CASEBOOK 2017

A Selection of Cases from the New South Wales Collaborating Hospitals' Audit of Surgical Mortality Program

DISCLAIMER

All identifying information has been omitted to preserve anonymity.

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Background

In New South Wales, the Collaborating Hospitals' Audit of Surgical Mortality Program includes the CHASM Committee, chaired by Professor Peter Zelas OAM. The Committee reports to the Minister for Health and members are appointed by the Secretary, NSW Health.

The CHASM Program is managed by the NSW Clinical Excellence Commission and, with the Royal Australasian College of Surgeons, is committed to the surgical mortality audit owned by the Surgical Fellows of New South Wales.

The Program works collaboratively as a member of the Australian and New Zealand Audit of Surgical Mortality (ANZASM) Steering Committee to support and guide the development of the audit to ensure both consistency and governance standards are met.

The process of peer review and reflection undertaken by Surgical Fellows as part of the audit process is protected by special privilege under the *Health Administration Act 1982*.

Introduction

On behalf of the CHASM Committee, I present the 2017 Casebook. The themes examined in this Casebook follow the trends of previous publications as many surgeons continue to deal with the challenges of practising in a modern society which has constantly evolving expectations. In particular, the complexities in the early recognition of the *deteriorating patient*; dealing with *the decision to operate* – either, the delay to surgery, or, whether an operation is in the best interests of the patient - especially where it may be considered futile; and *aspiration* - whether as a primary cause, or as a contributing factor in a patient's death - which features often in patients with neck of the femur fracture.

The cases presented in this publication are drawn from Second Line Assessments undertaken by CHASM Program participants. These surgeons undertake a detailed and independent review of the patient case notes to assess the care and treatment given to the patient so that peer review feedback can be provided to fellow surgeons for reflection.

This process of peer review and reflection also provides a platform to inform, educate and facilitate change with the aim of improving the quality of the practice of surgery in New South Wales Public Hospitals. Each case identifies clinical, system and process issues where a change in the care provided may have resulted in a different outcome.

I would like to express my appreciation to certain colleagues for their specific contributions to this Casebook.

- Dr Ming Loh for his review of Delirium
- Dr Lewis Chan for his reflections on Urosepsis
- Dr Carl D'Souza, Chairperson of the Special Committee Investigating Deaths Under Anaesthesia (SCIDUA) for his comments on Case 1

Importantly, I would like to express my gratitude to all the surgeons who participated in the Audit as a First and/or Second Line Assessor. The considered and thoughtful comments received on the cases have reflected often many hours of reviewing clinical notes. The not infrequent personal reflections from Assessors display a sensitivity and understanding of the difficult decisions that are made by surgeons, sometimes on a regular basis, and especially in relation to complex clinical problems in the elderly. Equally, surgeons completing a Surgical Case Form (SCF) quite regularly have insightful reflections with comments on the wisdom of hindsight, particularly how next time: "*I would do it differently*".

On behalf of the CHASM Committee I hope you find the 2017 Casebook a valuable tool to facilitate further educational discussions concerning the challenges of surgery in a modern day setting. It is just as important to generate these types of conversations in situations where multi-disciplinary and cross jurisdictional teams can participate.

As this is my last publication as Chairperson of the CHASM Committee, I would like to extend my gratitude to the members of the Committee, and the staff of the CHASM Program at the Clinical Excellence Commission. You have both enhanced the Audit of Surgical Mortality and worked tirelessly in your pursuit to implement the online reporting function for New South Wales. Your advice and support have been invaluable. Thank you and best regards to all.

Professor Peter Zelas OAM
Chairperson, CHASM Committee

The Clinical Excellence Commission would like to thank all of the staff that support the CHASM Program through the provision of notifications, reports and medical records.

Your commitment and diligence towards this valuable surgical audit program is greatly appreciated.

Arrangement of Cases

CASE 1

Prolonged hypotension and the deteriorating patient

An 80 year old patient was admitted for a total hip replacement for osteoarthritis. The patient had a number of comorbidities having undergone coronary bypass grafting in 2011, atrial fibrillation (AF), hypertension, hyperlipidaemia and diet-controlled diabetes. The patient had a poor exercise tolerance.

Medications included: apixaban, metoprolol, Zocor and frusemide.

The patient had been seen by a cardiologist 4 months prior to surgery, with an echocardiogram (ECHO) demonstrating normal left ventricular size with borderline impairment of systolic function. The anaesthetist considered the patient to be ASA 3. Preoperative blood pressure (BP) was 137/80 mm Hg.

The operative procedure proceeded uneventfully. The anaesthetic (spinal and sedation) was administered appropriately and from the trends of the anaesthetic chart seemed unremarkable. Systolic BP during the operation remained around 100 mm Hg.

Postoperatively the patient remained in the recovery room for three and a half hours during which time episodes of hypotension required fluid boluses. The systolic BP never rose above 100 mm Hg. There is no note of a neurological deficit.

During transfer of the patient to the ward at 19:00 hours a Medical Emergency Team (MET) call was raised by the nursing staff as the patient was noted to be unresponsive. The clinical picture was attributed to recovery from anaesthesia together with left lower lobe consolidation identified on a chest X-ray. The oxygen saturation was 80% on room air and rose to 94% with 4 litres of oxygen via nasal prongs. Intravenous (IV) antibiotics were commenced. No focal neurological deficit was noted.

Instructions for the nursing staff were to continue hourly observations. The medical notes indicated that the orthopaedic registrar was to be contacted by the orthopaedic JMO if the BP continued to be below the parameters of the Standard Adult General Observation (SAGO) chart.

During the subsequent hours, the patient remained drowsy with the systolic BP remaining at 100 mm Hg and the urine output between 20-30 mls per hour. At 00:30 hours the patient was reviewed by an Intensive Care Unit (ICU) Liaison Nurse where there is the first mention of a neurological deficit, in the left arm. BP was 83/43 mm Hg and Glasgow Coma Score (GCS) was 7. Continued observation was recommended.

At the next recorded review at 01:18 hours the patient was not responding to deep pain stimuli, the left arm was in the decorticate position and the GCS was 7. The systolic BP was 85 mm Hg, oxygen saturation 98% and the urine output was 15 mls per hour. A further bolus of IV fluids was advised. The electrocardiogram (ECG) showed ST changes consistent with ischaemia and the troponin level was 3863ng/l (Ref. Range less than 16 ng/l).

At 01:20 hours a MET call was placed. The neurological findings suggested that previous abnormal flexion of the left arm had resolved but there were suggestions of abnormalities in the left leg. GCS remained at 7.

02:05 review: CT scan of the head showed mild atherosclerotic disease in the major vessels but was otherwise normal. There was no evidence of acute intracranial haemorrhage.

The cardiology advanced trainee advised to repeat the troponin, commence dual antiplatelet therapy and notify if the ST elevation rose above 2 mm.

03:00 review: BP stable at 118 mm Hg systolic and GCS at 8. The medical registrar noted a change in neurological signs with increased tone in upper and lower limbs and positive Babinski.

At 06:00 hours the patient deteriorated and was admitted to ICU.

The patient was assessed as having sustained a perioperative anterior myocardial infarction, pneumonia and the GCS was 6. Troponin was 11,000 ng/l. The patient now required inotropes to maintain BP.

The neurologist considered the clinical picture to be consistent with global hypoperfusion against a background of a NSTEMI and significant comorbidities. This augured for a poor prognosis. CT angiogram of the head showed no large vessel occlusion or aneurysm.

During the next 24 hours, further deterioration required increasing inotropes and, following discussion with the family, treatment was withdrawn.

Surgical Learnings

This was an elderly patient with multiple comorbidities having a major orthopaedic procedure.

The patient was at high risk with a poor exercise tolerance, a history of ischaemic heart disease (IHD) and diabetes, making the patient prone to silent ischaemia. Preoperative assessment could have included some form of functional cardiac assessment, e.g. Persantin Sestamibi scan, to assess the likelihood of perioperative myocardial ischaemia. There was no comment as to whether the cardiologist was aware that a major operation was planned for the patient.

As a general rule, the treating anaesthetist and surgeon should be notified of any patient who is in recovery after one hour and who is still experiencing ongoing issues preventing discharge. After two hours in recovery, the patient should be reviewed by the anaesthetist (or registrar) and a definitive plan made. After three hours in recovery, treatment needs to be escalated to involve ICU.

Hypotension was multi-factorial. Preoperative deficit due to fasting (greater than 12 hours), intraoperative blood loss, spinal anaesthesia and a cardiac event all contributed. The first Troponin was in excess of 3000 ng/l but it is not clear whether the ischaemia occurred intra or post-operatively. A preoperative cardiac scan would have highlighted whether the patient's myocardium was a considerable risk factor in this surgery. Further, the diagnostic results may have assisted the treating anaesthetist in the management of the patient's hypotension. Perhaps a more aggressive approach could have been considered such as escalating the level of intraoperative monitoring and an ICU admission postoperatively. The management of this patient may have been different if the relevant information was available.

Blood pressure control should be seen as much more of a priority in at-risk patients. There is no hard consensus as to what is considered adequate blood pressure control in this setting. As a general guide, a blood pressure within 20% of baseline should be the goal, with even tighter control (aim for baseline) in those who are known to have cerebrovascular disease.

This patient had substantial risk factors to suggest that macro and micro vascular cerebral artery disease was present. It was this, in combination with the persistent hypotension, which was responsible for the patient's deterioration.

Deterioration in the ward: The patient became unresponsive on returning to the ward. The medical and nursing notes, clearly and in detail, document the subsequent deterioration. However, there was delay in recognising the significance of the developing clinical picture. The importance of escalation of care should be reinforced to nursing and junior medical staff when *Between the Flags* criteria on the SAGO chart, both Yellow and Red zones, are met. Not only are the raw observation numbers important, but trends are significant with white line deterioration, i.e. patients with clinical signs, within the white zone, but trending towards the yellow zone. It can be anticipated that the current trend will continue and a senior person should be consulted.

CASE 2

"The chain of command" - A hindrance in the deteriorating patient

A patient in their early eighties was due to undergo an elective hip replacement. The surgery was cancelled due to a chest infection. The General Practitioner (GP) was requested to manage the patient. Five weeks later the patient was readmitted for the operation. Preparation for surgery had been thorough with review by the Pre-anaesthetic Clinic and a cardiologist. The patient had a coronary artery stent in 2012. There was also history of a cerebrovascular accident 8 years prior and the anaesthetist noted that the patient had dyspnoea after walking 50 metres. The patient was rated ASA 3. The anaesthetist documented that the patient was, in their words, "FRAIL". Medications included Seretide, frusemide, clopidogrel and Dothep.

The patient's health on the day prior to readmission for surgery was not ideal as they had experienced vomiting and diarrhoea. These symptoms appear to have settled on the day of admission and the anaesthetist was comfortable to proceed with the operation. The surgery proceeded uneventfully with no technical or anaesthetic problems recorded.

Overnight it was noted that the patient was confused but otherwise stable.

Day 1 postoperatively, the patient complained of abdominal pain but remained clinically stable, although was recorded as being "vague". The patient was seen by the Orthopaedic Registrar who arranged for a chest X-ray and supplemental oxygen.

In the early hours of the second postoperative day, the patient became increasingly confused, developed abdominal distension and significant diarrhoea. The Orthopaedic Registrar suggested a possible diagnosis of gastroenteritis and ordered a stool culture, (subsequently the C.difficile tcd B gene was not detected). Nursing notes in the afternoon document vomiting following any oral intake, increasing confusion and a "chesty cough". However, clinical observations were noted to be *Between the Flags*.

Later that day the Consultant's review found the patient unwell and requested a medical consultation. There was a suggestion that the patient may have sustained a minor degree of aspiration. Chest X-ray showed changes in the left lower lobe.

At midnight a Resident Medical Officer (RMO) was asked to see the patient. Respirations were 36 breaths per minute and oxygen saturation was 92%. Examination noted the patient was alert, with a normal BP and pulse rate. Chest examination

revealed "very few basal creps" and the "abdomen mildly distended". A review by the treating team was suggested for the morning.

By 07:45 hours on postoperative day 3, the patient was obviously increasingly unwell with nursing notes reporting vomiting of "large amounts of very dark fluid", abdominal distension and the patient sounding "gurgly". There were two urgent requests for medical review within three hours.

The initial review was carried out by the after-hours resident who discussed the matter with a senior colleague (it is unclear whether this was a registrar or consultant).

Two and a half hours later the patient was reviewed by another RMO who discussed the patient with the surgical registrar. An abdominal X-ray was suggested. ECG showed no acute changes. The advice provided was to continue with clear fluids if tolerated, proton-pump inhibitor and await results of X-ray and blood tests.

At 13:00 hours a RMO noted that the patient's condition was dramatically worse, being confused with a respiratory rate of 40 breaths per minute. Chest examination revealed bilateral coarse crepitations. The abdomen was distended with non-specific tenderness. Blood results showed abnormal liver function tests, deteriorating renal function and a C-Reactive Protein (CRP) of 399 mg/L (Reference range: <5 mg/L).

Abdominal X-ray showed dilated bowel loops with no fluid levels. Chest X-ray reported: "?patchy left lower lobe". The patient's condition was discussed with the consultant who advised Lasix and IV antibiotics on the basis of possible respiratory tract infection secondary to aspiration. A nasogastric (NG) tube was inserted and one litre of dark liquid was drained.

Three hours later, specialist medical review was carried out. The patient's blood pressure was unrecordable. Examination revealed bilateral "crackles" in the chest with an abdomen that was tense and very distended. The patient was transferred to the High Dependency Unit (HDU) and died three hours later.

The actual cause of this patient's death is not clear. The Coroner's Report suggests IHD, however, the clinical issues that were most pursued were abdominal pathology and chest infection.

Surgical Learnings

It is clear from the nursing and medical notes that the patient was deteriorating. While appropriate investigations were done, it is unclear how much senior medical clinician input was involved. Direct involvement by a consultant might have been more appropriate given the patient's obvious clinical deterioration. The treating surgeon has reflected that he should not have relied on junior medical or nursing staff to request an urgent medical team review.

From postoperative day 1, there was clinical evidence that the patient was not proceeding down the expected pathway. By day 3, the patient's vital signs had breached the *Between the Flags* criteria. When a patient's condition is rapidly deteriorating, senior medical staff should be informed and involved as early as is possible, rather than going through "the chain of command".

It would be important for there to have been a de-briefing and opportunity to reflect on this patient's care between the clinical teams involved in the patient's care, to identify and discuss where there may have been opportunities to interrupt the steady deterioration that took place.

This discussion would need to include the Consultant who had expressed concern on day 2, and requested a formal medical consultation.

The Second Line Assessor commented that, in hindsight, the patient's preoperative symptoms probably contributed to the patient's outcome and that the significance of these symptoms could have been more carefully evaluated.

The patient may have benefited from a multi-disciplinary review prior to surgery to evaluate the risks (both mortality and morbidity), along with the expectations as to the outcome from the patient's and family/carer's perspective. The comment from the anaesthetist regarding frailty was significant, and indicated that there was the potential for increased postoperative complications.

CASE 3

Deteriorating patient...then aspiration

A patient in their mid-seventies underwent bilobar resection of liver metastases (including the porta hepatitis and with a biliary enteric anastomosis) originating from a colorectal carcinoma. Comorbidities included peripheral vascular disease, diabetes and AF.

Surgery proceeded uneventfully with minimal blood loss and the patient was admitted to HDU.

Day 1 postoperatively the patient was progressing well, apart from rapid AF (treated successfully with metoprolol and amiodarone), and a mild acute kidney injury (AKI).

Day 2 the patient remained unchanged, tolerating small amounts of oral fluids.

Day 3, (a Sunday), the patient was reviewed by both Surgical and ICU consultants early in the morning. Both were satisfied with the patient's progress. The patient's condition changed progressively during the day. They became drowsy with a transient episode of hypotension and AF, abdominal distension, increased intraabdominal pressure of 14 mm Hg (Ref. range 5-7 mm Hg) as measured by the nursing staff, and a low urine output despite a positive fluid balance of 4 litres. Nursing staff and the patient's family expressed concerns regarding the developments.

There was an indication of worsening AKI. Chest X-ray showed a moderately large right pleural effusion and gaseous distension of the stomach.

During nursing and medical handover at 19:00 and 20:00 hours respectively, both noted significant change from the previous shifts. Patient had GCS 14, was tachypnoeic and had been anuric for 5 hours with worsening AKI.

The surgical JMO was unable to be contacted and the case was not escalated to the ICU Fellow. The surgical consultant was not notified of the patient's deterioration. The ICU consultant was contacted and ordered an abdominal CT scan, which showed a distal small bowel obstruction. The patient was returned to HDU.

On return to HDU it was decided to insert an NG tube. This was undertaken but there was no aspirate of gastric fluid. The NG tube was left in place. Shortly thereafter the patient became unresponsive and hypoxic. During resuscitation a large amount of gastric fluid was found in the airway. A new NG tube was inserted and two litres of fluid was aspirated.

Resuscitation did not improve the patient's condition and they died later the following morning.

Surgical Learnings

Following two days of good progress, the patient then began not continuing the expected clinical pathway.

Junior staff should be encouraged to escalate their concerns regarding a deteriorating patient and seek advice from a senior clinician. The significance of the association of a postoperative distended abdomen, a positive fluid balance and oliguria/anuria was not recognised. The patient probably had developed an ileus and there was consequently third space loss into the gastrointestinal tract.

There would appear to have been little recognition of the oliguria in the nine hours prior to the development of anuria.

Communication between the treating teams (in this case Surgical and ICU) is important so that there is a better understanding of the progress of the patient from each of their perspectives. In this instance, the need for a CT scan with contrast may have been averted.

As highlighted in the CHASM 2016 Casebook, the insertion of an NG tube in a patient with ileus, especially if obtunded or postoperatively, carries a risk of vomiting and consequent aspiration. Local protocols and teaching should be considered to allow junior staff to become more familiar with the procedure of insertion of NG tubes, raise awareness of the possibility of aspiration, the clinical scenarios in which it is likely to occur, and the measures that can be taken to prevent its occurrence.

The REACH (Recognise, Engage, Act, Call, Help is on its way) program was introduced by the NSW Clinical Excellence Commission in 2013. REACH is designed to empower patients and families to bring clinical deterioration to the attention of staff and provide a direct route to escalate care if concerns are not addressed. This patient's family were aware of the deterioration. REACH guidance may have empowered the family to feel comfortable in escalating their concerns.

Summary for Cases 1, 2 and 3

The deteriorating patient

A pattern of care has emerged from these three cases. All were not following the expected clinical pathway. There were abnormal clinical findings such as, the vital signs largely remained within *Between the Flags* criteria, investigations were abnormal, the clinicians and nursing staff were "worried", and yet no escalation to a senior doctor or consultant was made.

Would "trigger tools" have been of benefit?

To address the common problem of early recognition of the deteriorating patient, the United Kingdom NHS has endorsed the introduction of a National Early Warning Score (NEWS) 2. https://www.rcplondon.ac.uk/projects/outputs/national-early-warning-score-news-2

This is a simple aggregate scoring system where a score is allocated to six physiological measurements and allows doctors and nurses to identify deteriorating patients and escalate care at an earlier stage.

Additional guidance produced by rapid response teams, which provides pragmatic advice on a number of topics for clinicians, *Managing Deteriorating Patients* (First Edition, 2018), is a free ebook available at: https://rrthandbook.org/

CASE 4

"Why isn't this case surgical?"

A patient in their early seventies presented to the local hospital with a four day history of cramping abdominal pain, vomiting and diarrhoea. There was a similar episode, three weeks earlier, which settled spontaneously within a few days. Comorbidities included diabetes, AF, chronic renal failure and previous right hemicolectomy for a fish bone perforation. Although overweight, there was evidence of generalised abdominal tenderness with dehydration and sepsis. With an acute abdominal condition being suspected, following resuscitation and the administration of antibiotics, the patient was transferred to a regional hospital the following day.

On arrival, the patient was admitted to the ICU where they were noted to be confused, with a low grade temperature, dehydrated and oliguric and with rapid AF. There was generalised abdominal tenderness, especially in the right upper quadrant. The provisional diagnosis was "septic shock with acute kidney injury and possible abdominal pathology". Appropriate resuscitation was provided and the patient was ventilated. A CT scan of the abdomen was inconclusive.

The attending surgeon was of the view that the patient did not have an abdominal cause for the septic shock and recommended the patient be transferred to the medical team. There was no improvement in the patient's condition. A further CT scan demonstrated an ileus. There was no subsequent surgical review. Ischaemia of the feet also became evident.

The undifferentiated shock, renal failure, severe right cardiac failure and metabolic acidosis was a "diagnostic dilemma". Three trials of pulmonary extubation were not successful.

After 19 days in hospital with no improvement, the patient was transferred to a larger regional hospital. Rectal bleeding developed three days following transfer, anticoagulants were ceased and a surgical opinion was sought. Abdominal CT scan was again inconclusive, although, "several ill-defined foci of gas, several of which have the suggestion of lying extramurally" related to the small bowel, were identified. There was no surrounding fat stranding or free fluid.

A colonoscopy was undertaken two days later. This revealed a considerable amount of dark blood, with a normal rectum and sigmoid colon, with disrupted mucosa in the splenic flexure region, raising the possibility of a necrotic tumour or ischaemia. A decision was made to proceed to surgery.

The patient was transferred to the operating theatre for laparotomy and tracheostomy. Operative findings were of multiple abscesses in the small bowel mesentery and between small bowel loops due to multiple perforations of jejunal diverticulae. Two metres of small bowel from 60 cms from the duodenojejunal (DJ) flexure to mid small bowel were resected with functional end to end anastomosis. The colon was not overtly ischaemic.

Histopathology showed multiple areas of patchy mucosal necrosis, with full thickness involvement of bowel wall associated with the perforations. Changes extended to the resection margins.

Six days later there was worsening metabolic acidosis and at laparotomy patchy necrotic bowel was resected with end to end anastomosis. At a second look laparotomy 24 hours later, there was a perforation in the first anastomosis. This was oversewn. A Vacuum-Assisted Closure (VAC) dressing was applied. Laparotomy and peritoneal lavage performed two days later. No new perforations seen. Three days later there was faecal fluid evident in the abdominal wound. Laparotomy confirmed this was originating from the first anastomosis, which was resected, and due to the proximity of the proximal line of resection to the DJ flexure a stoma was not possible.

A second anastomosis was undertaken, with 45 cms of small bowel now remaining. The patient was then managed with an open abdomen. Postoperatively there was improvement in renal function and the patient was breathing spontaneously. However, there was a persistent fever, metabolic acidosis due to systemic candidiasis and probable persistent abdominal sepsis. After a family conference, it was resolved to cease active treatment and the patient died the following day.

Surgical Learnings

The Second Line Assessor, in a detailed report, made a number of reflections.

There is general agreement that in surgical patients, the history of the presenting illness is probably the most important item of information in assisting the surgeon to achieve a diagnosis. Unfortunately, as the patient was so unwell, a complete history was never going to be possible. However, there were hints on several occasions when the patient was lucid, such as “generalised abdominal pain” and tenderness. These, together with lactate metabolic acidosis, made consideration of an intraabdominal cause by the medical and ICU teams worthy of consideration.

The specialist in charge has a duty of care to establish the diagnosis, especially in the critically ill patient. This may involve review of the patient on several occasions and consultation with a surgical colleague, medical and ICU specialists. There should be a low threshold for seeking advice from others, early and often, when a diagnosis is unclear. A key question should be "why isn't this case surgical?". However, if there is a transfer of care to another clinician, it would be useful for the surgeon to remain nominally on the case to allow ease of early re-consultation.

The patient's best chance of survival with abdominal sepsis is always in the hands of the surgeon of first contact.

The multiple jejunal perforations may have been ischaemic in origin, at least in part due to the use of vasopressors. The ischaemia of the legs is also evidence of this.

Exploratory laparotomy or laparoscopy is just another diagnostic tool in the surgeon's armamentarium and there is no need to apologise for negative findings. Either should be considered when the source of sepsis in a critically ill patient is unclear.

In a stressed, malnourished patient who requires a bowel resection, a stoma should be considered instead of an anastomosis. When mesenteric ischemia is the underlying problem, an early second look laparotomy should be considered.

As an Addendum, the Second Line Assessor commented on the operating theatre notes being "skimpy at best". A clear and contemporaneous record is important in facilitating continuity of care.

CASE 5

Acute diverticulitis...when to operate?

A patient in their seventies presented to the Emergency Department (ED) with a one day history of lower abdominal pain, localising in the left iliac fossa. The patient lived in a supported facility, managing on their own and said to be generally reasonably well, apart from treatment for breast cancer seven years ago with no evidence of recurrent disease. The patient was assessed as being ASA 3 category at time of admission.

On examination, the vital signs were normal apart from a low grade fever. Abdominal examination revealed localised peritonism in the left iliac fossa with the remainder of the abdomen being soft and non-tender. The white cell count was within normal range, though with a mild neutrophilia and the CRP was 149mg/L.

CT scan of the abdomen demonstrated acute diverticulitis, with a small amount of free fluid and a few locules of free gas.

Conservative versus surgical management options were discussed with the patient, and a decision made to proceed non-operatively.

On the day of admission, a note was made by the treating consultant "if deteriorates, to laparoscopy and washout +/- Hartmann's". Over the ensuing three days the patient improved with IV antibiotics and required relatively low levels of analgesia and was commenced on oral fluids and then a soft diet. Patient had several loose stools. White cell count remained normal and the CRP fell to 42 mg/L.

On day 4, the patient was noted to be hypotensive, which was attributed to dehydration, and this responded to IV fluids.

On day 5, the patient felt unwell, developed tachycardia and "respiratory distress". Clinical notes (in the morning) report "minimal pain, bowels open, afebrile". The patient deteriorated during the course of the day.

CT of the abdomen showed pneumoperitoneum, increased intraabdominal fluid around the liver and spleen, and generalised stranding of the mesenteric fat. A fluid collection in the pelvis, presumably an abscess, was not amenable to percutaneous drainage because of the risk of organ damage. Chest X-ray showed bilateral basal collapse.

White cell count was elevated to 13.4 $x10^9$/L and the CRP was 149 mg/L. A progressive AKI, hypoglycaemia and abnormal liver function tests were noted. The patient was transferred to the ICU where the consultant advised operative intervention. The surgical registrar reviewed the patient and notified the consultant regarding the patient's deterioration since the review earlier in the day. Continuing conservative management was advised.

On day 6, the patient showed signs of continuing deterioration with hypoxia, episodic supraventricular tachycardia, developing coagulopathy and oliguria. A second opinion was sought in the morning and surgery was advised. Surgery was delayed due to lack of theatre availability during which time the patient deteriorated further.

In the early evening, laparotomy revealed purulent peritonitis due to perforated sigmoid diverticulitis. Peritoneal lavage, drainage of a pelvic abscess and Hartmann's operation were undertaken. Considerable problems with clotting were encountered. Later that evening, the patient became haemodynamically unstable and was returned to the operating theatre where bleeding from the spleen was found. A splenectomy and packing of the abdomen were undertaken.

The following day the patient had a laparotomy with removal of the abdominal packs. The patient died shortly thereafter.

Surgical Learnings

In the conservative management of acute diverticulitis any clinical deterioration is an indication to review the management plan and actively consider surgical intervention. This is especially relevant in the elderly, where the early signs of deterioration can be subtle and rapid progression can occur. Hypotension was the first indicator of a change in the progression of improvement which had been occurring until that time.

Abdominal pain and fever were never prominent, even when the patient deteriorated. The white cell count was only mildly elevated. The CRP fluctuated during the whole illness making it an unreliable indicator of the patient's deterioration. On admission to ICU, a nursing note states the patient "remains within *Between the Flags*".

There were other clinical indicators of progressive deterioration, such as patient not feeling well, tachycardia, oliguria and later, early indicators of multi-organ failure.

Consultant to Consultant conversation would have been a real option, especially given the documented views of the ICU consultant when the patient was first admitted to the ICU.

Trends in the physiological data, rather than absolute numbers, should be reported to assist in the early detection of the deteriorating patient before severe physiological compromise occurs.

The morbidity risk of a laparotomy for control of the intra-abdominal sepsis is less than allowing the sepsis to continue.

Splenic injury is a well-recognised complication of mobilising the left colon. In this case, however, the infection related coagulopathy was already well established and compounded the local control of bleeding from the splenic bed.

CASE 6

Ensure continuity of care

A patient in their sixties with morbid obesity, Body Mass Index (BMI) of 60, underwent laparoscopic sleeve gastrectomy. Comorbidities included two myocardial infarcts, AF, dilated cardiomyopathy and severe obstructive sleep apnoea requiring Continuous Positive Airway Pressure. Patient continued to smoke cigarettes. Preoperatively the patient had consulted two physicians, an anaesthetist, as well as seeing the surgeon on three occasions. Investigations had included a sleep study, coronary angiogram, Persantin sestamibi scan and a cardiac ECHO. Advice was received from the cardiologist regarding the importance of anticoagulation as the patient was at very high risk of a postoperative cerebrovascular accident. It was acknowledged that the surgery was a high risk procedure with the ASA assessed as Grade 4.

Surgery proceeded uneventfully and the patient was discharged from hospital two days postoperatively on therapeutic Clexane, as instructed by the treating physicians.

The patient represented to another hospital two days later, on a Friday afternoon, with presyncopal symptoms, tachycardia, hypotension and a haemoglobin of 94g/L and white cell count 13.5×10^9g/L (Reference Range: 4.0 - 11.0×10^9g/L).

There were no clinical signs of sepsis. A CT scan showed a large haematoma adjacent to the stomach. The patient was seen by the Acute Surgical Unit registrar and was admitted under the care of the treating surgeon. The plan was to withhold anticoagulation and monitor.

The treating surgeon was then on leave over the weekend and it is unclear from the progress notes as to which surgeon was looking after the patient.

The patient remained stable the next day. However there were no surgical entries for that day.

During the afternoon of the following day, the patient became acutely unwell with increasing abdominal pain, fever, hypotension and tachycardia. A Rapid Response was called because of associated chest pain and a pleural effusion was noted. Another Rapid Response was called following development of tachypnoea. The patient's condition was discussed with a consultant who suggested continuing antibiotics and observation. The patient was treated for pneumonia overnight.

The patient became increasingly septic and transferred to ICU in the early hours of the following morning.

The primary surgeon was not notified of events on the weekend, only becoming aware of the patient's condition on Monday morning. A CT scan later that morning showed evidence of a leak from the gastric sleeve.

The patient was returned to the operating theatre for planned laparoscopy and gastroscopy. There was an injury to the colon with trocar insertion because of the abdominal distension. The operation was converted to a laparotomy with the colon being repaired, drainage of infected haematoma and drains placed.

The patient returned to ICU with multi-organ and renal failure. The patient died five days later following multiple cardiac arrests.

Surgical Learnings

Continuity of care: This case highlights the importance of good clinical handover and ensuring that there are clear instructions as to the consultant who will be responsible for the care of the patient.

Documentation needs to be contemporaneous so that there is a flow of information that can be handed over to treating teams.

There are numerous references to the patient being "*Between the Flags*". This again highlights the importance of not using these criteria as the main evidence that the patient is progressing well. The patient was not following along the expected clinical pathway i.e. had been readmitted following surgery, and this in itself, together with the CT scan, should place clinical staff on the alert.

Perioperative anticoagulation is a contentious issue. The benefits and risks need to be carefully considered on a case by case basis, especially in a patient with multiple complex clinical issues.

Early discharge: This patient was at significant risk of developing postoperative complications. It may have been prudent to delay the discharge from hospital until it was certain the postoperative progress was proceeding uneventfully.

Decision to operate: The Second Line Assessor comments that the patient was clearly high risk and had been thoroughly assessed prior to the elective operation with clear plans in place for both the medical and surgical care. However, questions remain about acceptable risks to the patient and the surgeon, and how best to balance these risks with optimal care. Programs such as POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity) and NSQIP (National Surgical Quality Improvement Program) provide guidance on what is "very high" risk, how it is quantified and the potential of mortality and postoperative morbidity.

CASE 7

Significance of pneumoperitoneum

A patient in their early eighties underwent a major right lung resection for a large squamous cell carcinoma. The comorbidities included osseous metastases from a breast carcinoma under control (with chemotherapy), chronic airflow limitation due to heavy smoking (FEV less than 1 litre/minute) and a history of heavy alcohol intake.

The postoperative course was complicated by the development of intermittent episodes of rapid AF, (requiring transfers to ICU for management with amiodarone), a bronchopleural fistula managed by chest drains, Haemophilus influenzae in the sputum treated with Amoxycillin and abdominal distension with constipation followed by diarrhoea. Frequent imaging was required.

On the morning of the eighth postoperative day, a routine CT scan to assess postoperative progress reported "there is now extensive pneumoperitoneum" with subcutaneous emphysema. This was in keeping with the clinical findings of a very distended abdomen. There were no clinical signs of sepsis and the patient continued to have bowel motions. CT with contrast did not reveal any gastro-duodenal leak.

A multi-disciplinary meeting between cardiothoracic, general surgery and intensive care decided on a "wait and see" approach. There was concern the patient would not survive an operative intervention. Three days later, a pigtail catheter was inserted to reduce the pneumoperitoneum. Provisional diagnoses were a sealed perforated duodenal ulcer or, less likely, a chest drain eroding through the diaphragm. The family was kept fully informed regarding the management plan.

A further three days later, a bronchoscopy was normal, a pericardial drain was inserted and a pigtail drain inserted to relieve the splinting of the diaphragm resulting from the pneumoperitoneum.

Over the ensuing days, the patient developed increasing abdominal distension and worsening respiratory failure. The CT showed increasing pneumoperitoneum. A percutaneous drain revealed enteric contents. Laparotomy revealed ischaemic perforation of the caecum, for which a right hemicolectomy and ileostomy was undertaken.

The patient was extubated 48 hours later but developed worsening respiratory failure and declined further active treatment.

Surgical Learnings

The unusual feature of the presentation was that for 72 hours, the patient did not show any signs of sepsis and the CT scan did not identify any free fluid in the abdomen. Thereafter, it was recorded that there was general abdominal tenderness, which was more pronounced on the right side of abdomen. The white cell count was only mildly elevated during the course of the illness. It is apparent from the clinical charts and the Surgical Case Forms submitted to CHASM that there were differing views as to the most appropriate decision in response to the finding of the pneumoperitoneum.

The alternative course to the conservative approach was a diagnostic laparoscopy/laparotomy. Given the diagnosis, this would have led to a therapeutic intervention with a much better chance of survival.

Massive pneumoperitoneum is unusual resulting from a perforated ulcer. The patient's abdominal clinical manifestations may have been a reflection of a colonic pseudo obstruction with a complicating caecal perforation.

Clinical Review:

Delirium - the next surgical sign. *By Dr Ming Loh.*

Delirium could be considered as the next surgical sign. It is simple to add to a skilled surgeon's armamentarium and requires little time to develop the teamwork and acumen to diagnose early. Delirium can identify a deteriorating patient well in advance of the changes in haemodynamics that declare a postoperative surgical emergency or a failure to rescue. Delirium may prove to be the definitive agenda in protecting the ever growing elderly surgical population.

Postoperative delirium is a disaster for the vulnerable elderly patient[1]. Complications ensue when delirium takes hold[2]. The dreaded sequence is of delirium leading to immobility, atelectasis and pneumonia. Sepsis and respiratory failure follow soon after, the 30 day mortality doubles[3] and the length of stay doubles[4]. Delirium is a stronger driver of extending length of stay than traditional surgical complications such as surgical site infection[5]. Rehabilitation becomes vexed and unravels. Patients become vulnerable to a later diagnosis of dementia[6]. Patients double their risk of discharge to a nursing home[7]. Delirium is confronting and distressing for families and, if left unmanaged, is not an infrequent trigger for complaint.

Perhaps too much emphasis is made on delirium diagnostic tools and algorithms and not enough emphasis is made on the skilled surgeon's instincts in recognising delirium. Postoperative delirium occurs most frequently in the first three days after surgery and is typified by its fluctuating course and inattention.

Hyperactive delirium is more obvious and readily reported by ward staff. These are the hypervigilant or agitated patients that after-hours residents prescribe psychotropics and sedatives to at the behest of ward staff. Routine surveillance for overnight prescriptions on the morning surgical rounds will reveal these patients, as will close liaison with nursing staff.

Hypoactive delirium is far more insidious than hyperactive delirium. Picking up the subtle behavioural changes of hypoactive delirium - the drift in conversation, the steadily evolving stupor, the gnawing aggravation of family members as they recognise the patient's deteriorating demeanor - requires the cogent surgeon to invest time during the busy ward round.

It is easily overlooked by staff and can run unchecked for days. Hospital mortality is high and double that of hyperactive delirium[8].

Being familiar with the patient's temperament and personality prior to surgery is helpful to denote delirium in the elective surgical

setting. Preadmission clinics are useful here, particularly if the geriatrician and anaesthetist can assess the patient together and strategies to limit delirium can be discussed with family[9]. Positioning family members to attend the patient in recovery or on the ward, during the evening when delirium is oftentimes more recognisable, is eminently useful. Providing systems for families or patient advocates to escalate their concerns to senior medical staff is critical to initiate a timely rescue.

Delirium is easier to recognise if the clinical suspicion is already held. Back surgery[10], cardiothoracic units[11] and vascular wards[12] are new territories of high delirium rates beyond the traditional orthopaedic / hip fracture ward. More elderly frail patients are undergoing emergency laparotomy and this will likely be a delirium battleground as well. Delirium occurs most frequently in frail, dependent patients. Dementia, depression and anxiety are predictive of delirium. Prolonged fasting prior to surgery has been linked to delirium and processes should be in place to prevent repeated fasting episodes[13].

Geriatricians can be useful in supporting surgeons in the surveillance for delirium, advising on interventions and coordinating the multi-disciplinary team. Immobility predicts delirium and physiotherapists are such a crucial resource. Nursing staff are critical in aiding the patient in reorientation programs, such as the Hospital Elder Life Program[14] or the Care of the Confused Hospital Older Persons (CHOPs) program. Nursing staff can provide guidance for multi-factorial interventions that are effective in preventing delirium.

If you or your staff suspect the patient's demeanor has changed, it is best to **presume** they are delirious and activate the multi-disciplinary team to support the patient. Seek common causes of delirium such as pneumonia, acute renal failure, surgical site infection or pain. Remove extraneous catheters and cannulas. Review the ward environment and reduce noise and excessive stimulation. Restraints are associated with increased mortality and should be removed[3].

Co-ordination of care is vital given the multiplicity of interventions and the need to ensure timely implementation of management.

The pharmacological treatment of delirium remains controversial[9]. Cholinesterase inhibitors are not effective and are not considered a mainstream intervention. Antipsychotics have a debatable role but bring established risks including sudden cardiac death[15]. There is ongoing suspicion that antipsychotics may worsen rather than alleviate the symptoms of delirium. Geriatrician or Psychiatrist counsel can be helpful to determine when antipsychotic use is justified to manage patient distress.

If commenced, antipsychotics are initiated at low doses with close attention paid to patient response and dose titration. Benzodiazepines have a limited role, primarily in the context of alcohol withdrawal. Midazolam may have a role in situations of extreme agitation or aggression but should be used with great caution.

Research has shifted to preventative measures. Whilst preoperative psychotropics are a tempting proposition, there is simply not enough evidence currently to support routine use[16]. Fast track surgery, regional anaesthetic, Bispectral Index (BIS) guided depth of anaesthesia[17], melatonin and Dexmedetomidine[18] are interventions that show promise but remain unproven. Preadmission clinic discontinuation of medications known to cause delirium is a simple and cost-effective strategy to reduce postoperative delirium risk. There is an inherent relationship between delirium and dementia[19] and referral to a geriatrician would be recommended even if the postoperative course is uneventful.

Whilst the body of evidence on how best to combat delirium continues to evolve, it is clear that the management of postoperative delirium is reliant on early diagnosis and multi-factorial interventions. Surgeons are ideally placed to build and lead a multi-disciplinary team to rescue frail, elderly patients from the dangers of postoperative delirium

- *Please refer to the bibliography on page 39.*

CASE 8

Look at the whole patient

An elderly patient with dementia was admitted from a nursing home with an intertrochanteric fracture of the left femur. The patient was made comfortable with a femoral nerve block. Following admission, it was noted that the urine output was low (IV fluids were ordered) and that the abdomen was "distended and firm".

An X-ray of the pelvis demonstrated a comminuted intertrochanteric fracture of the femur and "gaseous distension of small and large bowel loops is noted".

The following day, the nursing notes indicate concern regarding oedema of the legs to mid-calf, tachycardia and poor urine output. The RMO was informed of nursing concerns but "RMO not concerned". IV fluids were ordered and the patient, weighing 36kgs, became positive in fluid balance of 3840 mls.

The patient underwent surgery two days following admission. On induction the patient had a large vomit and aspirated. Following resuscitation, the operation proceeded and a dynamic hip screw for the fracture undertaken. The patient was reviewed in the recovery room by the General Surgery Team.

Patient apparently had a bowel movement earlier that day prior to the surgery. The abdomen was distended and soft.

A postoperative abdominal CT revealed a femoral hernia with evidence of small bowel obstruction and perforation with free air in the peritoneal cavity.

Following discussion with the family, it was agreed that surgery for the femoral hernia was not in the patient's best interests and active treatment was withdrawn.

Surgical Learnings

Symptoms and clinical signs are difficult to evaluate in the patient with dementia.

The Second Line Assessor commented on the importance of reviewing the whole patient and not just focussing on the presenting clinical problem, in this case a fractured neck of femur. It is important to respond to the concerns of nursing staff in ascertaining the significance of unexpected symptoms or signs.

There were reports of a distended abdomen, tachycardia, low urine output and distended bowel seen on a pelvic X-ray. There appeared to be no follow up of these issues when the RMO was alerted.

Careful attention needs to be given to the IV fluid requirements in the frail, elderly patient with regular review of the fluid balance charts providing guidance in this regard.

An Orthogeriatric review would have been helpful. References on best practice care are listed below.

References:

1. Hip Fracture Care Clinical Care Standard. September 2016.
   - *Australian Commission on Safety and Quality of Health Care*

CASE 9

Importance of post discharge instructions

A patient in their mid-seventies was admitted to a rural hospital (Hospital A) with a perianal abscess.

The patient had a number of major comorbidities including two metallic heart valves (on Warfarin), severe tricuspid regurgitation, cardiac pacemaker, chronic renal disease, gastric angiodysplasia (on tranexamic acid), chronic anaemia (requiring regular blood transfusions), hypertension and chronic liver function derangement.

Anaesthetic review recognised the risks and patient was transferred to a larger neighbouring rural centre (Hospital B).

The perianal abscess was drained under local anaesthesia on the following morning. In the afternoon, the patient was discharged on Augmentin Duo Forte with a follow up letter to the GP. The patient was advised to contact the surgeon if there were any concerns.

Following discharge from Hospital B, it appears that the patient developed diarrhoea (4-6 watery stools daily) in the days following the second dose of Augmentin Duo Forte.

The patient was phoned by the GP's Practice Nurse the day following discharge, but it is unclear as to what the conversation entailed.

One week later, the patient was admitted to Hospital A with acute renal failure attributed to diarrhoea and dehydration, with a serum potassium of 6mmol/L, and was transferred to Hospital B. The following day, the patient developed abdominal pain, became delirious and there was a deterioration in the GCS. Tonic-clonic seizure occurred during the early hours of the next morning. The patient was then transferred to a tertiary hospital. Stool cultures had not been undertaken to identify Cl Difficile as a possible cause.

Deterioration continued and, following discussions with the family, treatment was withdrawn.

Surgical Learnings

As the patient had major comorbidities, it would not have been inappropriate to have observed the patient in hospital for at least a day following the procedure.

It would have been appropriate to consider administrating antibiotics on induction and postoperatively in such a medically compromised patient.

The question arose regarding the prescribing of antibiotics following drainage of an abscess, in this case a perianal abscess in a patient with significant comorbidities. The decision would be guided by the extent of cellulitis surrounding the abscess.

The patient was noted to be "allergic to Penicillin" on the admission notes. It may have been prudent to seek an alternative to Amoxil. The addition of Metronidazole to the initial antibiotic regime would have provided coverage for anaerobic organisms.

The patient most likely developed pseudomembranous colitis, due to Cl difficile (although there was no testing for this).

The reviewers are not privy to the conversations held in regard to follow up and exactly what written instructions the patient was given. In particular, contacting the surgeon/GP should any problems arise. Nevertheless, the case highlights the importance of providing clear, concise discharge instructions.

CASE 10

Clinical equipoise

A patient in their late seventies attended ED having collapsed at home. The patient was assessed as having right upper quadrant abdominal tenderness, leg cellulitis and a necrotic sacral pressure ulcer. Investigations showed a pleural effusion and wedge fracture of the 12th thoracic vertebra. Further investigations suggested a lytic lesion in the 12th thoracic vertebra.

There were multiple comorbidities including red cell aplasia (haemoglobin 7 g/L), chronic renal failure eGFR 15 mL/min/1.73 m^2 (Reference Range: >50) and potassium 5.8mmol/L, type 2 diabetes, obstructive sleep apnoea, Parkinson's disease, IHD with an exercise tolerance of 100 metres, history of deep vein thrombosis (taking Warfarin) and recent admission at another hospital with acute diverticulitis.

The patient was transferred to the ICU at a neighbouring hospital. The following day, the patient showed signs of sepsis, secondary to the cellulitis of the leg requiring inotrope support, and was commenced on antibiotics.

MRI scan showed an unstable fracture subluxation of T12/L1 with possible discitis, with no collection or neurological compression of the spinal cord or conus.

The next day the patient was transferred to the neurosurgical unit at a tertiary hospital. The patient was assessed by the treating surgeon as having an unstable injury at T12/L1 requiring spinal precautions and surgical stabilisation when the patient was well enough. Patient was in septic shock requiring intubation, antibiotics and dialysis in ICU. Over the next seven days, the patient was seen by the relevant Consultants and gradually improved. After five days in ICU, the patient was transferred to HDU, where two days later the decision was made to proceed with spinal surgery. At the time the patient was being sat up in bed and on the bedside with a Thoracic Lumbar Sacral Orthosis.

Consent for surgery with next of kin was appropriate and rigorous, highlighting the high risks associated with the proposed surgery. A Not for Resuscitation Order was documented, facilitated by the Ortho-Geriatric team.

Upon induction of anaesthesia, the patient suffered a cardiac arrest requiring resuscitation with 2 minutes of CPR and adrenaline. No surgery was performed.

The patient recovered from the cardiac arrest and was transferred to the ward for conservative management of the T12 fracture/subluxation. Subsequent management was very well documented with daily review by the Ortho-Geriatric, Neurosurgical, Orthopaedic, Infectious Diseases and Haematology Teams.

Five days later the patient had a syncopal episode, was found unresponsive and died the following day.

Surgical Learnings

The main issue is the management of an elderly, frail patient with significant comorbidities and requiring surgery.

There was increased emphasis placed on the spinal injury and spinal instability early on in the patient's care. This was understandable in view of the management of a critically ill patient in the ICU/HDU setting.

An area of consideration is whether there was too much emphasis placed on surgery in a patient with a considerable risk of mortality. Whilst the surgery was highly desirable, having been delayed by nine days from the initial admission, it was probably not an emergency procedure. Even with a good outcome, it was planned that the patient would be admitted to a nursing home.

The Second Line Assessor did not identify any deficiencies of care provided as the documentation had been detailed, there had been consultations with all the relevant treating clinicians, the family had been kept well informed and consent had highlighted the risk of surgery. Each individual team provided optimal care and good communication.

In retrospect, the reviewer was of the opinion that the patient was possibly not suited for surgical management, however, the decision to operate was considered and appropriate. There was a great deal of value judgement in this decision and a reviewer will never have the same appreciation for the competing gravitas that various aspects of care have on the decision to operate or not.

Perhaps a dedicated multi-disciplinary case conference with all relevant treating clinicians in the same room may have concluded that surgery was not to be pursued in this case. The difference between a multi-disciplinary case conference and the current multiple, temporary, separate consultation model is that, in discussing the case in person with all interested parties, the clarity of globally futile situations can be better identified.

CASE 11

Quality of life, even with successful operation

A patient in their early eighties presented with a Stage 4 squamous cell carcinoma of the right lateral oropharynx. Patient previously had a carcinoma of the tongue treated with radiotherapy 10 years ago. Patient was being treated for diabetes.

It was recognised that the previous radiotherapy precluded any further local treatment for the pharyngeal carcinoma and also increased the risk of a major postoperative vascular event.

The patient underwent tracheostomy, right neck dissection, split mandibulectomy, right pharyngeal resection and radical forearm free flap. The operation lasted 13 hours.

Postoperatively the patient had persistent dysphagia and was commenced on TPN until an NG tube was inserted on day 36. On day 40, a major haemoptysis developed. A tracheostomy tube was reinserted to protect the airway.

A CT scan of the neck revealed a right internal carotid artery pseudoaneurysm.

There were ongoing haemorrhagic events from day 40 to day 55.

The condition stabilised and tracheostomy tube was removed on day 60 of admission.

The patient was found unresponsive on day 68 and, according to her wishes in an advance care directive, further active measures were undertaken and patient died shortly thereafter.

Surgical Learnings

It was appropriate surgery, once a decision for curative surgery was made, although in the Second Line Assessor's opinion the chances of cure were less than 20%.

This was complex, potentially highly morbid surgery in the "old, old group" and has to be viewed with concern. The chances that this lady would swallow again were small and highly likely she would remain with a permanent tracheostomy due to continued aspiration.

The surgeon reflected that the vascular event - the occurrence of the carotid artery pseudoaneurysm - was probably not preventable, and very likely the patient would require high-level care, even in the most favourable circumstances.

The patient was discussed at a multi-disciplinary case conference and the decision to proceed with surgery was made there. The patient was obviously also involved in the decision making. It then becomes a value judgement regarding the potential for cure versus the mortality and especially the morbidity and quality of life, even at best, with a technically successful operative outcome.

CASE 12

Managing Intravenous fluids

An elderly patient with advanced dementia requiring low care in a nursing home was admitted to hospital with nausea and vomiting. Comorbidities included congestive cardiac failure (CCF) with chronic bilateral leg oedema, previous CVA, pernicious anaemia, peripheral neuropathy and a right pleural effusion.

A trial of oral fluids failed and a subsequent CT scan of the abdomen revealed a small bowel obstruction due to an incarcerated paraumbilical hernia.

Discussions regarding management included the option of palliation alone but a decision to proceed with surgery was made. The surgery proceeded uneventfully.

Postoperatively the patient was assessed by the ICU Registrar and transferred to the ward. From the middle of day 2 to day 5, there were multiple Care Escalation calls for shortness of breath, falling oxygen saturation and onset of rapid AF. The patient was admitted to HDU on day 5.

The clinical picture was attributed to fluid overload resulting in acute pulmonary oedema, electrolyte imbalance causing AF and pleural effusion restricting right lung capacity. Arrangements were initiated on day 3 (Friday) to drain the pleural effusion on day 6.

Reassessment with the family on day 6 led to a decision to provide comfort care only.

Surgical Learnings

The Second Line Assessor's main concern was related to the management of the IV fluids in an elderly patient with CCF and leg oedema. It appears that all IV fluids administered were high in sodium (Normal Saline, Hartmann's and Plasmalyte), which were maintained even when the volume was restricted after pulmonary oedema was diagnosed. Early postoperative fluids were 125 mls/hour, perhaps considered excessive for this patient.

A United Kingdom study (1) highlighted that one third of junior doctors felt that they had not received enough education in the management of IV fluids. This is also the feedback that medical schools in Australia are receiving (2). Also, a guideline from the UK (3) is useful in managing IV fluid therapy.

The Second Line Assessor reflected if it would have been beneficial to drain the pleural effusion more urgently.

This patient again demonstrates the difficulty in decision making in the elderly with multiple comorbidities, in this case advanced dementia and CCF. While we are not privy to the discussions between the surgeon and the patient's family, it is possible the surgeon could have provided advice that surgery was not in the best interest of this patient.

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CASE 13

Anastomotic dehiscence... consider it early

A patient in their early sixties was admitted for closure of an ileostomy. The patient had undergone an uneventful laparoscopic anterior resection and loop ileostomy for recurrent urinary tract infections caused by a colo-vesical fistula related to diverticular disease.

Comorbidities included myelodysplastic syndrome requiring second weekly platelet transfusions, requiring Hydroxyurea under the continuing care of a haematologist. The spleen was enlarged to the umbilicus. The patient was very active, travelling overseas and keen for the ileostomy to be closed nine months following the original surgery. Appropriate consent, outlining the potential complications, were discussed and the haematological status was considered adequate for closure of the ileostomy. The patient continued taking Hydroxyurea for the myelodysplastic syndrome.

The operation proceeded uneventfully with the ileostomy being closed by a functional side to side anastomosis. The patient was returned to the ward postoperatively, receiving pre and post-operative platelet transfusions.

For the next 4 days the patient was progressing well and mobilising: vital signs normal, tolerating oral fluids and had several loose bowel movements.

On the evening of day 5 and continuing into postoperative day 6, the patient became confused and breathless with a fall in the oxygen saturations. The haemoglobin was 9.0 g/L, the white cell count 135 x 10^9/L (elevated due to underlying haematological malignancy), platelets 59 x 10^9/L and creatinine raised at 132mmol/L. The patient was transferred to ICU and IV antibiotics commenced.

A CT scan showed bi-basal pneumonia and a dilated small bowel with no free fluid or air around the anastomosis with no evidence of an anastomotic leak.

Days 7 and 8: The patient continued to deteriorate requiring intubation. The possibility of anastomotic leak was discussed. The patient became unresponsive to stimuli despite weaning off all sedation.

Day 9: Abdomen examination did not reveal any abnormality. However, there were spikes of fever, worsening of renal function and a CT scan later in the day demonstrated gas outside the anastomosis and associated free fluid.

Later that evening, the patient underwent laparotomy, revealing dehiscence along the line of longitudinal staple line. Peritoneal lavage and formation of ileostomy were undertaken.

Postoperatively the patient's neurological status remained uncertain. They continued to be intubated, on vasopressors and required renal dialysis. Ischaemia of the ileostomy developed. A blood culture showed E. coli.

The patient's condition continued to deteriorate with multi-organ failure and died on the 6th postoperative day.

Surgical learnings

Assessment of risk of surgery

This needs to be individualised, balancing the benefits versus the risks and possible complications, morbidity and mortality. Chemotherapy is considered a significant factor in the development of anastomotic complications.

Early detection of an anastomotic leak

There should be a high index of suspicion of an anastomotic complication in a patient with significant comorbidities, especially when on chemotherapy. The most serious complication is related to the anastomosis. A change in the patient's condition on the 5th postoperative day, the most typical time this complication occurs, would make this the first condition to consider.

The initial CT scan did not demonstrate any suggestion of a problem but it would have been worth considering a second opinion given the change in the patient's expected clinical pathway.

CASE 14

"Beware the acute abdomen in the elderly"

A patient in their early eighties was admitted to hospital with a two day history of abdominal pain. They had been vomiting a few days before presenting to the ED.

Comorbidities included a history of significant weight loss over 2 years, a urinary tract infection and uterine prolapse with a pessary in place, which obscured the initial CT assessment.

Vital signs were normal apart from a pulse rate of 105 beats per minute. Abdominal examination revealed a distended abdomen with tenderness in the hypogastrium. White cell count was 16.3 $x10^9$/L and CRP 306 mg/L.

An abdominal CT scan, without contrast because of renal impairment, demonstrated thickening of the terminal ileum with moderate amount of free fluid. The radiologist reported that the findings were consistent with small bowel lymphoma. The patient was assessed by a senior surgical trainee and admitted under the medical team with the working diagnosis of lymphoma. The surgical consultant had not been notified. Antibiotics were commenced for a urinary tract infection. The haematology consultant commented that lymphoma was unlikely to cause the free intraperitoneal fluid.

The surgical team was consulted three days later. At that time, the patient had clinically deteriorated with the repeat CT scan (with contrast) demonstrating an occlusion of the superior mesenteric artery.

At laparotomy the findings were of ischaemic bowel with full thickness necrosis from the DJ flexure to the distal transverse colon with an incidental finding of a perforated large caecal tumour. Patient died soon after surgery.

Surgical Learnings

From the Second Line Assessor "Beware the acute abdomen in the elderly".

It may be worth considering that all patients with undifferentiated acute abdominal pain be admitted under the surgical team with referral to appropriate specialties when a diagnosis has been established.

A further consideration would be, when a surgical resident/trainee has seen a patient with an acute abdomen and has decided to refer to another specialty, the on-call surgeon is informed of their decision.

Although unlikely, it is possible that, had the diagnosis of mesenteric ischaemia been made at the time of the patient's admission, there may have been an opportunity for thrombolysis.

CASE 15

Urosepsis

A patient in their early fifties underwent flexible pyeloscopy and laser lithotripsy to treat a large partial staghorn calculus in the left kidney. The patient presented with loin pain but no infective symptoms. The preoperative mid-stream urine/microurine (MSU) grew Escherichia coli. The patient was commenced on trimethoprim 3 days before surgery and the procedure covered with IV gentamicin.

The procedure itself was uncomplicated. The surgeon elected to perform complete stone fragmentation, resulting in an extended procedure with operative time of over 2 hours. Postoperatively the patient deteriorated rapidly in recovery with septic shock requiring transfer to ICU. They developed multi-system failure with Disseminated Intravascular Coagulation and blood cultures identifying Proteus mirabilis. Despite maximum support, including inotropes, dialysis, antibiotics and blood products, the patient continued to deteriorate and died 48 hours after the procedure.

Surgical Learnings

Urosepsis is a significant cause of mortality especially in the elderly with reduced reserves and multiple comorbidities. This case of overwhelming sepsis in a younger patient who was otherwise fit but had a large infection-related stone burden in the kidney, highlights the risks of surgery in the presence of bacterial colonisation and infection.

With improvements in endoscopic instrumentation, retrograde pyeloscopy with laser lithotripsy is an attractive alternative treatment option to percutaneous nephrolithotomy in patients with a large stone burden, such as this patient who had a partial staghorn calculus.

Whilst retrograde pyeloscopy is less invasive, the procedure is commonly performed with high pressure irrigation. The extended procedure further increases the risks of sepsis in the presence of infected urine. In such patients, apart from preoperative optimisation of antibiotic treatment and immediate peri-operative antibiotic prophylaxis, consideration should also be given to a staged approach (e.g. clearing the stone burden in two procedures).

The Therapeutic Guidelines Antibiotics[1] recommend treatment of urinary infection prior to major urological endoscopic surgery such as ureteroscopy/pyeloscopy. Whilst it is often not possible to completely sterilise the urine with antibiotics before treatment of infection-related stones, it is important to treat infected urine with an appropriate course of antibiotics. Where possible, there should be a repeat MSU prior to surgery, especially in the current era of emerging antibiotic resistance.

In the presence of large stones, a short course of antibiotics should not be relied on to sterilise the urine sufficiently.

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