situ for nearly two weeks. They drained fluid for the whole time. Given the history of surgery involving the pancreas, it would have been prudent to check the lipase or amylase in this fluid at a much earlier juncture.

Communication and transfer

When transfer was required for ICU care, communication should have occurred at consultant-to-consultant level. In particular, the exact details of the operation, including the proximity of the pancreas, the liver resection and the vena cava injury, should have been clearly communicated to the second surgeon. Apparently, this did not occur. In the second hospital, the identification of the pancreatic fistula could have been aided by better communication.

Finally, the request for assistance from a tertiary hospital was met with acceptance in principle, but the

patient was not transferred due to lack of beds. During the delay waiting for a bed, the patient deteriorated. It is entirely possible that had the second transfer occurred in a more timely fashion, the patient's outcome may have been different. The general issue of difficulty in transfer is one which ANZASM should look into as a system problem.

Case study 7: Inability to contact on-call surgeon

Case summary

The patient was a woman who was admitted to hospital with symptoms and signs of a tubal ectopic pregnancy, namely, six weeks amenorrhoea, an elevated human chorionic gonadotropin (HCG), an ultrasound which showed an empty uterus, an adnexal mass and some free fluid. Arrangements were made for her to undergo laparoscopic surgery to deal with the ectopic pregnancy.

The operation commenced at approximately 2200. A Veress needle was inserted at the umbilicus to obtain the pneumoperitoneum. It was recorded that the patient was thin. After inserting the Veress needle, the intraabdominal pressure, which was initially 5 mm, fell to 0 mm Hg and remained low. The abdomen became tightly distended. A 10 mm trochar was then inserted at the umbilicus and, when the laparoscope was inserted, the abdomen was noted to be full of blood. Also, another 5 mm port was inserted in the left iliac fossa (LIF). A decision was made to do an immediate laparotomy, initially through a Pfannenstiel incision which was converted to a midline incision above the umbilicus. Aortocaval compression was applied. The help of the surgical registrar, general surgeon, vascular registrar and gynaecological consultant was also sought. The vascular surgeon on call was not contactable; however, other vascular surgeons at the hospital were called and one responded.

The general surgeon extended the incision to the xiphisternum. The bleeding was initially controlled by pressure to the site of the vascular injury for 15 minutes; then the general surgeon attempted to repair the vascular injury, which was thought to be venous. Cardiopulmonary resuscitation (CPR) commenced at about 10 minutes into the operation, with blood transfusion and IV fluids given by the anaesthetist.

The operation notes indicate "likely trochar injury to major vessels—vigorous bleeding from near iliac bifurcation". Attempts to oversew achieved only partial control of the bleeding, which was mostly controlled by pressure. The vascular surgeon arrived nearly an hour into the operation and repaired arterial bleeding from the right iliac artery near its origin. They noted that the general surgeon had already repaired an iliac venous injury. The patient was very coagulopathic by this time. Local pressure assisted haemostasis. During this time, the patient remained on CPR.

CPR ceased when the patient was in asystole. She was given defibrillation, calcium and adrenaline to no avail and was pronounced dead soon after.

Comments

1. First Gynaecological Review

Adverse event

This was clearly an unintended and unexpected adverse event which occurred in a young, fit patient undergoing surgery who would have been expected to survive.

2. Areas of concern

There are several areas of concern:

- Use of the Veress needle vs. Hasson cannula. There is ongoing debate about the best method of obtaining a pneumoperitoneum for laparoscopy. Most gynaecologists prefer to use the Veress needle inserted through the umbilicus. General surgeons, on the other hand, tend to prefer to use the Hassan cannula and perform an open laparoscopy. Patients who are thin are at increased risk for vascular damage to aorta, inferior vena cava (IVC) and iliac vessels. So this thin patient was at increased risk for vascular damage. It is not absolutely clear which instrument caused the damage, but in my opinion, it may well have been both as there seem to be two separate injuries noted by the vascular surgeon—one venous by the Veress needle and the other arterial by the 10 mm trochar. The drop in the intraperitoneal pressure occurred immediately after insertion of the Veress needle; could this have been as a result of gas embolism when the Veress needle entered the iliac vein?
- Seniority and availability of senior surgical staff: there was lack of timely involvement by experienced staff. The laparoscopy was performed by a senior gynaecological registrar who would be expected to have been competent and able to deal with an unruptured tubal ectopic pregnancy. It appears that attempts were made to contact the on-call vascular surgeon who was not immediately contactable.
- Method of vascular repair. Compression and packs seemed to be only partly successful in controlling the bleeding. Clamping of the aorta would have been preferable to pressure, before any attempt to directly suture the damaged vessels, especially when arterial damage was a distinct possibility.

3. Level of care

Apart from the surgical technique for laparoscopic entry in this thin patient, the level of care was in line with current practice. Most gynaecologists would have operated on an unruptured tubal ectopic pregnancy laparoscopically using the Veress needle to obtain the pneumoperitoneum. With the benefit of hindsight, a direct entry would have been preferable in this

thin patient. Alternatively, there should have been a modification of the technique, with more elevation of the abdominal wall (thereby further away from the major blood vessels) and using a more oblique entry with the Veress needle. The gynaecology surgical registrar (SR) probably made an error of surgical judgement and did not appreciate how very close the major vessels were to the surface of the abdominal wall in this thin patient.

4. Constructive comments

The Veress needle is the instrument preferred by most gynaecologists for obtaining a pneumoperitoneum. Debate should be reopened regarding the uncritical use of the Veress needle by gynaecologists for all laparoscopies. Damage to large vessels and/or viscera is slightly more common with the Veress needle technique than with the Hasson, or open entry, technique. Most gynaecologists have only been trained to use the Veress needle. They are usually not familiar with, or trained to use, an alternate method such as open entry for more high-risk cases, for example, thin patients and/or those who have had previous open abdominal surgery. Gynaecologists should be trained to use more than one method to obtain a pneumoperitoneum and select the method which is most appropriate to the individual patient.

Vascular Review

Exsanguination from laceration of major retroperitoneal vessels, and its avoidance and control, are well known to all laparoscopists, gynaecological and other. A senior gynaecological registrar should be capable of avoiding and of controlling this event, or not have been entrusted with operating unsupervised on such a tubal pregnancy; limited control by pressure over the bleeding site was achieved. A consultant general surgeon should be capable to control the aorta with a vascular clamp and then either suturing the laceration or calling for help; arterial control was not achieved before attempting to suture.

1. Preoperatively

Laparoscopy began nine hours after the patient's arrival in the Emergency Department (ED) with obvious clinical features of tubal pregnancy. An earlier start, in daytime, might have found more consultants accessible and more support for the gynaecological registrar operating. Patient observations in ED and ward, tests and ultrasound imaging, IV fluid therapy and anaesthetist assessment (ASA 1) were all satisfactory. No consultant involvement is recorded. Consent was duly signed, for "Laparoscopic/Laparotomy +/- Salpingectomy—Right side—for ectopic gestation," with specific risks noted as: "Infection, Bleeding, Damage vital organs".

2. Operation

There are separate operation reports written by the gynaecological registrar and vascular surgeon, separate page notes by the general surgeon and vascular registrar, and a further page by the gynaecological team. The anaesthetic chart provides details of the collapse, times and CPR. A progress page added later

by the gynaecological registrar revises the original operation note "post discussion of events", and describes technical difficulty with the tested Veress needle (single pass, NB thin patient) and inflation measurement, despite tight gaseous abdominal distension, resulting in a change of technique to trochar at the umbilicus. The gynaecological consultant provided the e-deposition to Coroner.

The technique for inducing pneumoperitoneum by needle or trocar is well-studied (evidence from Australian Safety and Efficacy Register of New Interventional Procedures–Surgical). Thin patients are at particular risk of injury to major retroperitoneal vessels with whatever sharp instrument is used, and this patient's anterior abdominal wall was obviously inadequately elevated before entry of needle and/or trocar.

3. Response to iliac vessel injury

The patient's bleeding was recognised via the laparoscope 15 minutes into the operation; an LIF port was inserted, and the response to circulatory collapse was prompt conversion to open laparotomy (Pfannenstiel incision, predictably inadequate, was extended by midline incision to above the umbilicus). Aortocaval pressure appropriately limited the bleeding from iliac vessels, so 20 minutes of CPR, damage control resuscitation (DCR), fluids and vasopressor enabled spontaneous heart circulation to resume. Consultant help was sought.

4. Vascular surgeon not able to be contacted

The vascular surgeon rostered on call had arranged a substitute, unbeknownst to switchboard and theatre. Neither was immediately contactable, so a general surgeon was sought. Meanwhile, the operating registrar had attempted more than once to oversew the presumed venous bleeding site, but it was still only partly controlled by packs and pressure. The patient remained stable. An indwelling catheter (IDC) was inserted by the resident. The gynaecological consultant arrived. The vascular registrar attended and scrubbed in, having located a vascular surgeon.

The general surgeon removed packs and attempted 0-Prolene oversewing sutures about half an hour into the surgery with continued bleeding, asystole recurred and persisted until death, despite CPR. Proximal aortic control by clamping would have been standard and prudent. One must hope that suitable vascular clamps and more precise suturing are available in such a teaching hospital.

A vascular surgeon arrived during the final asystolic episode and repaired the lacerated iliac artery, but to no avail. The diagram of the injury shows a rounded laceration at the origin of right common iliac artery (not the iliac bifurcation) where it crosses the left iliac vein and caval confluence, usually midline at the level of the umbilicus. This is consistent with a vertical puncture by the umbilical trocar.

5. Anaesthetic considerations

The anaesthetist's response to bleeding and both arrests was prompt. Anaesthetic was endotracheal with a cubital cannula and non-invasive blood pressure monitoring (NIBP). Then, a 16G external jugular vein catheter was added and a brachial arterial line attempted, but there was no pulse and no ultrasound to guide ("available later, Department's = broken!"). Coagulopathy developed. IV 4.5L crystalloid and colloid, 24 packs red cells, 12 units cryoprecipitate, 4 units fresh frozen plasma (FFP), and 1 unit platelets were given. It is not clear what help the anaesthetist received. The team decided to cease CPR and declare death 1 ½ hours from the beginning of surgery.

6. Coroner e-deposition

This omits reference to who was operating or who supervising when the injury occurred, and describes the salvage attempts but not the cause. The case notification is no more insightful; question 15 is quite inadequately answered. There is no autopsy report from the Coroner's pathologist, and this must be obtained.

7. Evidence and practice guidance

The second-line assessor comments on gynaecologic training being unreasonably restricted to the Veress needle technique of inducing pneumoperitoneum. Trainees in laparoscopy should experience several methods and select the most appropriate to the individual patient. Current evidence on risk of major vascular or intestinal damage during laparoscopy shows no entry technique any less risky than any other (Australian Safety and Efficacy Register of New Interventional Procedures–Surgical review of high-level evidence). Thin patients especially require elevation of the anterior abdominal wall to avoid laceration of the major retroperitoneal vessels, and it's vital how the sharp instrument is used rather than whether Veress, Hasson or any other is selected. The management of the emergency, should it occur, must be well-rehearsed, in simulation or during open laparotomy or autopsy.

General surgeons must be able to dissect and obtain proximal control of a bleeding artery in the trunk, or pack an injured vein, and attempt controlled suturing, unless someone more adept at vessel repair can be summoned. Suitably experienced specialists; appropriate supervision of trainees; better theatre access for emergencies; surgeon contactability; vascular clamps and sutures; anaesthetic equipment maintenance and support in theatre; and more autopsies for precise diagnosis, feedback and training of clinicians are further areas of concern raised by this tragic and unnecessary outcome.

Second Gynaecological Review

1. One of the factors responsible for large vessel injury is lateral deviation of the needle or trocar at the time of insertion. This can be a particular problem in thin patients. When the instruments are inserted from the patient's left side, which is usual, the

vascular injury can more usually involve the right common iliac artery and the left common iliac vein close to the bifurcations. This was the injury sustained in this particular case.

2. The lack of immediate back-up from more senior and experienced surgical staff (and possibly extra anaesthetic staff) appeared to be a factor in the unfortunate train of events.

3. When the massive haemorrhage was realised and the abdomen was opened, the bleeding was controlled by pressure. This allowed resuscitation of the patient and stabilization of her condition. This is evident from the operation notes and the anaesthetic chart. The vascular surgeon was not quickly available and the general surgery team arrived and attempted repair of the injured vessels before clamps were applied to prevent further major blood loss (e.g. aorta clamp). This resulted in massive blood loss for the second time, an event from which she did not recover. The comments and recommendation of the gynaecological and vascular reviewers appear to be reasonable and constructive.

Case study 8: Bowel necrosis following laparoscopic cholecystectomy

Case summary

A 60-year-old obese, hypertensive and diabetic patient underwent an ERCP with extraction of a bile duct stone. Three months later, the patient underwent an uneventful laparoscopic cholecystectomy, along with repair of an umbilical hernia. Three days later, the patient presented to the Department of Emergency Medicine with abdominal distension and tenderness. A CT scan showed free fluid in the subphrenic and right paracolic regions. A diagnosis of fluid collection and ileus was made.

The patient then developed sudden onset of dyspnoea and underwent Computed Tomographic Pulmonary Angiography (CTPA) which showed multiple pulmonary embolisms in the right mid and lower zones. Ultrasound-guided abdominal aspirate showed bilious fluid. The patient was then heparinised and was started on full anticoagulation. Shortly after this, the patient became aggressive and was transferred to the ICU for sedation and intubation. A repeat CT scan showed more extensive free fluid in the abdomen compared to previous examinations. The surgeon felt that there was little evidence of intraabdominal pathology and hence no laparotomy was contemplated. The patient was managed in the ICU with Clexane, ventilation and ICU care. Renal

functions deteriorated and the patient developed fever and features of sepsis.

A repeat CT showed progressive increase in intraperitoneal fluid and increase in blood lactate, white blood count (WBC) and creatinine. Therefore, an exploratory laparotomy was performed which showed bile-stained fluid in the peritoneal cavity. The abdomen was washed out and drains placed. A tracheostomy was also performed and Clexane restarted.

Despite the patient's renal function improving in the ICU, the patient deteriorated again and lactate levels increased to 3.5. Day 18 post-operation, a CT scan showed intramural gas in the small bowel with evidence of portal vein thrombosis. The patient underwent a laparotomy which showed that much of the bowel was dusky with dubious viability consistent with portal vein thrombosis. Just over a third of the bowel was definitely non-viable starting at 35 cm below duodenojejunal (DJ) flexure. This segment was excised. A double-barrelled ileostomy was created. A decision to start anticoagulation soon was made as the surgeon realised that the patient had a hyper-coaguable state. The patient stabilised after the surgery and a re-look laparotomy with take down of double-barrelled jejunostomy and restoration for bowel continuity was performed.

There was a sudden deterioration with fever, hypotension and abdominal distension 26 days post-operation. It was felt that the patient had re-bled in the abdomen and a decision was taken to cease active treatment and to provide palliative treatment. The patient died shortly thereafter. Details about the autopsy were not available.

Clinical lessons

There are several significant events relating to this case:

- bile leak post laparoscopic cholecystectomy
- pulmonary embolism
- thrombosis of the portal vein with bowel ischaemia
- re-bleed after bowel re-anastomosis.

In retrospect, the patient probably suffered from a hypercoagulable state and the sequence of events caused by this, including pulmonary embolism and portal vein thrombosis, led to the patient's demise. Going through the notes, the patient was placed on Heparin/Clexane anticoagulation following pulmonary embolism. Despite this, the patient developed portal vein thrombosis.

On day 15, the INR levels were 1.1 (Activated Partial Thromboplastin Time Test [APTT] not found). There is no record of the INR or APTT on day 16, and on day 17 the patient deteriorated with signs of portal vein thrombosis. A detailed look at ICU charts may show whether the anticoagulation was adequate around these dates. Overall, the combination of obesity, intraabdominal sepsis and multiple thromboses caused by a hypercoagulable state was a difficult combination to overcome.

In retrospect, the things that could have been done differently include:

1. Early laparoscopy, laparotomy and washout following presentation to Department of Emergency Medicine. However, this was probably delayed due to the pulmonary embolism and the anticoagulation required after that.
2. Haematological tests to determine the type of hypercoagulable state. However, this may not have been possible because he was on anticoagulants and would not make a difference to the management.
3. Delayed closure of the double barrel jejunostomy because of risk of anastomotic leak in view of poor blood supply to the bowel. However this may have been necessitated by the high volume fluid loss from the jejunostomy.
4. Monitoring of the anticoagulation levels to make sure it was adequate.

Areas of concern or consideration and adverse events

All of the above would be areas of consideration. A review of the level of anticoagulation following the pulmonary embolism would be helpful.

Suggestions for change in practice:

1. early laparoscopy or laparotomy and abdominal drainage following bile leak.
2. suspect a hypercoagulable state and institute rigorous anticoagulation following pulmonary embolism.

Case study 9: Vascular insufficiency complicated by bleeding

Case summary

This patient was admitted to hospital with a history of bilateral hip pain which subsequent examination showed to be due to a cold, numb, pale, pulse-less right lower leg and lesser changes on the left. The patient had a past history of coronary artery bypass surgery, possible chronic renal failure and a ureteric stent. There was no past history of atrial fibrillation or peripheral vascular disease.

The patient was treated with Heparin infusion initially and had an angiogram which showed that a distal right popliteal embolus was present. An arterial urokinase infusion was then instituted and the patient was transferred back to the ward with increased nursing care.

The same evening, the patient was noted to have developed a haematoma in the right groin and when this extended to produce right flank pain, the urokinase infusion was stopped. Subsequent investigations showed that the haematoma had extended into the right flank.

The patient was subsequently stated to have developed worsening of the pain in his right leg and, as a result of this, underwent popliteal artery exploration, embolectomy and fasciotomy. After this operation, the patient was transferred to

Intensive Care; he was ventilated, required haemofiltration because of deteriorating renal function and also required inotropic support. The patient's haemoglobin was 7.7. This was treated with blood transfusion.

The following day, the patient was noted to have abdominal pain and a subsequent CT scan showed ischaemic gut which was confirmed by the presence of an elevated serum lactate. A laparotomy was performed which showed extensive ischaemic gut from the proximal small bowel to ascending colon and was judged to be inoperable. The patient, with consent of the family, was kept comfortable and subsequently died.

Clinical lessons

This history was difficult to assess because of some of the times not being recorded or blanked out. This patient presented to hospital with a surgical condition which was treated by attempted thrombolysis. This process resulted in a significant complication of groin and retro-peritoneal haematoma. In addition to this, despite having a history of chronic renal failure, the patient underwent two CT scans, presumably with contrast, and lower limb angiography. This may well have resulted in deterioration of the renal function requiring haemofiltration.

The treating unit appeared to concentrate solely on the lower limb ischaemia whereas the initial history suggested that both lower limbs were affected. That the patient developed worsening renal failure as well as gut ischaemia suggests that there was the possibility of a shower of emboli rather than a single embolus affecting the right lower limb. This is, in some ways, confirmed with the surgical findings of no thrombus retrieved from the right lower limb when popliteal embolectomy was performed.

I noted that this patient, during the embolectomy procedure, was given a further 100,000 units of urokinase; given the extensive retroperitoneal bleed which occurred with the previous urokinase infusion, this may have exacerbated the problem. It may have been prudent to explore the groin and make sure that the bleeding site was well controlled beforehand. The operative procedures, both embolectomy and laparotomy, were otherwise carried out in a conventional manner.

As far as the history itself is concerned, there are a number of deficiencies. I believe that the initial assessment concentrated solely on the right leg. I could see no pathology results of the renal function when the patient presented to hospital and no pathology results showing the level of myoglobin in the blood or urine, given that the patient had a significantly ischaemic leg. The presence of lactate in the blood was noted prior to the patient having a laparotomy. I could see no consent forms for any of the procedures but assume that as they were done under emergency situations, these were deemed not to be required. The notes are also deficient in that there is no history of the discussion with the radiologist prior to performing angiography and certainly no discussion about the pros and cons of

thrombolysis in this situation.

In addition to this, the history is deficient in that there is no information written as to the lead up to the patient undergoing formal popliteal exploration, embolectomy and fasciotomy. The ICU discharge summary suggests that there was a deterioration in the leg after the urokinase infusion was stopped, but there is no information pertaining to this in the history itself.

On reading the popliteal embolectomy operation report, there is no note of the patient undergoing a formal evacuation of the haematoma although other documents suggest that that was proposed. The operation itself appears to have been carried out in a conventional manner; however, as I stated previously, the use of urokinase may have exacerbated the previously noted haematoma.

The Intensive Care notes show that the patient was looked after in a conventional manner within the Intensive Care situation. It was obvious that the patient's condition was deteriorating throughout their stay.

The first-line assessor's concern was the entire care of the patient, the patient's history at presentation, the peripheral arterial disease status in the other leg, the presence of a raised creatinine kinase, renal function, and past surgical and cardiovascular history. On reading the notes, this patient's surgical team concentrated solely on the problem of the right leg ischaemia; however, the presenting history suggested a more generalised problem. That this patient underwent angiography and thrombolysis in the presence of a potentially surgically remedial condition is an area of concern. That the patient underwent popliteal embolectomy and fasciotomy without exploration of the groin haematoma and control of the bleeding site and had additional urokinase administered is also an area of concern.

The use of angiography and CT scanning with contrast in the presence of chronic renal failure is also an area of concern, although I note that in Intensive Care, when the patient was on haemofiltration, discussion was had with the radiologists and Renal Unit. It is not clear whether the deteriorating renal function was due to contrast, hypotension or microscopic emboli. This patient would not have had the groin and flank haematoma complications had they undergone a formal popliteal artery exploration and embolectomy as an initial procedure.

Case study 10: Earlier consultant involvement needed

Case summary

An elderly patient in a care home fell on a Saturday afternoon. The patient arrived in a peripheral hospital ED at 0500 on the Sunday and was found to have a fractured hip. The background included dementia and hypertension. The patient previously

walked with a frame. The admission full blood counts (FBC) included a Hb 80 and white blood cell (WBC) count of 26,000.

The patient was transferred to a teaching hospital, arriving on the orthopaedic ward at 19:00 on the Sunday. A chest x-ray (CXR) revealed a left hilar mass and probable left lower lobe infection. The patient was reviewed by the anaesthetic team shortly after arrival and was thought "unlikely to be fit for OT [operating theatre] tomorrow", "needs medical review" and "needs echo". The first orthopaedic review appears to have been at 17:00 the next day (Monday), some 22 hours after arrival on the ward. There is no written evidence that a consultant was present. Antibiotics were commenced for the chest infection.

The next orthopaedic note, made at 13:00 on the Tuesday (some 40 hours after admission), was by the intern, with no evidence of any input by the consultant. The intern wrote "has been cancelled for theatre again today... hopefully tomorrow". The echo was done that afternoon.

At 18:00 that day, almost exactly 48 hours after admission to the orthopaedic ward, the patient was seen by the orthogeriatric team. There is a note, for the first and only time in the entire folder, that the patient had "known myelodysplasia" and was "transfusion dependent". Although not precisely stated, this appears to be a previously established diagnosis. The note stated that the mass on the CXR was "not for further investigations due to age—likely neoplasm. Plan—review post-op".

Some five hours after that review, an MET call was made. CPR was undertaken and appears to have lasted for some 50 minutes before being terminated.

Because of the fall in a care facility, the patient was referred to the coroner. A postmortem revealed a primary bronchogenic cancer.

Clinical lessons

The orthopaedic consultant returned the audit proforma marked "terminal care" and did not complete the rest of the proforma. This does not seem consistent with the care offered this patient. If "for terminal care", why was:

- the patient clearly being worked up for theatre?
- the patient sent for an echo in anticipation of her surgery?
- the patient commenced on antibiotics for a chest infection?
- a not for resuscitation (NFR) form not completed?
- CPR commenced, and then persisted for almost one hour?

There is no evidence in the notes that the patient was ever seen by the consultant orthopaedic surgeon. That may be why there appears to be a disconnect between what was written on the audit proforma (terminal care) and the care received. Had the consultant reviewed the patient, it is likely the patient would have been assessed as highly unlikely to survive any surgery and death inevitable. The patient could then have been offered proper terminal care.

There was a delay of over 12 hours in transfer from the care home to the peripheral hospital ED. There was a further delay of over 12 hours before the patient arrived in an orthopaedic ward. A delay of 24 hours to surgery following a hip fracture increases mortality. Such falls are a predictable event and the care home and the peripheral hospital need to review their processes to speed up such referrals. For example, why send a high-risk patient to a peripheral ED on a Sunday?

Although this patient's death was not in any way related to the apparent lack of consultant input, the lack of consultant decision making was not conducive to good terminal care.

Case study 11: Death from pseudomembranous colitis

Case summary

An elderly patient with multiple medical problems, including diabetes mellitus, hypertension and renal failure, had recurrent cellulitis secondary to peripheral vascular disease (PVD). The right great toe became ulcerated and the patient was admitted under the care of a renal physician pending a planned amputation for an ischaemic toe. At this time, the patient was on Timentin. The next day, before the amputation could occur, the patient developed urinary retention, catheterisation failed and insertion of a catheter was undertaken by a urologist. Some five days later, the patient had day leave.

Two days after that, the patient was given Endone, though the reason was not stated. The patient was also pyrexial. The next day, Vancomycin and Ceftriaxone were added to the antibiotics and the patient underwent the amputation. This was uneventful, as was the recovery and the next few days.

On the fifth post-operative day, clindamycin and ciprofloxicillin were added, pending discharge. However, the patient became confused and anorexic, and the abdomen was noted to be distended. This distension became worse over the next 48 hours and an abdominal x-ray (AXR) was undertaken. The renal physician wrote in the notes "gaseous distension" and that the patient was "cold and clammy". In the early evening, the patient collapsed on the ward. Bloods at that time included a WBC count of over 60,000, albumin 16, urea 25.5, lactate 1, C-Potassium 5.8, creatine 321 and c-reactive protein (CRP) 395. The intensivist involved in the resuscitation reviewed the AXR and wrote "grossly distended large bowel loops with thickening of the transverse colon".

Following resuscitation, a General Surgeon undertook a laparotomy. At surgery, the patient had pseudomembranous colitis. No resection was undertaken, but a transverse colostomy was raised. The patient was profoundly septic with multiple organ failure (MOF) and died in ICU the next day.

Clinical lessons

This patient's abdominal distension was secondary to a toxic colonic dilation that was secondary to pseudomembranous colitis. The patient had been on multiple antibiotics and opioid-based analgesia.

Following the collapse, it was reasonable to undertake a laparotomy. Some patients with pseudomembranous colitis who develop a toxic colon require a colectomy to save life. Indeed, given this patient's septic state, a colectomy was likely to be the only life-saving operation. It is not clear from the notes whether the surgeon did not do a colectomy because they did not appreciate it was required or whether they judged the patient would not survive a resection.

If a colectomy was deemed too high-risk, then the alternative was to do nothing. I cannot see the rationale of undertaking a loop colostomy and leaving a septic, toxic colon. I think it almost certain this patient would have died even with a colectomy, and I do not think a "stoma only" contributed to death. But, equally, it predictably would not improve the patient's chances.

The key question is whether the diagnosis of pseudomembranous colitis could have been made earlier, in which case, his antibiotics changed or, in the face of deterioration, offered an earlier colectomy. To date, Australia has been relatively free of Clostridium difficile, pseudomembranous colitis and, unlike other countries, there is not a high index of suspicion. However, there are an increasing number of cases being detected and some of these have been after minimal, even single shot, antibiotic usage and associated with multiple resistance.

The main message here is that clinicians need recognise that *C. difficile* is becoming more frequent and need to have a high index of suspicion.

Case study 12: Missed subdural haematoma

Case summary

An elderly patient with significant past comorbidities and previous cerebrovascular accidents (CVA's) presented to the emergency department of a major tertiary hospital.

The patient had been found on the floor of their room in the nursing home and was thought to have an undisplaced subcapital fracture of the hip. The patient had a Glasgow Coma scale of 14 and the main complaint was pain in the hip. The patient was transferred to the orthopaedic ward. There were no fractures noted on the CT scan of the hip. Over the ensuing 24 hours, the patient gradually became less and less rousable. Initially, it was thought the patient may have been over sedated, but a subsequent CT scan of the brain showed there was a subdural collection causing herniation. The patient eventually passed away within 36 hours of being admitted.

Clinical lessons

The presentation is one that is quite common, where an elderly person is admitted with hip pain for investigation. In this specific case, there was no hip fracture but a subdural haematoma collection which eventually caused the brain herniation and death.

In the medical notes there were no signs of having been given any anticoagulants, which could have accelerated the subdural collection. The haematoma was not detected by the emergency staff due to the fact that the patient's overall mental state was not disturbed at the time of admission.

Would the overall outcome have been any different if the patient had been admitted under Orthogeriatrics or even under Neurosurgery? The answer to this question is impossible to state. One can state, however, that the fall caused the subdural haematoma as the head may have hit the ground and the haematoma gradually evolved over a period of time. Would our Neurosurgical colleagues have considered evacuation of a haematoma, given the past comorbidities and the age of the patient? At least a consultation would have been appropriate.

The area of concern is increased need for vigilance and possible scans in this age group, especially if there is any stigmata of head injury, such as bruising around the eye or the head area itself, or if there is a history of loss of consciousness.

Case study 13: Intraoperative aortic dissection

Case summary

A patient in their early 60s was electively admitted to hospital for mitral valve repair surgery because of severe mitral valve regurgitation probably related to a congenital atrial septal defect. The patient had a past history of ASD repair, hypertension and chronic thrombocytopenia, the latter requiring preoperative platelet transfusion.

At surgery, cardiopulmonary bypass was established via cannulae inserted into the right femoral artery and vein. There was no difficulty in cannulating the femoral vein but with femoral artery cannulation, it was noted by the anaesthetist that the guidewire which is routinely inserted prior to insertion of the femoral artery cannula was "not visualised in the descending aorta on two-dimensional echocardiography (TOE)" and "the surgeon was aware".

Mitral valve repair was then undertaken routinely using a right mini thoracotomy approach. Towards the end of the procedure, there was a sudden drop in arterial line pressure and intraoperative transoesophageal echocardiography revealed an extensive aortic dissection involving the ascending and descending thoracic aorta and aortic arch branches. Expeditious salvage was quickly attempted but to no avail and the patient died on the operating table.

Clinical lessons

Aortic dissection complicating cardiac surgery is a rare but catastrophic event that is usually fatal.

There were no adverse events involving the surgery related to the mitral valve repair and the attempt to salvage an extreme situation once the aortic dissection was apparent. The only concern was related to the cannulation of the femoral artery prior to establishing cardiopulmonary bypass. It was noted by the anaesthetist that the guidewire which is routinely inserted prior to insertion of the femoral artery cannula was "not visualised in the descending aorta on TOE" and "the surgeon was aware". The concern is that the guidewire was malpositioned and may have torn or ruptured the artery at some point above where the guidewire was inserted and may have been responsible for the later development of the aortic dissection.

Whether further investigation at this point of time to clarify potential arterial trauma above the cannulation site as a result of the question about the guidewire position would been useful is unclear and may have made no difference to the tragic outcome.

Case Study 14: A simple knee injury can be fatal

Case summary

A younger middle-aged patient presented to an ED with an acute avulsion fracture of the tibial spine. The initial treatment was discharge home with a knee brace. There was a review four days later and the advantages and disadvantages of operative versus conservative management discussed. The patient had not been on prophylactic DVT measures. The X-rays were discussed at a multidisciplinary team meeting the next day. The decision was to undertake an operative repair. The patient was admitted for surgery 16 days after the injury. Some 15 minutes after the anaesthetic commenced, and before any surgery, the patient suddenly had a cardiac arrest. Despite full resuscitation for over 60 minutes, including streptokinase for the presumed diagnosis of a pulmonary embolism (PE), the patient died. A massive PE was confirmed at postmortem.

Clinical lessons

The prophylactic use of Clexane, or similar, in this situation has been much debated and there is no clear opinion. The decision not to commence this was thus reasonable, particularly as the patient was mobile.

Editor's comment

A study reported by Jameson SS et al in Knee 2012 Jan: 19 (1) looked at 13,941 anterior cruciate repairs in the UK. The 90-day DVT rate was 0.3% and the 90-day pulmonary embolism rate was 0.18%. There were no deaths. Although this is not the exact same situation, it emphasises the rarity of DVT/PE in the less severe knee injuries.

Shortened forms

AF	atrial fibrillation
ANZASM	Australian and New Zealand Audit of Surgical Mortality
APTT	Activated Partial Thromboplastin Time
ASA	American Society of Anesthesiology
AXR	abdominal x-ray
BSL	Blood Sugar Level
CPD	Continuing Professional Development
CPR	cardiopulmonary resuscitation
CT	computed tomography
CXR	chest x-ray
DEM	Department of Emergency Medicine
DVT	deep vein thrombosis
ED	emergency department
ERCP	endoscopic retrograde cholangiopancreatography
HDU	high dependency unit
ICU	intensive care unit
INR	International Normalised Ratio
IV	intravenous
LIF	left iliac fossa
MET	medical emergency team
RACS	Royal Australasian College of Surgeons
SAAPM	South Australian Audit of Perioperative Mortality
WBC	white blood cell

Contact details

Royal Australasian College of Surgeons

Australian and New Zealand Audit of Surgical Mortality

199 Ward Street
North Adelaide SA 5006
Australia

Telephone:
+61 8 8219 0900

Facsimile:
+61 8 8219 0999

Email:
mortality.audits@surgeons.org

Website:
www.surgeons.org/for-health-professionals/audits-and-surgical-research/anzasm.aspx

The information contained in this annual report has been prepared on behalf of the Royal Australasian College of Surgeons, Australian Audit of Surgical Mortality Steering Committee. The Australian and New Zealand Audit of Surgical Mortality, including the Western Australian, Tasmanian, South Australian, Australian Capital Territory, Northern Territory, New South Wales, Victorian and Queensland Audits of Surgical Mortality, has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the *Health Insurance Act* 1973 (gazetted 23 August 2011).

NOTES

NOTES

Royal Australasian College of Surgeons

NOTES

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS

Royal Australasian
College of Surgeons

Australian and New Zealand
Audit of Surgical Mortality

199 Ward Street
North Adelaide 5006 SA
Australia

Telephone: +61 8 8219 0900
Facsimile: +61 8 8219 0999
Email: audit@surgeons.org
Website: www.surgeons.org