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Foreword

The Collaborating Hospitals’ Audit of Surgical Mortality (CHASM) audits patient deaths under the care of a specialist surgeon that have occurred in NSW public hospitals. Cases are reported, reviewed and then selected for second-line assessment if there are issues identified that provide learning and improvement opportunities for surgeons and the broader health system. This is a peer review process conducted voluntarily by specialist surgeons with an aim of improving care and reducing unintended harm.

From the 74 cases undergoing second-line review, eleven have been selected for presentation in this booklet as they identify key opportunities for reflective learning by surgeons and opportunities for system improvement.

From the information in these case studies, situational awareness, clinical decision-making, judgement, supervision of junior staff and team work are competencies that have been shown to need attention.

In five of these cases, aspiration pneumonia was a condition that was either not anticipated as a risk, or not communicated appropriately among the teams so that effective prevention or reparative action could be commenced.

The absence of DVT prophylaxis remains an issue, in spite of implementation of “time out” and more recently the WHO/RACS “Safe surgery saves lives” protocol.

Good clinical judgement is not just related to surgical skill and knowledge, as appropriate reflection about how to provide safe, high quality and holistic care is also important.

How improvement is achieved is something that will vary from person to person and institution to institution across the State, but it is intended that these case studies provide the stimulus for such improvement.

The resources of the Clinical Excellence Commission are available to assist this process.

Bruce Barraclough, AO
Chair, Clinical Excellence Commission
Dean of Education, RACS
Introduction

Improvement in surgical practice and continuing education are assisted by reflective learning from clinical experience. We have selected eleven cases from those deaths in NSW which have gone to a second-line assessment through the CHASM program and summarised the clinical features and learning points for your consideration.

Aspiration pneumonitis was a recurrent theme and we have highlighted five illustrative cases with commentary by Dr Allysan Armstrong-Brown, consultant anaesthetist at the John Hunter Hospital and CHASM committee member. Dr Armstrong-Brown has written on the prevention and recognition of this condition in the post-operative period.

We have provided a variety of short summaries of cases from different specialities which should be of interest to surgeons in general, as well as those who belong to the particular speciality.

The vast majority of surgical deaths in public hospitals are unsurprising and may be anticipated, because of the severity of the disease with which the patient presents. When an unexpected death occurs, a peer review may provide valuable learning insights which can be shared among colleagues. Most of these patients have multiple co-morbidities and come to surgery with significant risk. Careful pre-operative preparation and discussion among the various teams are essentials for an optimal and successful treatment plan.

We gratefully acknowledge and thank surgeons for their participation in the program. The committee hopes you will find this booklet useful and welcomes any feedback you may care to make to CHASM.
Aspiration pneumonitis and carcinoma of stomach and abdominal aneurysm

CASE 1

Summary

An elderly male with co-morbidities of mild dementia, asymptomatic carotid artery stenosis and a history of smoking, was admitted to hospital for treatment of a carcinoma of the stomach and abdominal aortic aneurysm. A gastrectomy and repair of the aneurysm was performed. During the procedure there was a coincidental injury to the spleen, necessitating splenectomy. Persistent oozing required abdominal packing. The packs were removed uneventfully two days later.

On extubation he was confused and was treated with physiotherapy. Four days after the operation, the nursing report recorded that “bile-stained fluid leaking from mouth”. There was increasing agitation, confusion and tachypnoea. A day later an indirect laryngoscopy was performed, which showed “greenish fluid in the oral cavity”. A nasogastric tube was placed and a small amount of fluid aspirated. Despite continuing respiratory support, he died several days later.

There was some delay in recognition of the possibility of aspiration, which was not clearly identified until the indirect laryngoscopy. Symptoms suggestive of respiratory distress were recorded prior to the diagnosis and these included confusion, tachypnoea and agitation.
Aspiration pneumonitis and perforated viscus

CASE 2

Summary
An elderly male underwent emergency surgery for a perforated jejunal diverticulum. A coincidental and undiagnosed carcinoma of the hepatic flexure was found and both pathologies resected with primary anastomoses. A defunctioning loop ileostomy was performed proximal to the more distal anastomosis. His post-operative course was complicated by septic arthritis of a joint, which required surgical procedures and delayed recovery. Two months following admission, he developed vomiting and hypotension and the ileostomy output decreased. Oral fluids were withdrawn and intravenous fluids commenced. Vomiting was noted to be faeculent. A computerised tomography (CT) scan was to be performed and he was given oral contrast prior to the scan. As the films were being reviewed, a major episode of vomiting with aspiration occurred, which resulted in a cardiac arrest. At the time of the CT scan, a nasogastric tube had not yet been inserted.
Aspiration pneumonitis and empyema

CASE 3

Summary
An elderly man was admitted to a regional hospital with fatigue and dyspnoea. A chest x-ray showed bilateral pleural effusions and attempts to drain the effusions percutaneously were unsuccessful. He had extensive co-morbidities, including chronic renal failure, cardiac failure with moderate pulmonary hypertension and hypercapnoea (PaCO₂ 50mmHg).

A thoracotomy was performed, at which time a chronic empyema was decorticated and he improved initially post-operatively. About 24 hours post-operatively, he vomited and thereafter there was a deterioration of respiratory function requiring intubation and inotropic support. Following the aspiration and despite intensive treatment, his condition did not improve and he died shortly thereafter.
Aspiration pneumonitis and biliary obstruction

CASE 4

Summary
An elderly man was admitted to hospital with a history of dysphagia, gastro-oesophageal reflux and chronic bronchitis. Investigations of the upper gastro-intestinal tract revealed dilated biliary and pancreatic ducts suggestive of pancreatic cancer. Cannulation of the biliary tree was not possible following several attempts at endoscopic retrograde cholangiopancreatography (ERCP). A percutaneous transhepatic cholangiogram did not permit stenting of the biliary obstruction and a hepaticojejunostomy was performed. For the first 24 hours, recovery was uneventful. On the second post-operative day, increasing dyspnoea was noted and he was reviewed by the consultant surgeon, the physiotherapist and the acute pain service. Confusion and tachycardia worsened throughout the day. A chest x-ray was performed, but he had a cardiac arrest four hours after the x-ray and could not be resuscitated. The diagnosis was that of aspiration pneumonia. It was felt that earlier consultation with the intensive care staff would have been appropriate and the use of intensive care or high-dependency unit would have been desirable immediately following surgery, given age and co-morbidities.
Aspiration pneumonitis and obstructed femoral hernia

CASE 5

Summary
An elderly male with extensive co-morbidities was admitted to hospital with intestinal obstruction from a strangulated femoral hernia. The co-morbidities included ischaemic heart disease, chronic obstructed airways disease, atrial fibrillation, renal artery stenosis with hypertension and a prior cerebrovascular accident. The strangulated femoral hernia was promptly treated surgically, following rehydration and he was managed in the intensive care unit of the hospital following surgery. Post-operatively he remained confused and agitated, pulled out his nasogastric tube, vomited and the nasogastric tube was replaced. On the second post-operative day, he had evidence of a paralytic ileus with absent bowel sounds but was commenced on oral fluids. The next morning, day 3, he had a large vomit with aspiration requiring emergency intubation and re-admission to the intensive care unit. There was clinical deterioration in his respiratory status over the next 24-48 hours. Despite a minor improvement, his condition further deteriorated and he died eight days following the aspiration. The adverse event was considered to be the introduction of oral fluids in the presence of an abdominal ileus.
Aspiration pneumonitis (Mendelson’s Syndrome) is a chemical injury caused by the inhalation of gastric contents into the larynx and lower respiratory tract. It should be differentiated from aspiration pneumonia, which is an infectious process caused by the inhalation of oropharyngeal secretions that are colonised by pathogenic bacteria.

Patients at increased risk of aspiration pneumonitis may include any patient administered sedating drugs or with a reduced level of consciousness, ASA3-4 patients, parturients, the obese and the elderly.

Aspiration pneumonitis is acute lung injury occurring after aspiration of highly acidic gastric contents. There are three elements of the aspirated material that are significant: the volume of aspirate, its pH and the presence of solid or semi-solid matter such as food or blood clots.

Most authors agree that a pH of less than 2.5 and an aspirated volume of 0.3ml/kg body weight are required for the development of aspiration pneumonitis. Aspiration of solid matter may cause severe pulmonary damage, even with a pH of >2.5, and may predispose to the development of lung abscess.

Aspiration of gastric contents results in a chemical burn of the tracheobronchial tree and pulmonary parenchyma, causing an intense parenchymal inflammatory reaction. As gastric contents are usually sterile, bacterial infection does not have an important role in the early stages of the acute lung injury. (This may not be the case for patients on H₂-antagonists, proton pump inhibitors or antacids, those receiving enteral feeds, or with gastroparesis or small bowel obstruction.)

Patients who have aspirated gastric material may present with dramatic symptoms and signs. There may be gastric material in the oropharynx, as well as wheezing, coughing, shortness of breath, cyanosis, pulmonary oedema, hypotension and hypoxaemia, with rapid progression to severe acute lung injury including ARDS and death. However, many patients have only a cough or wheeze, and occasionally ‘silent aspiration’ which presents only as arterial desaturation and CXR changes. Some patients remain asymptomatic.

Complete and rapid recovery from aspiration pneumonitis is the rule for those who survive the early acute lung injury. Smokers may be at increased risk of persistent respiratory symptoms, particularly cough.

Management consists of prevention of further aspiration, physiotherapy and respiratory support. The patient should be placed in a left lateral position, the oropharynx suctioned, and consideration given to decompression of the stomach. Bronchoscopy is not helpful
unless there is a suspicion of aspiration of solid material. Endotracheal intubation should be considered in patients who are unable to protect their airway, or in whom non-invasive respiratory support is inadequate to maintain arterial oxygenation. Antibiotics are not indicated in the first instance. There is no place for corticosteroids in the management of this syndrome.

Surgical learnings

- Aspiration pneumonitis is acute lung injury secondary to aspiration of acidic gastric contents
- It presents as a spectrum of signs ranging from arterial desaturation to severe ARDS and death
- Treatment consists of prevention of further aspiration and management of respiratory failure.

Reference

Aspiration Pneumonitis and Aspiration Pneumonia. NEJM 2001 (March). 344(9): 665-670

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Death following transfer: omitted DVT prophylaxis

CASE 6

Summary
An elderly male was transferred from a rural hospital to a metropolitan cardiothoracic unit for coronary artery surgery. Coronary angiography had been performed in the rural centre and triple vessel disease, together with a critical left anterior descending lesion was identified. On arrival at the tertiary service a further coronary angiogram was performed. He was then transferred to a second tertiary centre, where coronary artery bypass grafting x 4 was performed. On day 12 following the quadruple bypass, the patient collapsed and died. Autopsy revealed massive thromboembolism as the cause of death.

Surgical learnings
• The timely use of deep venous thrombosis (DVT) prophylaxis remains an opportunity for improvement in clinical practice.
• Early DVT prophylaxis was not used and it was not until admission to the cardiothoracic unit that it was commenced. It is likely that the DVT occurred during the first two admissions.
• Guidelines for prevention of venous thrombosis are included in the majority of protocols and procedures in hospitals, including on admission, ward management, peri-operative work-up, and are included in the check list in the operating theatre prior to induction of anaesthesia.

Reference
Prevention of Venous Thromboembolism
The Australia and New Zealand Working Party on the Management and Prevention of Venous Thromboembolism

Health Education and Management Innovations
(Email: HemiAustralia@aol.com)
Caution in surgery in patients with liver cirrhosis and ascites

CASE 7

Summary

A patient with co-morbidities of diabetes mellitus, hypertension, chronic pain, gastro-oesophageal reflux and a history of thrombocytopaenia was admitted to hospital with abdominal pain. A CT scan demonstrated a possible carcinoma of the transverse colon, subsequently confirmed at colonoscopy. The scan also showed ascites, cirrhosis of the liver and evidence of portal hypertension. The patient was admitted under a medical unit with peripheral oedema of the legs and ascites. Blood count reported haemoglobin 11.3 g/dL, leucopaenia 3.7 x 10^9/L and platelets 104 x 10^9/L with an albumin of 29 g/L. The patient was treated with Clexane, fluid restriction and an ascitic tap showed no malignant cells. Despite treatment for ascites, the haemoglobin fell to 10.4 g/dL, albumin to 24 g/L and on the day before surgery, the platelet count was 123 x 10^9/L, with a marginal increase in coagulation studies. The patient was classified as Child-Pugh Class B.

At surgery, there were multiple adhesions, and evidence of portal hypertension. A right hemicolectomy was performed. Severe bleeding occurred and the patient ultimately died from blood loss.

The patient had been admitted under a medical team and there had been extensive consultations with a number of consultants and the patient was aware of the risks of surgery.

Surgical learnings

• This patient represented one of three patients reported to CHASM who died following abdominal surgery in the presence of cirrhosis (right hemicolectomy, laparotomy and cholecystectomy)

• The mortality in patients undergoing abdominal surgery with advanced cirrhosis (in this case Child-Pugh Class B) is 40 per cent. In view of the likelihood of severe bleeding and other complications, such as encephalopathy, consideration should perhaps have been given to transfer to a larger centre.

Reference

Acute subdural haematoma – was operation appropriate?

CASE 8

Summary
An elderly male presented to a district hospital following a fall at home. He had a past history of hypertension and atrial fibrillation and was being treated with Warfarin. His international normalised ratio (INR) was measured on admission at 5.9. His GCS was 15 and his pupils were equal and reacting to light. He was treated with fresh frozen plasma. The referring hospital did not have a CT scanner and he was referred to the regional base hospital.

During transport, his Glasgow Coma Scale (GCS) deteriorated to 11. When he arrived and was being assessed, his GCS fell to 3-4. His left pupil was large and unreactive, the other eye constricted. He was intubated and an urgent CT scan revealed a large left sub-dural haematoma with midline shift to the right. Pupils then became fixed and dilated.

The consultant surgeon who performed the burr hole operation at the base hospital raised the question as to whether the operation should have been performed at all.

The surgeon at the base hospital consulted a neurosurgical unit. The advice was to perform a burr hole to drain the blood and then to transfer the patient.

A burr hole was inserted, but only a small amount of clot removed. The patient did not improve. Further consultation with the neurosurgical unit resulted in advice that the prognosis was poor. The patient was not transferred and he died shortly thereafter.

Comments
The treatment provided at the base hospital was appropriate and on direction from a neurological unit. However, a burr hole alone is rarely adequate to drain or decompress an acute sub-dural haematoma, which was confirmed by this case. Further, by the time the patient arrived in the operating theatre, his GCS was 3 and he was likely to be unsalvageable. The very rapid deterioration in the emergency department was an indication that decompression was unlikely to improve the outcome.

Adequate drainage of the sub-dural haematoma generally requires a craniotomy flap, which not only allows sufficient access, but also acts as a decompression should post-traumatic brain swelling occur. This was outside the ability of the surgical team in the base hospital.

Early consultation with a neurosurgical unit is a fundamental principle in the management of head injury, where geography prevents
timely transfer. Neurosurgical units need to carefully consider the advice provided to non-neurosurgeons who deal with cases such as this, where insertion of the burr hole would be unlikely to affect outcome. Undoubtedly, the hypo-coagulation state of the patient contributed to the rapid deterioration.

The data from this patient was entered into the CRASH head injury prognosis model, which provides an aid to estimate mortality at 14 days and death and severe disability at 6 months in injury in patients with traumatic brain injury (ref: www.crash2.lshtm.ac.uk/Risk%20calculator/index.html). The risk of 14 day mortality (95 per cent CI) was 96.7 per cent (93.4 – 98.3). The risk of unfavourable outcome at 6 months was 98.7 per cent (97.5 – 99.4).

Surgical learnings

• It was appropriate to seek and follow the advice from the neurosurgical unit.

• The neurosurgical unit should have considered the condition of the patient and the expertise of the non-neurosurgeons at the base hospital when giving advice to operate. Early consultation with a neurosurgical unit is fundamental, but there is an obligation on that unit to provide advice which is appropriate for the clinical situation and for the capabilities of the medical staff managing the case.

• A burr hole is rarely adequate to decompress and to drain an acute subdural haematoma. Craniotomy is usually necessary and this is often beyond the capabilities of rural general surgeons.

• The rapidity of deterioration and the hypo-coagulability state made success, even in expert hands, unlikely.

Reference

Screening may cost lives – colonoscopy and primary sigmoid anastomosis with fatal outcome

**CASE 9**

**Summary**

A 79-year-old female underwent a colonoscopy to investigate a positive faecal occult blood test in a hospital other than where death occurred. The patient’s co-morbidities included congestive cardiac failure and renal and respiratory impairment. At colonoscopy, no source of the bleeding was identified, but a colonic perforation occurred. This was recognised and an immediate laparotomy was performed with a sigmoid resection and primary anastomosis. A request for transfer to another hospital because of concerns about metabolic function resulted in admission to a standard surgical ward, but not intensive care, because of the lack of beds in the second hospital. Post-operatively, the patient was given large doses of narcotic analgesics, developed acute pulmonary oedema and worsening renal failure. A gastro-intestinal bleed occurred on day two following surgery, and on day four, a pelvic collection was diagnosed on CT scan. After initially declining surgery, the patient agreed on an operation and a Hartmann’s procedure and drainage of the pelvic abscess was performed two days later. Following surgery, the patient was managed in the intensive care unit but sepsis persisted with multi-organ failure.

**Surgical learnings**

- Consideration should be given to:
  i. The risks and benefits of colonoscopy in high-risk patients when investigating positive faecal occult blood tests
  ii. The use of another imaging modality, such as virtual colonoscopy.
- Careful consideration needs to be given to undertaking a primary anastomosis in an elderly person with co-morbidities in this clinical situation. Despite the patient’s wishes to the contrary, a colostomy might have been an option.
Is joint replacement indicated in the presence of cancer?

CASE 10

Summary
An elderly male underwent a knee replacement and died of cardiac causes four days later. There was a long history of osteoarthritis of the knee, with progressive limitation of mobility and increasingly severe pain. Co-morbidities included diabetes mellitus type II (complicated by chronic renal failure), a non-small cell carcinoma of the lung, and a pleural effusion and some shortness of breath.

A straightforward total knee replacement was performed under a combination of spinal and general anaesthesia. DVT prophylaxis with Clexane was given on the second and third post-operative days. On day three, his oxygen saturation fell to 91 per cent on room air, his level of consciousness deteriorated and he was transferred to the intensive care unit. Following discussion with the family, it was decided that in event of cardiac arrest, resuscitation would not proceed and he died peacefully a day or so later.

Surgical learnings
• Pain and disability as a result of osteoarthritis of the knee or hip can severely affect the patient’s quality of life.
  i. For this patient, the teams managing the chronic lung cancer and renal failure felt that he had some months to live. The patient wished to proceed with the surgery to relieve the pain of osteoarthritis of the left knee, with an understanding of the risks involved.
  ii. This case highlights the complexities of decision-making by surgeons where multiple co-morbidities exist.
Summary

A 68-year-old patient presented with acute myocardial ischaemia. Coronary angiography showed triple vessel disease and significant involvement of his left main stem, often a critical and life-threatening lesion. It was elected to proceed with a percutaneous intervention to his right coronary artery, although the reasons for this limited approach were not documented. A stent was inserted and long-term thrombolytic therapy commenced.

The patient developed recurrent ischaemic symptoms whilst in hospital and the cardiothoracic team was consulted urgently. The recommendation was for myocardial revascularisation, with the support of intra-aortic balloon counter pulsation. However, further percutaneous interventions were attempted without this support. During one attempt the patient deteriorated and was then referred to the operating room as a matter of urgency.

There was no clear documentation as to who performed the procedure. Following a short and complicated post-operative course, the patient died.

Multi-disciplinary teamwork demands clear, concise and informed communication. The responsibility for this communication and, indeed, for the management of the patient, rests with the senior attending medical officers.

Surgical learnings

- Clear communication between the surgical and referral teams is essential for optimal outcomes.
- Supervision and delegation of team responsibilities is a key role of the attending surgeon.
- Clinical and supervisory decisions must be well documented.
- Ultimate outcomes may be modified by excellent post-operative care, but are often determined by pre-operative decisions.
CHASM committee membership between January 2008 and June 2009

A/Prof Michael Fearnside, AM, chairman

Dr Philip Truskett, Deputy Chair, NSW State Committee Chair RACS (to 30 June 2008)

Dr Peter Holman, Deputy Chair, NSW State Committee Chair RACS (from 1 July 2008)

Dr Allysan Armstrong-Brown, anaesthetist

Dr. Graham Beaumont, human factors safety specialist

Prof. Belinda Bennett, professor of health law

Professor Danny Cass, paediatric surgeon (to July 2008)

Dr Lewis Chan, urologist

Prof Stephen Deane, general and trauma surgeon

Dr Anthony Eyers, colorectal surgeon

Dr Charles Fisher, vascular surgeon

Dr Hamish Foster, general surgeon

Dr Kim Hill, Director, clinical governance

Prof John Hilton, forensic pathologist

Dr Charles Pain, Director, Health Systems Improvement

Prof Allan Spigelman, surgical oncologist

Dr Warwick Stening, neurosurgeon

Dr Mauro Vicaretti, vascular surgeon

Dr Shane Waddell, orthopaedic surgeon

A/Prof Peter Zelas, OAM, colorectal surgeon

Dr Michael King, general surgeon (from 24 February 2009)

Dr Hugh Martin, AM, paediatric surgeon (from June 2009)