

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS  
AUSTRALIAN CAPITAL TERRITORY AUDIT  
OF SURGICAL MORTALITY (ACTASM)

# CASE NOTE REVIEW BOOKLET

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ROYAL AUSTRALASIAN  
COLLEGE OF SURGEONS



The Royal Australian  
and New Zealand  
College of Obstetricians  
and Gynaecologists  
*Excellence in Women's Health*





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# Contents

CHAIRMAN'S INTRODUCTION .....	4
INTRODUCTION.....	6
CARDIOTHORACIC SURGERY .....	7
CARDIOTHORACIC SURGERY .....	11
CARDIOTHORACIC SURGERY .....	15
GENERAL SURGERY .....	19
GENERAL SURGERY .....	22
GENERAL SURGERY .....	24
GENERAL SURGERY AND GYNAECOLOGY .....	26
NEUROSURGERY .....	29
NEUROSURGERY .....	31
ORTHOPAEDIC SURGERY .....	34
UROLOGY SURGERY .....	37
UROLOGY / COLORECTAL SURGERY .....	39
VASCULAR SURGERY .....	42
VASCULAR SURGERY .....	45
LIST OF SHORTENED FORMS .....	47
CONTACT DETAILS.....	48
REFERENCES .....	49

# Chairman's introduction

The Australian Capital Territory Audit of Surgical Mortality (ACTASM) is pleased to provide the fourth ACTASM Case Note Review Booklet. This booklet is produced in collaboration with the Victorian Audit of Surgical Mortality due to the small number of cases within the Australian Capital Territory (ACT). Each of the cases contains topical and timely lessons for all surgeons and clinical team members in the region.

Recommendations to ACTASM clinical stakeholders emerging from this Case Note Review Booklet include:

## **Better documentation of clinical events and plans:**

- The surgical case form is an essential tool for identifying clinical trends and management plans. It must contain clear and accurate documentation regarding events and plans. A repeated issue for reviewers is the lack of adequate legible documentation.

## **Action on evidence of clinical deterioration:**

- Clinical deterioration is an issue that is recognised throughout Australia and internationally.
- The cause of clinical deterioration in a patient may lie outside your specialty area. When clinical deterioration of a patient occurs, and there is no clear cause, it is important to seek advice from other relevant medical experts.
- Clinical findings must be considered along with the results from any investigations. Investigations are an aid to diagnosis.
- Clinical deterioration must be acted on and not just recorded.

## **The decision to operate or not and making decisions regarding end of life management:**

- Several surgeons and assessors considered that some of the surgical procedures were futile.
- It is important to document the reasons behind the decision making, including the reasoning behind not operating.
- If the decision was for withdrawal of care, it should be recorded as to whether it was a surgical decision, a decision made by other teams, or a decision based on the patient's advanced care directive.

- The Royal Australasian College of Surgeons has explored the topic of futile surgery and end of life matters and prepared a policy statement on this topic.

To the assessors and the treating surgeons: I thank you, as this publication would not be possible without you. Please learn from these cases.

John Tharion  
Clinical Director, ACTASM

# Introduction

The audits of surgical mortality review deaths that occur while patients are under the care of a surgeon in the public and private hospital sectors. The peer-review process that underpins the audit is primarily an educational exercise, and the cases selected for inclusion in this booklet highlight specific clinical issues. There are several areas of patient management that have repeatedly been identified as problematic over successive years. In particular: delay in diagnosis, identification and treatment of the deteriorating patient, and deficiencies in postoperative management. These areas of patient management are again highlighted in this edition.

All cases have gone through a second-line assessment (case note review) by a Fellow from the Royal Australasian College of Surgeons, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists or the Australian and New Zealand College of Anaesthetists. The cases document critical incidents, often involving system issues rather than issues that were the responsibility of the treating specialist surgeon alone. The assessments have been edited to ensure that the patient, hospital, treating surgeon and assessor remain anonymous.

Qualified Privilege prevents assessment feedback being sent to anyone other than the treating surgeon. Hospital management only receive themed feedback on cases involving patients who died in their hospital. As a consequence, this publication is a valuable learning tool for surgeons, hospitals and clinical care teams. It provides vital insight into the issues presenting in the healthcare system.

The audit is an educational exercise and this publication is recommended for use as a teaching aid. There are important lessons contained within that will be of interest to surgeons, clinical care teams, hospital management and others who are involved with patient management and care.

Audit staff would like to take this opportunity to thank all surgeons and hospitals participating in this educational activity.

# Cardiothoracic Surgery

## Case 1: Management by ICU consultant required for deteriorating postoperative patient

### CLINICAL DETAILS:

Diagnoses: Severe aortic stenosis and postoperative right ventricular (RV) dysfunction.

Operations: Aortic valve replacement.

Cause of death: Heart failure.

### COURSE TO DEATH:

The case involves an elderly, overweight patient who presented with a past history of acute pulmonary oedema and no other major comorbidities. The patient presented to the cardiologist with shortness of breath (SOB) and got admitted for an episode of profound hyponatremia. This was treated, and investigations showed that there was a critical aortic stenosis (aortic valve area 0.74 cm<sup>2</sup>) with relatively normal coronaries. The patient was taken up for elective aortic valve replacement surgery.

Intraoperatively, there seem to have been three distinct issues. One was a retrograde catheter injury to the coronary sinus, which was appropriately and promptly repaired. What is unclear is the mode of cardioplegia delivery. The surgeon's

notes indicate that both antegrade and retrograde cardioplegia was used, while the registrar's notes and the anaesthetics notes mention only antegrade delivery. The second issue was that the initial 21 mm valve replacement prosthesis had to be downsized to a 19 mm prosthesis, probably due to occlusion of the coronary ostia. Lastly, there was obviously RV dysfunction while coming off cardiopulmonary bypass (CPB). There is again some discrepancy between the surgical notes and the anaesthetic notes. The surgeon seems to consider that the RV dysfunction was not major, while the anaesthetic notes mention significant RV dysfunction as well as severe tricuspid regurgitation.

Postoperatively, the patient appeared to have been stabilised with appropriate inotropic support as well as mechanical measures, such as keeping the chest open. The intensive care unit (ICU) management seems to have been appropriate, although the reason for weaning off milrinone was not clear. The patient succumbed to progressive RV dysfunction and subsequent multiorgan failure and passed away.

### ASSESSOR'S COMMENTS:

#### Case notes:

The admission and operative notes

were adequate and documented the events clearly. However, there were a few points of note:

- The surgeon indicated on the surgical case form (section 16) that there were no definable postoperative complications. Yet, as identified above, there was postoperative RV dysfunction. As well as intra-operative complications: coronary sinus injury, re-replacement of the prosthesis.
- It was not clear from the case notes whether retrograde cardioplegia was given, and so there is doubt about the adequacy of myocardial protection. There was a discrepancy between the surgeon's notes and the anaesthetist / registrar notes.
- There was a similar discrepancy in the notes about the magnitude of the RV dysfunction. The surgeon's notes suggest that a right coronary artery (RCA) injury was not suspected or any similar cause for RV dysfunction, while the anaesthetist reports severe tricuspid regurgitation and significant RV dysfunction.
- All the notes from the referring doctor were tidy, as were the admission, surgical and perfusion notes.

- It is not clear whether a postmortem examination was performed. There was no report indicating that the coroner had considered a postmortem unnecessary.

Preoperative assessment: the preoperative assessment, decision to proceed and choice of surgical procedure were all appropriate.

Intraoperative management: The conduct of surgery seems appropriate until RV dysfunction was noticed while coming off CPB. RV dysfunction after aortic valve replacement can occur from air embolism, improper myocardial protection, perioperative right coronary artery (RCA) injury / thrombosis, and occlusion due to the prosthesis or sutures. Clearly, the surgeon had noticed the potential occlusion of coronary arteries and hence replaced the prosthesis with one of a smaller size. The myocardial protection strategy seems appropriate and the cross-clamp time was only 80 minutes despite the re-replacement surgery. It is possible that an injury to the RCA occurred during the valve re-replacement or coronary sinus repair, and this could have been investigated in the immediate postoperative period with a conventional coronary angiogram.



**Adverse events:**

The main adverse events associated with this case were:

1. Valve re-replacement
2. Postoperative RV dysfunction of unknown cause, although possible causes include RCA injury or air embolism.

**Areas of consideration:**

1. Intraoperative management: In an acute setting, intra-aortic balloon pump improves septal motion to a certain extent in RV dysfunction; and could have been considered.
2. Postoperative management: Consideration should have been given in the early postoperative period to do a formal coronary angiogram to rule out RCA injury. Also, the management of acute RV failure in the ICU could have been better. Increasing the preload could worsen RV failure, although it temporarily increases the blood pressure.<sup>(1,2)</sup> Lastly, the surgeon's form mentions a lack of communication between the ICU staff and the surgical team. Multidisciplinary management of a critical care patient, like this one, should involve the cardiothoracic surgeon and intensivists.

**Areas for concern:**

The surgeon's report that the ICU intensivist visited and assessed the patient 3 hours after admission to the ICU is an area for concern.

**Comments:**

The preoperative management and work up seem entirely appropriate. The intraoperative management seems fine until the development of the RV dysfunction. It is not clear if the transoesophageal echocardiogram (TOE) was available only at the end of the case. The cause of RV dysfunction could have been further assessed by a coronary angiogram and the management of acute RV failure in the ICU could have been different. In particular, the sudden weaning of milrinone and increasing preload did not help the situation. An autopsy report would identify whether a thrombotic event, injury in the RCA or RV ischemia / infarction was the cause of death.

**SURGICAL LESSONS:**

- When a cardiac patient deteriorates in the postoperative period, consideration should be given to surgical problems that could be corrected.
- Need to have a senior ICU person involved in the management of compromised patients.

- Decisions regarding significant changes to medications should be made jointly by the surgeons and intensivist.

## **REFERENCES:**

1. Ventetuolo, C.E, Klinger, J.R.  
Management of acute right ventricular failure in the intensive care unit. *Ann Am Thorac Soc.* 2014;11(5): 811-822.
2. Harjola VP, Mebazaa A, Celutkiene J, Bettex D, Bueno H, Chioncel O, et al.  
Contemporary management of acute right ventricular failure: a statement from the Heart Failure Association and the Working Group on Pulmonary Circulation and Right Ventricular Function of the European Society of Cardiology. *Eur J Heart Fail.* 2016;18(3):226-41.

# Cardiothoracic Surgery

## Case 2: Major surgery with inadequate preoperative assessment

### CLINICAL DETAILS:

Diagnoses: Aortic valve stenosis and coronary artery disease.

Operations: Aortic valve replacement and coronary artery bypass grafts (CABGs) and tracheostomy.

Cause of death: Pneumonia (respiratory failure).

### COURSE TO DEATH:

An 86-year-old patient with severe aortic stenosis, rapidly progressive, was admitted for elective aortic valve replacement and triple CABGs. Surgery was unremarkable. Postoperative recovery was complicated by acute respiratory distress syndrome with ventilator-associated pneumonia, and surgical tracheostomy was performed.

The patient developed acute renal impairment in the context of sepsis and progressive right heart failure, and was put onto haemofiltration.

The patient developed heparin-induced thrombocytopenia, treated with danaparoid. There were no overt signs of bleeding. The filter for renal replacement therapy clotted off but otherwise there were no overt signs of clotting. The patient developed

ventricular arrhythmias (torsade de pointes treated with electrolyte replacement only) and failed to improve on appropriate antibiotic and respiratory/circulatory support. Further treatment was thought futile after meetings with cardiothoracic surgeons, intensive care physicians and the family.

Active treatment was withdrawn, and the patient died within 24 hours of that decision.

### ASSESSOR'S COMMENTS:

There was insufficient information available, in particular, whether an echocardiogram (ECHO) was ordered or performed. Therefore my opinions are based on incomplete information available in the medical notes.

The death concerns an 86-year-old patient with a past history of chronic atrial fibrillation (AF) and diverticular disease. The patient had been, until recently, active and independent although limited by cardiac symptoms. The patient was found to have severe aortic stenosis and triple vessel coronary disease, with normal left ventricular (LV) function and mild LV hypertrophy. This profile made the patient a good surgical candidate with reversible pathology, albeit an elderly patient with the risk profile that advanced age provides.

The patient was seen in the preadmission clinic 1 month prior to surgery, and was found to have signs and symptoms of cardiac failure including significant pulmonary oedema. Unfortunately, these findings were diligently noted but were not treated, perhaps reflecting the conveyor belt of preadmission clinics (whereby forms are filled in by junior staff, as opposed to the premise of assessing and treating a patient). Nonetheless, this was the beginning of this patient's demise as they were sent home to await surgery with a worsening clinical condition.

A month later the patient presented on the day of surgery in florid cardiac failure with severe orthopnoea and shortness of breath (SOB). The patient was in rapid AF (rate 130) and had significant pulmonary oedema and right heart failure. The patient was seen by the anaesthetic Fellow who felt that there would be no value in preoperative admission and optimisation due to the likelihood that the patient's failure was due to "LV outflow obstruction with or without ischaemia". There was no evidence of either and no request or investigations to confirm this.

The decision was made to proceed with surgery, though there was no record of a consultant anaesthetist or surgeon being consulted. This was an incorrect decision and set

this patient on their terminal path. Even an otherwise robust 86-year-old patient carries an increased risk profile to surgery, and must have all factors optimised to ensure the best chance of success. This patient was sent to theatre acutely unwell when they should have been admitted, treated for heart failure, and undergone an ECHO and chest x-ray (CXR) to reassess their status prior to surgery.

The patient became cyanotic on induction but the aortic valve replacement and triple CABGs were otherwise uncomplicated, with good bypass and cross-clamp times. The patient came off CPB on a small amount of support with noradrenaline and milrinone. There was a single shot of cardioplegia. On return to ICU, the next few days were significant for dealing with the patient's instability: labile blood pressure, sudden hypotensive episodes, hypoxia, flash pulmonary oedema, recurrent ventricular tachycardia and delirium.

The patient also had hepatitis with coagulation disturbance that was due to right heart failure and/or ischaemia. Despite this, there was no record of an ECHO examination until day 4, when a bedside transthoracic echocardiography was performed and showed normal atrioventricular function and normal LV. There was

the suggestion of RV dilatation and pulmonary hypertension; however, this finding was not pursued despite the patient's ongoing "failure to thrive". On day 8 the possibility of a TOE was raised but the cardiology registrar felt this was unwarranted and the matter was left. There was no mention of another ECHO assessment throughout this patient's stay. The lack of urgency in pursuing causation of this patient's gross instability was concerning. The patient's symptoms and signs were treated with an increasing list of interventions and yet the right heart was never assessed by TOE or posterior lead electrocardiograms. It was assumed the patient was an elderly patient struggling to overcome a large operation – this should be a diagnosis of exclusion.

The patient's heart failure symptoms should have been addressed given the normal LV and renal function, yet were resisted and possible aetiologies were not pursued. Over the next 10 days the patient continued to struggle, requiring two reintubations and eventually a tracheostomy. The patient inevitably tipped into multiple organ failure from which there was no recovery.

This patient's path was disappointing. Deficiency in care occurred from the outset in the preadmission clinic and then an opportunity was missed

to optimise the patient on the day of admission. The substandard level of care continued into their postoperative course, in which critical diagnoses were not aggressively pursued. The cardiac surgery team, though recording and making notes each day, had little input into the patient's postoperative care, with only passive reiteration of ICU notes and blood tests.

It is pertinent to note that the patient's postoperative course occurred over a holiday period, which may have affected the availability of services such as ECHO.

#### **SURGICAL LESSONS:**

- The preoperative workup of the cardiac surgical patient (or any patient, especially when they are elderly) is critical in achieving a successful outcome for the proposed surgery.
- It is essential that all individuals involved in the assessment and management of these patients have a basic understanding of the disease processes that are being treated. Junior doctors are often assigned to the preadmission clinic; however, they should have a low threshold to defer to their more senior colleagues if there is any deviation in the patient's condition compared with

when they were last seen by a consultant.

- Any acute deterioration in cardiovascular status should alert the treating doctor in the preadmission clinic that admission for medical optimisation could be required.<sup>(3)</sup>

**REFERENCE:**

3. Bojar R. Manual of Perioperative Care in Adult Cardiac Surgery: Wiley-Blackwell; 2010.

# Cardiothoracic Surgery

## Case 3: Unnecessary chest drain inserted by physician in the emergency department proves fatal

### CLINICAL DETAILS:

Diagnoses: Acute pulmonary oedema, severe mitral regurgitation and coronary artery disease, impaired LV function.

Operations: Mitral valve repair (Gore-tex chord to P2, cleft closure, 34 mm Physio II annuloplasty ring) and two CABGs (Left internal mammary artery left anterior descending artery sequential).

Cause of death: RV injury during intercostal drain insertion.

### COURSE TO DEATH:

An 84-year-old patient was admitted to hospital for an elective coronary angiogram. This was being performed to investigate symptoms of SOB on exertion and at rest. The patient had SOB on minimal exertion, was short of breath at night time and was unable to lie flat (required five pillows to sleep).

The patient had a past history of recently diagnosed AF, hypertension and gastro-oesophageal reflux disease (GORD). The patient also had known cardiac symptoms, with a previous investigation 10 years

ago demonstrating ischaemia in the anterior territory. This was not further evaluated. At the time of the angiogram the patient was found to be in acute pulmonary oedema and was therefore admitted to hospital for the management of decompensated heart failure. The coronary angiogram demonstrated significant stenosis in the left anterior descending artery and diagonal system and was managed medically with diuretic therapy. A TOE was performed on day 2 and this demonstrated severe mitral regurgitation with left atrial and LV dilatation.

The medical management resulted in a significant improvement in the patient's clinical condition. After discussions at the cardiac case conference regarding the patient's suitability for cardiac surgery, the decision was made for the patient to have mitral valve and coronary artery bypass surgery. In view of the patient's age and comorbidities it was recognised that the surgery held higher than normal risk. The patient was assessed by the cardiothoracic surgical team and the procedure was discussed. The operation was performed on the morning of day 6.

The operation proceeded in the standard fashion. A repair of the mitral valve was performed, placing

Gore-tex chords to the posterior leaflet, closing the clefts and the A3 P3 commissure. A 34 mm annuloplasty ring was implanted. The operation was successful, with an excellent mitral valve repair and no residual mitral regurgitation. The patient was returned to the ICU in a stable condition on low dose inotrope support.

The patient made a satisfactory recovery in ICU with a slow wean off the inotropes. The intercostal drain tubes were removed on day 8 and the patient was discharged from the ICU on the same day. In the ward the patient made a satisfactory recovery. The patient had pre-existing AF and was commenced on oral anticoagulation. There was ongoing management for the patient's heart failure. The oxygen saturations were satisfactory (94% to 95% on room air). There were small residual pleural effusions that were managed with ongoing diuretic therapy. The patient was assessed and felt to be suitable for discharge from hospital to a supported care facility, and was discharged from hospital on day 13. The plan was for a follow-up appointment in the outpatient clinic 2 weeks from the date of discharge.

The day after discharge the patient experienced increasing SOB and attended the emergency department (ED). A CXR demonstrated what was

thought to be a left pleural effusion. A pigtail catheter was inserted in the ED and this drained a quantity of dark blood. The tube was clamped. Shortly after the patient arrested and could not be resuscitated. The case was referred to the coroner and reported to the hospital review committee. The postmortem showed an injury to the RV caused by the catheter.

### **ASSESSOR'S COMMENTS:**

The patient's presentation on day 14 was for increasing SOB and right sided chest pains. A number of investigations were undertaken, including a CXR that showed no significant change in the pleural effusion than when discharged. Later that morning a decision was made (although it is unclear as to who made the decision and what discussion was had) to drain a left sided pleural effusion by process of insertion of an intercostal pigtail catheter using a Seldinger technique. It appears this procedure was carried out in the ED, and shortly after the insertion of the catheter the patient became unresponsive with low blood pressure. The patient responded partially to an intravenous (IV) infusion, and a larger than expected amount of blood drained out of the intercostal catheter (ICC). The patient subsequently arrested and was given external cardiac massage, and a clinical decision was taken



not to attempt further resuscitation by way of exploratory thoracotomy. The patient had a cardiac ECHO during the resuscitation period that demonstrated no significant pericardial effusion, some ascites and no significant pleural effusion. The patient was declared deceased later on day 14.

The main concerns associated with this case were the decision to insert the ICC and the efficacy and care with which the catheter was inserted. Based on the information in the medical records, it remained unclear as to why insertion of the left sided costal catheter would be beneficial in treating a patient with a right sided chest pain and SOB, when no investigative imaging identified any significant pleural effusion.

While a retrospective note suggested that a reasonable technique was employed, the catheter was deployed in an inappropriate direction and depth, as the autopsy indicated it was entering the RV. This could only have occurred if the inserting practitioner was either inexperienced or impaired at the time of insertion. The level of experience of the practitioners that made the decision to insert the ICC was also unclear. Given the information available, it is probable that an experienced cardiothoracic surgeon would not have recommended such

catheter insertion, but would have considered medical management. They may also have considered further investigation to exclude a more likely diagnosis of pulmonary embolisation or pericardial effusion.

In summary, this 84-year-old patient, while having a significant cardiac illness and confronting significant risks of surgery, underwent a successful operation and was discharged home from hospital. Unfortunately, early re-presentation to the ED with a questionable cause for insertion of an ICC and incorrect placement of the catheter, led to a premature and avoidable death. The surgical team associated with this patient's care need to review the decision-making process that led to the use of an ICC in this clinical setting, as well as the experience and training of those clinicians inserting the catheter.

### **SURGICAL LESSONS:**

- Adequate supervision is required if the insertion is to be performed by someone who is inexperienced with ICC management.<sup>(4)</sup>
- Careful consideration should be given to the indication and location for ICC insertion.
- ICC insertion is a common procedure in the postoperative cardiothoracic surgical patient

and is often performed by more junior staff.

- Nevertheless, it remains an invasive procedure and can result in harm to patients if strict adherence to general surgical principles is not practiced.

#### **REFERENCE:**

4. Dev SP, Nascimento B, Jr., Simone C, Chien V. Videos in clinical medicine. Chest-tube insertion. *N Engl J Med.* 2007;357(15):e15.

# General Surgery

## Case 4: Lack of consultant input leads to confusion in goals of management

### CLINICAL DETAILS:

Diagnoses: Rectovaginal fistula with dysfunctional loop ileostomy.

Operations: Closure of loop ileostomy and laparoscopic formation of end colostomy.

Cause of death: Gross systemic sepsis; possible anastomotic leak.

### COURSE TO DEATH:

An 81-year-old patient was admitted for planned closure of loop ileostomy (dysfunctional) and conversion to end colostomy. The patient had a past history of anterior resection for rectal cancer with postoperative radiotherapy. The patient also had a colovesical fistula that was biopsy-negative for local recurrence. All investigations were negative for local recurrence and it was presumed that the fistula was as a result of radionecrosis. Comorbidities included diabetes, cardiac failure and dementia. Lung and liver metastases were diagnosed. Palliative loop ileostomy had resulted in poor local stoma control, which was revised. This final admission was for an elective closure of the ileostomy.

A laparoscopic mobilisation of the

left colon with side-to-side stapled anastomosis of small bowel after resection of ileostomy was carried out. All staple lines were oversewn and an end colostomy formed. It was an uneventful recovery until day 7.

The patient went into urinary retention on day 3 postoperatively, the indwelling catheters were removed on day 5 and a urinary tract infection with *Escherichia coli* was documented. A medical emergency team (MET) call was made on day 6 at 11:59 am for rapid AF. The patient's condition was discussed with the medical registrar regarding anticoagulation. Electrolytes were replaced due to low magnesium, nausea and vomiting. The patient was febrile and tachypnoeic and deemed to be septic. Blood cultures were taken and bloods were sent with full septic screen initiated. CXR was performed revealing free gas and a computed tomography (CT) abdomen showed increased possible air leak. Subsequent multiple MET calls were made due to increased respiratory rate, tachycardia and sepsis.

Discussion were held with the family regarding resuscitation limitations, and the patient was not deemed appropriate for ICU on day 7 at 4:00 am. Over the course of the day the patient continued to have multiple MET calls. Gastrografin

was given, revealing extravasation at the anastomosis. The patient was planned for surgery but this was cancelled due to low blood pressure, leading to further discussions with the patient's family. The patient continued to deteriorate throughout the day and a decision was made to palliate. The patient passed away on day 7 at 9:00 pm.

### **ASSESSOR'S COMMENTS:**

This 81-year-old patient was admitted for elective surgery because of a difficult to manage ileostomy that was performed to control a colovesical fistula resulting from treatment of rectal cancer. The patient had low volume metastatic disease known for several years, in addition to mild vascular dementia, biventricular heart failure and type 2 diabetes. The patient had been transferred after unsuccessful refashioning of a loop ileostomy at another hospital.

The laparoscopic assisted ileostomy resection and formation of colostomy proceeded uneventfully. Three days later there was some vomiting, the patient was noted to be in AF and there was minimal stoma output. On postoperative day 6 progress was satisfactory, and the patient was reviewed by the rehabilitation team and deemed ready for transfer to rehabilitation.

At midnight on day 6 there was a MET call with a heart rate of 130 beats per minutes (bpm) and rigors. A CXR showed significant free gas and a subsequent CT scan confirmed increasing free gas and intra-abdominal fluid. After a second MET call the criteria were modified to allow a heart rate of up to 140 bpm.

The overnight plan was for palliation including antibiotics and fluids, and not for resuscitation in light of known metastatic cancer, but these instructions were only documented at 8.00 am the following morning. The patient continued to deteriorate with a total of seven MET calls (although the documentation was unclear, so a couple of the MET call entries may actually refer to the same episode). The surgical registrar considered an anastomotic leak and ordered a Gastrografin follow through, which occurred at 11:30 am but was unhelpful. The ICU consultant reviewed the patient at 3:00 pm and requested a surgical consultant review. The consultant documentation was at 4:30 pm and the plan was to take the patient to theatre for laparotomy for peritonitis. The patient's condition deteriorated and it was felt that surgical intervention would be futile. Palliation was instituted and the patient died later that evening.

Documentation in the progress notes was patchy. There was no indication of goals of care, or of advanced care planning. At the time of being made palliative it was documented that there was no advanced care plan. There was no documentation of any surgical consultant review, or of postoperative discussions being held with the consultant, until the day of death.

The delay in the involvement of a surgical consultant, despite seven MET calls for this desperately unwell patient in the space of 12 hours, seemed to have contributed to patients demise. The patient's only chance of survival would have been early recognition of anastomotic leak and return to theatre. The covering team overnight had no written indication of advanced planning, and did not appreciate the significance of free intraperitoneal gas and clinical deterioration.

Documentation of the goals of care and advanced care planning are important in elderly patients with significant pathology and comorbidities. The responsible consultant should be kept informed of progress and this should also be documented. A MET call indicates significant clinical concern and should mandate notification of the consultant, who can advise appropriate investigations or care limitations.

# General Surgery

## Case 5: Importance of recognising early signs of a deteriorating patient

### CLINICAL DETAILS:

Diagnoses: Obstructing colon cancer

Operations: Extended left hemicolectomy with side to side hand sewed anastomosis. A very small proportion of great curvature of the stomach was removed with tumour and repaired. Nasogastric tube (NGT) was inserted during operation, and there was no blood in the drainage from NGT.

Cause of death: Sepsis / anastomotic leak

### COURSE TO DEATH:

A 76-year-old woman was admitted to hospital for bowel preparation for elective colonoscopy and was diagnosed with a partial obstructing right sided colonic lesion and a polyp on the left side of colon. She was then referred to the surgical unit for management of bowel cancer. Eight days after the colonoscopy she underwent an elective left hemicolectomy.

Past medical history indicated breast cancer (for which she had left mastectomy in 2016), melanoma (2015), and she had cervical cancer stage 2B for which she received

chemoradiotherapy in 2007. She also had a significant history of smoking and was diagnosed with emphysema.

The left hemicolectomy was uneventful. Postoperatively she was transferred to ICU, was managed appropriately and received regular deep vein thrombosis (DVT) prophylaxis. She was then shifted to the ward and was managed appropriately. On postoperative day 10 she had distention, pain in abdomen and on clinical examination she had a rigid, tender abdomen. Initially a CT was appropriately asked for but in view of continuing deterioration a MET call was raised. The patient was tachycardic, tachypnoeic and had lactate of 7 on venous blood gas, suggesting that the patient had sepsis and/or perforation.

In view of multiple comorbidities, a family discussion was held and it was decided that the patient would receive palliative/comfort care. She gradually deteriorated and expired on that day.

### ASSESSOR'S COMMENTS:

In view of the advanced age and multiple comorbidities, the operation was done appropriately although a Hartmann's procedure could have been considered. The patient was

doing well postoperatively but on day 9 and 10 she gradually deteriorated. By the time the patient was assessed there were symptoms of peritonitis. It appears that she could have had a CT scan earlier and bowel ischaemia or intra-abdominal collection secondary to bowel leak could have been diagnosed.

In view of the patient's multiple comorbidities there could have been consideration of stoma in the first place, but as the patient was stable at the time of surgery (and prior to surgery), it appears that the decision to operate was correct.

One area of consideration is that the pain in the abdomen could have been investigated earlier. Whether this would have prevented the death of the patient is difficult to assess from the notes. It appears that by the time the patient was seen with these symptoms she had severe peritonitis and was deteriorating. The patient did have a reasonable care pathway as described in the notes. Any abnormalities or concerns regarding the patient should have been communicated to the treating consultant by the registrar/resident medical officer as soon as possible.

### **SURGICAL LESSONS:**

- In a deteriorating patient following abdominal surgery, sepsis and peritonitis should be

considered. Early investigation should be done to exclude this in order to prevent serious sepsis and organ dysfunction.

# General Surgery

## Case 6: Help of second consultant ideal in difficult and prolonged surgery. Missed enterotomy after adhesiolysis

### CLINICAL DETAILS:

Diagnosis: Small bowel obstruction.

Operations: Laparotomy for small bowel obstruction and two relook laparotomies.

Cause of death: Septic shock.

### COURSE TO DEATH:

A 61-year-old patient was admitted with a small bowel obstruction. The patient was transferred from a rehabilitation facility following a recent intracerebral haemorrhage from which the patient was now bed bound. The patient also had significant comorbidities, including ischaemic heart disease, type 2 diabetes, hypertension and multiple previous laparotomies for small bowel obstruction. The patient had a history of a total colectomy and ileorectal anastomosis many years ago for inflammatory bowel disease. The patient also appeared to be difficult to assess due to a history of chronic abdominal pain.

The patient was treated conservatively for 3 weeks with total parenteral nutrition and nasogastric

tube (NGT). The patient developed recurrent small bowel obstruction and peritonism after an initial response and was clinically assessed to have probable dead bowel. A laparotomy was performed after extensive discussions with the patient about the high operative risk. It took approximately 6 hours, with dense adhesions and multiple enterotomies made and repaired. The patient developed severe sepsis. Second-look laparotomies were performed on each of the two following days, which revealed a missed enterotomy and two other leaking repaired enterotomies. At the second relook, most of the patient's small bowel was infarcted secondary to shock and inotropes, and this led to the discontinuation of active treatment.

### ASSESSOR'S COMMENTS:

The patient was a high risk for laparotomy given the comorbidities and multiple previous laparotomies, and this was recognised. There was no immediate indication for laparotomy on admission and a period of conservative management was undertaken. This included the use of water soluble contrast follow-throughs. The obstruction appeared to resolve and discharge plans were made for rehabilitation 12 days after admission.



The patient then appeared to re-obstruct. Eleven days later laparotomy was performed. Documentation in the patient history was lacking as to the reason for operating at this time, rather than earlier following re-obstruction. It was reported in the case record form that the patient developed peritonism with concern for ischaemic bowel.

It was uncertain as to whether the patient was given total parenteral nutrition during the period of re-obstruction. Albumin levels were 22 g/L at the time of initial laparotomy. There were no records of preoperative total parenteral nutrition being administered even though this was reported in the case record form (these may be missing). Poor nutritional status may have adversely affected the patient's ability to recover from surgery.

Laparotomy, adhesiolysis, small bowel resection and repair of enterotomies were performed. The patient was in the operating room for around 6 hours and extensive dense adhesions were noted. The small bowel was noted to have herniated behind the superior mesenteric artery. A preoperative note was made in the patient's history that two consultant surgeons would likely be required for a laparotomy. The seniority of the assistant was not recorded in the case record form.

At the second laparotomy the missed

enterotomy was repaired, as were two previously repaired enterotomies that were leaking. These would appear to represent technical errors. The patient continued to deteriorate and at a third laparotomy performed the next day, 1 metre of infarcted bowel was present along with global ischaemia of the entire small intestine. The situation was determined to be non-salvageable.

Appropriately, a consultant general surgeon performed all three of the patient's laparotomies. Once the patient re-obstructed, laparotomy was indicated and it was unclear why a further 11 days of conservative management was undertaken..

The treating surgeon and first line assessor identified the patient as high risk with technical difficulties associated with care. The use of a two-surgeon team may be useful in such difficult laparotomies. The patient's death was, however, not directly attributable to any delay in operating. Ultimately the patient died from an unrecognised enterotomy and leaking repaired enterotomy sites. These represent technical errors, and were reported as such in the case record form by the operating surgeon. Once again, it is possible that the presence of a second consultant at such a difficult operation may have resulted in the technical errors being recognised at the initial laparotomy, possibly preventing the patient's death.

# General Surgery and Gynaecology

## Case 7: Major surgery in a complicated patient should be performed at a major hospital

### CLINICAL DETAILS:

Diagnoses: Liver failure (decompensated hepatitis C cirrhosis) and vaginal haemorrhage.

Operations:

Hospital A: Hysterectomy and bilateral salpingo-oophorectomy, laparotomy and haemostasis.

Hospital B: Laparotomy for haemostasis, liver transplant, laparotomy and splenectomy.

Cause of death: Multiorgan failure, disseminated *Candida glabrata* infection.

### COURSE TO DEATH:

A 59-year-old woman with a known history of hepatitis C cirrhosis and some evidence of decompensation (international normalised ratio [INR] 1.6 preoperative, and evidence of portal hypertension – dilated intra-abdominal veins and ascites noted at laparotomy) presented with bleeding per vaginam that failed to respond to embolisation. Other significant comorbidities were type 2 diabetes, hypertension, chronic obstructive airways disease, bipolar affective disorder and gastro-oesophageal reflux.

The patient underwent elective total abdominal hysterectomy and bilateral salpingo-oophorectomy at Hospital A. This was complicated by large volume bleeding, for which repeat laparotomy was performed the following day. At laparotomy, 3 to 4 L of blood was evacuated, and a bleeding ovarian pedicle was underrun. The patient subsequently developed hepatic and renal failure.

Four days post-surgery the patient received haemofiltration, was intubated and transferred to the ICU at Hospital B. Patient was admitted under the care of the liver transplant unit. Ongoing support of renal, respiratory and circulatory systems was undertaken. Broad spectrum IV antibiotics (vancomycin and piperacillin [Tazocin]) and IV fluconazole were given. Fourteen days post-surgery, bleeding into the rectus sheath and peritoneal cavity were identified in the lower abdomen. She underwent laparotomy and evacuation of haematoma. Bleeding from the inferior epigastric vessels was identified and haemostasis was performed.

Consideration was given to liver transplantation, with assessments made on a daily basis as to her fitness for the procedure given her high operative risk. Cardiology assessment was performed and the patient was deemed fit for

transplantation. A suitable standard criteria (i.e. good quality) liver donor became available and liver transplantation was performed on day 16. The native liver was small with evidence of micronodular cirrhosis. Haemoperitoneum of 1.5 L was noted and evacuated at the start of the procedure. Liver transplantation was performed expeditiously, with a cold ischaemia time of only 4.4 hours. During the transplantation, following implantation, there was evidence of right heart failure with rapid swelling of the liver. This was managed by off-loading volume via the haemofilter and administration of milrinone.

Following transplantation, despite good liver function, the patient remained critically unwell, with ongoing need for haemofiltration. Disseminated *Candida glabrata* infection was identified. Maximal medical therapy was continued with the assistance of the infectious diseases unit. CT abdomen revealed low density throughout the spleen and there was concern that the spleen might be a source of ongoing candidaemia. Therefore, laparotomy and splenectomy were performed. *Candida glabrata* was grown from the spleen, confirming this as a site of Candida infection. Unfortunately, candidaemia continued despite the medical and surgical management and aortic valve endocarditis was identified.

The treating surgeon was on annual leave from day 45, therefore knowledge of the patient's subsequent course was based on review of the notes. The patient continued to deteriorate and did not recover from multiorgan failure. Seventy five days post transfer, after consultation with the patient's family, life sustaining therapy was withdrawn and the patient died in ICU .

### **ASSESSOR'S COMMENTS:**

#### **General surgical perspective**

There were no concerns regarding the management of this patient at Hospital B where she was treated by a surgical unit. The records regarding the treatment at Hospital A, a regional hospital, were not available.

The area of concern in this case was the decision to proceed with a necessary operative procedure at a regional hospital in the setting of Child's C cirrhosis with a known preoperative clotting disorder (INR 1.6) and portal hypertension. This patient may have been better managed in a major metropolitan hospital, where there were more available resources and the opportunity to consult rapidly with appropriate specialists. However, the outcome may have been the same given the underlying disease processes and comorbidities.

## Gynaecological perspective

There were several areas of concern with this case. The first area of concern was the decision to proceed with major surgery in the presence of liver failure secondary to hepatic cirrhosis. This was a significant risk factor for a bleeding disorder, especially in a regional centre without an ICU experienced in managing such cases or the back-up of a liver unit. Consideration should have been given for transfer to a tertiary centre with stabilisation prior to surgery and planned postoperative ICU admission.

The second area of concern was the postoperative care in the first 24 hours, with long delays in diagnosing the postoperative intraperitoneal bleeding and delays in returning to theatre. They contributed to the patient's deterioration following the second procedure and the multiorgan failure that necessitated an urgent liver transplant. This patient was anuric overnight, with no senior clinical input into her care and delays in returning to theatre to manage postoperative bleeding.

Finally, there were significant comorbidities existing in this patient that significantly increased the risks of surgery. The final result may have occurred regardless of the patient's intraoperative and postoperative care.

## SURGICAL LESSONS:

High-risk patients with hepatic

failure have a higher risk of bleeding and should have laparotomy earlier when there is suspicion of continued bleeding. It would be safer to do a laparotomy that will may turn out to be negative, rather than have delays with the development of complications, from which the patient will have no capacity to recover.

1. For patients with liver failure, hysterectomy should be considered only where other treatment options have failed or are contraindicated.
2. Preoperative assessment and stabilisation should be planned for any patient with a medical comorbidity.
3. Surgical cases likely to require postoperative ICU care should be managed in centres where those facilities are easily accessed.
4. Early return to theatre in an unstable patient should be considered.<sup>(5)</sup>

## REFERENCE:

5. National Institute for Health and Care Excellence. Heavy menstrual bleeding: assessment and management UK: National Institute for Health and Care Excellence; 2007 [updated Aug 2016; cited 2016 16 Dec 2016]. Available from: <https://www.nice.org.uk/guidance/CG44>.

# Neurosurgery

## Case 8: Early definitive management required for a patient with ruptured intracranial aneurysm

### CLINICAL DETAILS:

Diagnosis: Subarachnoid haemorrhage (SAH).

Operations: External ventricular drain (EVD), digital subtraction angiography, coiling anterior communicating artery and decompressive craniotomy.

Cause of death: SAH.

### COURSE TO DEATH:

A 47-year-old patient driving a car had a seizure secondary to SAH and drove into a fence at low speed. Glasgow Coma Scale (GCS) 3 at the scene improved to 12 once in hospital. A CT demonstrated SAH from anterior communicating artery aneurysm with a large left lobar/ frontal haemorrhage. An EVD was placed and the patient was taken to the interventional suite for coiling. The patient was extubated in ICU by the next day. The patient was found to have arm weakness. A repeat CT brain scan showed evolution and expansion of the haematoma in the right frontal lobe. Repeat digital subtraction angiography showed a small second aneurysm. Intracranial pressure (ICP) from EVD was not

elevated. The patient was kept sedated for the next 2 days then slowly woken with ICP now elevated. Repeat CT scan showed increased mass effect from right frontal haematoma. Frontal craniectomy was undertaken on day 4 but the patient continued to deteriorate despite intra-arterial vasodilators between days 8 to 11, and was unable to be extubated. There was no meaningful neurological recovery. A decision to palliate resulted from family meetings and the patient died on day 20.

### ASSESSOR'S COMMENTS:

The medical notes do not show the reasoning behind the decision to proceed to coiling rather than immediate evacuation of the haematoma. They also do not explain why, following repeat CT demonstrating more mass effect from the haematoma on day 1, the decision was not made to evacuate the haematoma at that time.

Why did the initial management involve a three-stage procedure after the diagnosis of intracerebral haemorrhage and aneurysm? Instead of EVD, digital subtraction angiography and coiling, it would have been more appropriate to have proceeded straight to craniotomy, evacuation of intracerebral

haemorrhage, clipping of aneurysm and placement of EVD. This would have dealt with the aneurysm, intracerebral haematoma and hydrocephalus under a single procedure, and would likely have obviated the subsequent requirement (4 days later) for decompressive craniectomy.

On day 4, why was a craniectomy performed rather than evacuation of intracerebral haematoma or a combination of the two? The standard of care for significant intracerebral haematoma and aneurysmal SAH is to evacuate the haematoma and clip the aneurysm. In today's era of subspecialisation in which some on-call general neurosurgeons do not have sufficient experience in surgically clipping such aneurysms, and therefore revert to referring for coiling procedures, it is recommended that the treating surgeon ring a colleague who is experienced in such surgery. Most experienced surgeons are only too willing to attend and supervise the junior surgeon, or manage the case him or herself. Ringing for help when required is a sign of clinical insight, not a sign of weakness.

### **SURGICAL LESSONS:**

The management of aneurysmal SAH has been recently aided by rapid advancements in endovascular treatment approaches. In many

centres the primary intervention has been via the endovascular route. However, as illustrated in this case, the primary neurosurgical management, as with many other surgical fields, is still to consider removing a space-occupying lesion in order to afford less detrimental impact upon the surrounding healthier tissues. As described in the assessor's comments a more timely and integrative approach, rather than multiple standalone procedures, could have resulted in a better outcome for the patient.

Finally, treating surgeons should seek intra- or inter-departmental assistance when they encounter conditions beyond their usual scope or expertise. A simple request for assistance from an appropriately-skilled colleague may result in a very different outcome for the patient.<sup>(6)</sup>

### **REFERENCES:**

6. Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davies AR, D'Urso P, et al. Decompressive Craniectomy in Diffuse Traumatic Brain Injury. *New Eng J Med.* 2011;364(16):1493-502.

# Neurosurgery

## Case 9: Dilemma of anticoagulation in a patient with a thrombotic cerebral event and prosthetic cardiac valve

### CLINICAL DETAILS:

Diagnosis: Right hemispheric infarct.

Operations: Right decompressive hemicraniectomy with durotomy, evacuation of right extradural haematoma and insertion of ICP monitor.

Cause of death: Right hemispheric infarct with mass effect.

### COURSE TO DEATH:

This 62-year-old patient presented with left hemiparesis and dysphasia on a background of mitral valve disease and warfarin anticoagulation for AF. The patient's INR on admission was subtherapeutic at 1.8. The first CT brain showed low attenuation in the right insula, posterior frontal and parietal lobes but no haemorrhage or midline shift. A CT perfusion scan showed luminal filling defect in proximal right internal carotid territory with associated extensive perfusion abnormality in the right hemisphere, and also segment of occluded left vertebral artery. It was decided to admit to the neurology ward, withhold (but

not reverse) warfarin and observe the patient. The patient was given 40 mg enoxaparin (Clexane) subcutaneously on admission for thrombosis prophylaxis as well. On day 2 the GCS deteriorated on the morning ward round, so the patient was intubated for a second CT brain scan. This showed significant oedema in the right hemisphere with significant mass effect. Comment was also made by the radiologist about an abnormality suspicious for infarct in the right cerebellar hemisphere.

The patient underwent right frontotemporal decompressive craniectomy at about 11:30 am after administration of fresh frozen plasma, Prothrombinex and vitamin K. The patient was extubated and nursed in ICU postoperation. By 8:30 pm the patient deteriorated neurologically to decerebrate posturing with pupil dilatation, so had to be taken to radiology for a third CT. The main changes were the presence of the craniectomy and a new 1.5 by 1.0 by 1.3 cm haematoma in the right temporal lobe and mild increase in midline shift. Only after return from that CT was the patient intubated. The patient was then returned to theatre for reopening of craniectomy and evacuation of extradural and

intraparenchymal haemorrhage, but apparently the dura was not tense and the ICPs were low. An ICP monitor was inserted at this time. The patient was taken back to ICU and given maximal medical therapy but showed no neurological recovery. On the morning of day 3 a further CT was performed due to an increase in ICP. This fourth CT showed ongoing oedema and midline shift with increasing entrapment of the left lateral ventricle, but there was no change in management after the CT result. The patient's ICPs drifted higher and was again taken to radiology for another CT, however the patient arrested and died while in the CT room.

#### **ASSESSOR'S COMMENTS:**

- As noted above, the patient was administered a 40 mg dose of enoxaparin (Clexane) on the day of admission, which was significant as warfarin was not reversed until the next day and the patient was already at high risk of haemorrhagic conversion of the infarct.
- The operation reports neglect to mention that the temporal lobe was resected on both occasions.
- The extradural haematoma was not actually mentioned as a significant cause of mass effect in the third CT scan result. The

radiologist actually mentioned the right intraparenchymal haematoma as more significant. It was incongruous that the second surgery findings were said to show no impression of raised ICP as the surgeon noted that the dura was not tense.

It was probably inappropriate to give the patient 40 mg Clexane when admitted. The warfarin was not reversed on the day of admission. Both these actions would have increased the risk of haemorrhagic transformation. Besides, it was given that the patient would develop cerebral oedema the next day as the area of infarction was so big. She was always going to need a decompressive craniectomy, so coagulation parameters should have been normalised in anticipation of this.

The surgeon should have inserted an ICP monitor at the time of the first operation. This used to be the routine, and would have provided the ICU with a better means of assessing ICP than continually taking the patient to CT.

It was surprising that the patient was not intubated prior to the third CT, when the patient was said to have exhibited extensor posturing. Intubation would have assisted with ICP management. In the final analysis, this patient's prognosis



was terrible and probably nothing would have changed the final outcome. However, this case does expose some seeming errors in management, which if corrected may save someone else's life.

### **SURGICAL LESSONS:**

The role of decompressive craniectomy in ischaemic cerebral events and trauma is still under debate. Multicentre studies have reported a good short-term outcome, with a poor medium-term and long-term prognosis. Irrespective of these findings, however, once a decision is made to go down the path of decompression then all subsequent actions should aim to maximise the success of such an approach.

Several points were raised by the assessor in the review of this case. Each point of contention relates to the inability to fully commit to the success of the craniectomy. The misuse of Clexane in this setting, the lack of an ICP monitor, and the failure to protect the airway by re-intubating for transport of the patient at the time of maximum cerebral oedema, all contributed to setting the craniectomy up for failure. Although individually of minimal significance, when added together these factors certainly could have altered the outcome for this patient. The lesson here may well be that should any surgical approach be considered,

then all actions must aim to give that surgical approach the best chance of success.<sup>(6)</sup>

### **REFERENCE:**

6. Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davies AR, D'Urso P, et al. Decompressive Craniectomy in Diffuse Traumatic Brain Injury. *New Eng J Med.* 2011;364(16):1493-502.

# Orthopaedic Surgery

## Case 10: Surgical team should get the medical team involved early in a high risk postoperative patient

### CLINICAL DETAILS:

Diagnosis: Osteoarthritis left knee.

Operation: Left total knee arthroplasty.

Cause of death: Brain injury.

### COURSE TO DEATH:

This 72-year-old patient presented for elective left total knee replacement, undertaken the same day under spinal anaesthesia and sedation, with no immediate complications. There were comorbidities of chronic obstructive pulmonary disease, obesity (lap band), hypertension, gastro-oesophageal reflux disease (GORD) and tachyarrhythmia, and was assessed preoperatively as American Society of Anesthesiologists grade 3. The patient was subsequently noted to develop pseudo-obstruction/ileus of bowel by day 5 but refused NGT care. A rectal tube was placed and the lap band deflated. There were multiple MET calls for tachycardia and hypoxia, and the patient had a CT pulmonary angiogram on day 6 that excluded a pulmonary

embolism. An NGT was eventually inserted for decompression. The patient required careful management of electrolytes.

Despite all measures tachycardia persisted with development of delirium, removal of the NGT and a fall on the ward. Medical review was obtained on day 7 and CT brain was negative for injury. On day 10 the patient was found unresponsive on the ward at approximately 4:25 am (last seen 4:00 am). The patient had an asystolic arrest when pads were applied and was transferred to ICU on inotropic/pressor support. On day 1 in ICU he was noted to have myoclonus. The patient failed to wake when weaned from sedation. A somatosensory evoked potential test was performed. Response was found to be absent bilaterally, suggesting unsurvivable brain injury. The decision was made to withdraw active treatment following discussion with the family. The patient died on day 12.

### ASSESSOR'S COMMENTS:

Hospital records show that there was appropriate documentation of the sequence of events, including the surgical procedure and immediate postoperative management. There was clear evidence to suggest that neither the surgery nor the anaesthetic event lead to this death.

However, there were discrepancies in the postoperative management and a clear and strong medical intervention was lacking from the clinical notes. The surgical team were incapable of managing medical problems and it appears that there was a failure to recognise the medical complications at the appropriate time. There was a substantial delay in getting the patient to the high dependency unit (HDU) or ICU. Postoperative ileus leading to electrolyte imbalance leading to medical complications appeared to be the major cause of death for this patient.

The patient had a fairly short procedure time and had been anticoagulated and treated appropriately for surgery. However, what was not recognised were the significant preoperative comorbidities, which qualified the patient for postoperative management in an HDU or ICU bed. Fluid balance had not been well documented although cardiac failure (implying overload) was not documented.

**Adverse event:**

While the total knee replacement was uneventful, the fact that the patient required multiple MET calls in the first 5 days was not a good sign. There had been communications from the surgical team asking the medical team to review the patient and stating

that they hadn't identified the cause of the haemodynamic instability. This resulted in a delay in management, and was suggestive of inadequate medical management by the surgical team. The patient was admitted to the ICU, but had deteriorated by that point and was beyond recovery. This admission to ICU should have been initiated much earlier.

**Area of concern:**

The major area of concern in this case was the lack of proper medical management by the dedicated medical team. There had been a number of entries by residents and registrars of the surgical team liaising with the medical team asking for support and opinions, which may have not been properly communicated. ICU admission was ineffective as it was initiated quite late. Preoperative identification of a high-risk patient and appropriate alerting of the medical team to manage this patient postoperatively could have saved the life of this patient.

**Comments:**

This patient clearly had limited medical management in the postoperative period. Although the orthopaedic management had been adequate, medical management was suboptimal. Recognising high-risk patients and dealing with such patients in anticipation would be the

correct standard of care. Multiple MET calls in an elective patient in the surgical ward should raise alarm bells, and there should have been more stringent scrutiny of the situation by the medical team.

### **SURGICAL LESSONS:**

This case illustrates the need for orthopaedic surgical teams to liaise with their physician colleagues in the management of high-risk patients with multiple comorbidities.

Although it is unclear whether this tragic outcome could have been avoided, complex patients require a team approach to their management. Surgeons should ensure that systems are in place, both in public and private hospitals, for early involvement of physicians at a senior level to ensure that there are no delays to diagnosis, treatment, or transfer to ICU or HDU. Following a MET call, it would be wise to organise joint care of patients with physician.

In this case there was no mention of a medical preoperative assessment, which would have been helpful, and it appears that medical review was only obtained on day 7 after the patient had deteriorated significantly.

Post-arthroplasty ileus is not uncommon and can have a bad prognosis. It should be recognised early and senior advice obtained regarding ongoing management.

It was also unclear whether a postmortem was arranged. A postmortem should be encouraged when a patient dies following an elective joint replacement so that we can learn as much as possible and improve management decisions for future patients.

# Urology Surgery

## Case 11: Inappropriate preoperative assessment leading to futile surgery

### CLINICAL DETAILS:

Diagnoses: pT4N2MxR1 High grade bladder cancer

Operations: Radical cystoprostatectomy and urethrectomy

Cause of death: Respiratory failure secondary to COPD and sleep apnoea. Postoperative atelectasis and pneumonia, hypercalcaemia, paraneoplastic syndrome. Acute and chronic renal failure.

### COURSE TO DEATH:

An 83-year-old man with multiple comorbidities including obstructive sleep apnoea, chronic obstructive pulmonary disease and hyperparathyroidism presented to the urological surgeon with macroscopic prostatic and bladder neck urothelial carcinoma. There was evidence of left hydronephrosis on presentation due to malignant cancer infiltration of the left distal ureter.

The patient was consented for a cystoprostatectomy, urethrectomy, bilateral pelvic lymph node dissection and ileal conduit formation. The procedure went for 7 hours and was aborted early due to

patient instability. Ileal conduit was converted to bilateral ureterostomies. Histopathology demonstrated T4N2 micropapillary cancer of the bladder.

Postoperatively the patient stabilised in ICU, but developed multiple complications including wound dehiscence that required a return to theatre, pneumonia, pleural effusions, DVT of the arm and probably pulmonary embolism. The patient was warfarinised and treated with appropriate antibiotics, but ultimately died of respiratory failure 29 days after cystectomy. The respiratory failure was likely caused by a combination of chest infection, pulmonary embolism and cardiac failure with pulmonary oedema. The decision was made correctly to palliate given the abysmal oncological prognosis of the bladder cancer.

### ASSESSOR'S COMMENTS:

The degree of preoperative assessment, and the decision-making process, were not clearly documented. It is not known whether the diagnosis of micropapillary urothelial carcinoma was evident on the initial transurethral resection of a bladder tumour. Staging CT scan and bone scan did not demonstrate metastatic disease, and it is not clear if the patient underwent a multidisciplinary team process.

In hindsight it is likely that had the diagnosis of T4N2 micropapillary carcinoma been known prior to the operation, the surgeon would have taken a nonsurgical course of action. Micropapillary is a variant of bladder cancer that is more aggressive and generally associated with a very poor outcome regardless of treatment.

The operation was very lengthy and was undertaken by an international Fellow assisted by an unaccredited registrar; the surgeon was supervising but did not scrub. It is possible that had the surgeon scrubbed and performed the operation then it may have been performed more quickly and some of the postoperative complications may potentially have been avoided. However, ultimately the nature of the cancer meant that his prognosis was very poor.

If the lymph node dissection was performed first and there was evidence of lymph node metastasis, the operation may reasonably have been aborted. The patient would still have ultimately succumbed to his aggressive cancer, but the suffering associated with the postoperative recovery may have been reduced.

This was a very challenging case due to the aggressive nature of the patient's cancer. His prognosis was very poor regardless of treatment. In hindsight, a nonoperative approach

would have been better for the patient and the healthcare system.

### **SURGICAL LESSONS:**

- Complex surgical cases should not be left to a surgical registrar or Fellow without senior surgical supervision.
- It is important to assess the extent of the disease which will impact on prognosis before embarking on a radical surgical resection.

# Urology / Colorectal Surgery

## Case 12: Unrecognised ureteric injury after anterior resection and poor postoperative management

### CLINICAL DETAILS:

Diagnoses: Hypoxaemic cardiac arrest, acute kidney injury, aspiration pneumonia, hypoxic brain injury.

Operations: Colonoscopy, anterior resection of rectosigmoidal carcinoma and exploratory laparotomy.

Cause of death: Brain injury secondary to cardiac arrest and prolonged resuscitation.

### COURSE TO DEATH:

A 71-year-old patient with comorbidities of obesity, non-insulin-dependent diabetes and raised cholesterol underwent a laparoscopic anterior resection for rectosigmoid cancer at Hospital A.

The operation notes were brief but describe no intraoperative problems.

On day 2 postoperation the patient was in considerable pain, and a distended abdomen was noted.

On day 3 postoperation CT scan without contrast demonstrated free fluid within the abdominal cavity.

The right colon was dilated to 6 cm. The patient had ongoing pain and abdominal distention. On day

6 postoperation the patient was noted to be more distended with generalised tenderness. The patient underwent a flexible sigmoidoscopy, colonoscopy and no leak was found at the anastomosis site.

A laparoscopy / laparotomy was considered but not performed. On day 7 postoperation the patient remained unwell, with a pulse of up to 131 bpm and still with abdominal distention and tenderness.

On postoperative day 8 a high white cell count (WCC) was documented. A CT scan demonstrated free fluid within the abdomen and right basal pneumonia. On day 10 postoperation the patient was vomiting and an NGT was inserted. The patient's condition continued to be very poor. A CT scan was performed on day 14 that showed free fluid within the peritoneal cavity. Respiratory rate was up to 40 per minute and heart rate varied between 110 and 130 bpm with oxygen saturation maintained at 94% on 10 L of oxygen.

The ambulance was called and the patient was transferred to the ICU of Hospital B. It was noted around this time that the creatinine was markedly elevated at 28  $\mu\text{mol/L}$  and WCC was 31,000  $\times 10^9/\text{L}$ . On day 15 postoperation the patient was unresponsive, bradycardic and

cyanosed and underwent cardiac pulmonary resuscitation. The patient was noted to be anuric.

The patient was transferred to Hospital C and it was noted that there was cerebral oedema following the cardiac arrest, and neurological recovery was thought to be poor. On day 17 a further CT scan with IV contrast was performed, which demonstrated a pelvic collection and reduction in the small bowel dilatation. The patient subsequently underwent a laparotomy and an infected presacral abscess (urinoma) was drained. Urology input was obtained and a cystoscopy and bilateral retrogrades were performed, which demonstrated extravasation of contrast from the left ureter 4 cm from the vesicoureteric junction. A left ureteric reimplant was performed with a psoas hitch. The patient's condition did not subsequently improve and the patient died from multiorgan failure including hypoxic brain damage.

### **ASSESSOR'S COMMENTS:**

The major issue in this case was the unrecognised left ureteric injury. This is a known complication of an anterior resection. It was unrecognised by the treating surgical team even though three CT scans had demonstrated free fluid within the peritoneal cavity. The patient's general condition was

poor with tachycardia. The patient had abdominal distention, which the nurses had measured up to 127 cm, and creatinine was elevated from reabsorption of urine. The patient's death would have been prevented by timely recognition of the ureteric injury. A CT scan with IV contrast certainly would have demonstrated the leak and it was obvious when the laparotomy was performed.

### **SURGICAL LESSONS:**

This case provides an example of the "blinker" approach to overall patient management. In the absence of any information regarding urine output, attention to the fluid balance surely would have alerted the surgeon to the obvious positive balance this patient was in.

#### **Issues arising are:**

- The CT scan on day 3 postsurgery demonstrated free peritoneal fluid. This should have prompted questions regarding the source of the fluid.
- Given that the endoscopic examination on day 6 postoperation failed to explain the problem or the reason for not intervening with laparoscopy or laparotomy is not clear.

As the days passed the patient's condition worsened - surely a time to stand back and reconsider the present treatment. Asking for help



should never be an issue. Share the management with fresh minds, look laterally and/or request a urologic review given the fact that ureteric injuries in the pelvis are so often recognised far too late.

The skills of the managing team come into question here if the fluid imbalance, worsening patient condition with cerebral oedema, increasing girth, rising creatinine, increased respiratory rate and tachycardia don't cause them to question their approach and ask for assistance. On the evidence provided, this death was avoidable had the urine leak been diagnosed early.

This case demonstrates the importance of a team approach. Preoperative involvement of a perioperative physician in complex cases with comorbidities is more the norm nowadays, as is anaesthetic involvement both preoperatively and postoperatively in ICU or HDU.

When deterioration occurs in a potentially curable case, the individual or team responsible for the patient must question their management decisions more objectively and involve other specialist units sooner.

# Vascular Surgery

## **Case 13: Femoral embolus should be treated by urgent embolectomy as thrombolysis can have fatal consequences and is not the best therapy**

### **CLINICAL DETAILS:**

Diagnosis: Thromboembolic occlusion left common femoral artery.

Operations: Thrombolysis and left femoral embolectomy.

Cause of death: Retroperitoneal haematoma (spontaneous, removed from operative site) and acute myocardial infarction secondary to retroperitoneal haemorrhage on heparin infusion.

### **COURSE TO DEATH:**

An 82-year-old patient presented with acute ischaemic left limb with a diagnosis of a left femoral embolus from AF. The patient had a history of cerebrovascular accident, acute myocardial infarction with CABG stent, AF, hypercholesterolemia, hypertension, obesity, diabetes, obstructive sleep apnoea and gout. The patient was commenced on heparin infusion.

The patient was admitted to Hospital A on day 1 at 11:00 pm with acute left lower lobe ischaemia. On day

2 at 5:30 am heparin infusion was commenced, and the patient was transferred to Hospital B. At 8:30 am the patient was pain free, had improved perfusion on arrival, but capillary refill was slow and had absent pulses. Day 3 an ultrasound showed a high-grade stenosis at the origin left superficial femoral artery. Angiography showed complete common femoral artery occlusion and thrombolysis was commenced. On day 4, repeat angiography post 24 hours of thrombolysis showed no significant change.

The patient remained pain free on heparin infusion. On day 5 the decision was made to book the next available dedicated theatre list and continue heparin infusion until then. The patient was booked for open femoral embolectomy on day 12. Note: between day 5 and day 11 the patient remained pain free on heparin infusion. On day 11 the patient was pain free on the morning round, but at 10:15 am there was a sudden return of severe left lower lobe pain. At 11:45 am the patient had an open left femoral embolectomy, which resulted in a return of good pulses and warm limb postoperatively. Initially well in recovery but on return to the ward:

- Became anuric with low

estimated glomerular filtration rate/high creatinine.

- Developed right flank/abdominal/thigh pain, although the timing of onset was not documented.
- Multiple reviews/MET calls.
- Multiple fluid boluses. Heparin infusion continued then slowed, but not ceased, because of supratherapeutic activated partial thromboplastin time.
- No further investigation/imaging.
- On the morning round on day 12 (day 1 postoperation) the patient was in extreme pain, with a globally tender abdomen and right flank pain radiating to right thigh.
- Urgent CT (noncontrast), blood cross-matched, heparin ceased (not reversed as concern about ischaemic gut as a differential) showed a large retroperitoneal haematoma (on right side, near kidney – i.e. far removed from angiogram and operative sites). Lactate was high.
- CT reviewed on consultant morning round.
- As the patient was stable, an urgent ultrasound was performed to assess the superior mesenteric artery patency or flow before complete reversal of heparin was given. There were still concerns

about possible ischaemic gut.

- After the ultrasound the patient had a MET call for near arrest. After discussion with the ICU, vascular surgeon and family the patient was palliated and died soon afterward.

### **ASSESSOR'S COMMENTS:**

Ultimately the patient died due to a complication associated with the attempt at thrombolysis, and one that is a recognised complication of the procedure. The decision for thrombolysis rather than femoral embolectomy has to be questioned. An embolus originating from the atrium is not a recognised indication for thrombolysis, while a past history of haemorrhagic stroke is a recognised contraindication for thrombolysis. No doubt the surgeon was trying for a “less invasive” solution to the problem in a patient with multiple medical comorbidities. However, thrombolysis is not an insignificant intervention and is associated with complications. In this case it was predictable that it would have limited benefit. An initial decision for femoral embolectomy would have likely led to a better outcome. The assessor does not know of any randomised trials comparing thrombolysis to operative embolectomy, and doubts that such a trial would ever gain ethics approval.

The surgeon was critical of the time delay associated with diagnosing the retroperitoneal haemorrhage. However, the time sequences in this case indicate a general lack of urgency – thrombolysis was not commenced for 2 days, and the operation was planned for 11 days after an acute admission. This “relaxed” approach to an emergency admission can be transmitted to junior staff, resulting in junior staff also taking a more relaxed approach.

On reviewing the case, the assessor came to conclude that the best management of this patient would have been early femoral embolectomy after appropriate medical work-up. The failure to do this led the assessor to conclude that this was an avoidable death.

### **SURGICAL LESSONS:**

This case illustrates that an initial incorrect management decision can adversely affect the ultimate fate of the patient. It is not a usual decision to institute thrombolysis for acute ischaemia resulting from femoral embolism. Surgical embolectomy is often performed under local anaesthetic and in a previously normal arterial tree should result in complete return to normality with restoration of pulses. Thrombolysis is not as effective and does not deal with propagated thrombus in the profunda femoris,

which was removed at the time of surgery (on review of the case notes). Moreover, thrombolysis is associated with double the incidence of haemorrhagic complications, and these were the initiating factor in the demise of this patient.<sup>(7)</sup>

### **REFERENCE:**

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# Vascular Surgery

## Case 14: Smaller aneurysms in older high-risk patients should be treated conservatively

### CLINICAL DETAILS:

Diagnosis: Abdominal aortic aneurysm (AAA).

Operation: Endovascular AAA repair.

Cause of death: Renal failure.

### COURSE TO DEATH:

An 83-year-old patient was admitted electively for endovascular AAA repair. A 70 mL contrast dose was used during the procedure. The patient had a background of chronic renal failure with a baseline creatinine of 23  $\mu\text{mol/L}$ , hypertension, osteoarthritis, gout, AF (on warfarin) and GORD. The patient was admitted the day prior to surgery for IV hydration. Vitamin K was given for INR reversal with an uncomplicated endovascular stent graft. Postoperatively, the patient developed right iliac fossa pain. General Surgery was consulted. Eventually the patient underwent two colonoscopies (first one inadequate preparation), which showed no evidence of ischaemic colitis. The patient also had a severe drop in renal function postoperatively, and a vascath was inserted for temporary dialysis despite the patient not being

a candidate for dialysis.

The patient had persistent and ongoing abdominal pain of unknown aetiology for which a CT abdomen was performed. The CT demonstrated mucosal thickening of the caecum, ascending and feasibly transverse colon infective colitis. Superior mesenteric artery and coeliac trunk filled normally. The patient developed respiratory failure and was made not for resuscitation. The patient died within 1 month of the procedure.

### ASSESSOR'S COMMENTS:

The CT report stated that it was 56 mm in maximal diameter, but there was no comment in the inpatient notes about a risk-benefit discussion. Baseline renal function was severely impaired, and careful consideration would need to be given before subjecting a patient to a procedure that would likely require significant amounts of contrast medium. The use of contrast medium would certainly cause significant deterioration in renal function, even in light of renal protection measures.

This patient was obviously not a candidate for haemodialysis (long term), and as such the very high likelihood of causing significant renal failure should have been apparent.

The relatively small size of the aneurysm and risk of rupture begs the question of why the operation was performed in a patient who was living at home with a fairly reasonable quality of life. The cause of the gut colitis is not fully known, and was unlikely to be related to the procedure directly, but may have been precipitated by this event. One should apply the 'family test' to all patients in decision making: if this was your parent, with identical risk factors, would you recommend they have the procedure given the significant risk of death (compared with the small risk of rupture with conservative management)?

### **SURGICAL LESSONS:**

Small AAAs have a low incidence of rupture. This was initially shown in the United Kingdom small aneurysm study.<sup>(8)</sup> A subsequent study confirmed that endovascular aneurysm repair compared with surveillance showed no difference after a mean 54 months follow up, despite a very low (0.55%) perioperative mortality for endovascular aneurysm repair.<sup>(9)</sup> In an elderly patient with multiple comorbidities and a 56 mm AAA, the decision to treat was not supported by the evidence.

### **REFERENCE:**

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9. Cao P, De Rango P, Verzini F, Parlani G, Romano L, Cieri E. Comparison of Surveillance Versus Aortic Endografting for Small Aneurysm Repair (CAESAR): Results from a Randomised Trial. *Eur J Vasc Endovasc Surg.* 2011;41(1):13-25.

# List of shortened forms

AAA	abdominal aortic aneurysm	IV	intravenous
ACT	Australian Capital Territory	LV	left ventricular
ACTASM	Australian Capital Territory Audit of Surgical Mortality	MET	medical emergency team
AF	atrial fibrillation	NGT	nasogastric tube
bpm	beats per minute	RCA	right coronary artery
CABG	coronary artery bypass graft	RV	right ventricular
CPB	cardiopulmonary bypass	SAH	subarachnoid haemorrhage
CT	computed tomography	SOB	shortness of breath
CXR	chest x-ray	TOE	transoesophageal echocardiogram
DVT	deep vein thrombosis	WCC	white cell count
ECHO	echocardiogram		
ED	emergency department		
EVD	external ventricular drain		
GCS	Glasgow Coma Scale		
GORD	gastro-oesophageal reflux disease		
HDU	high dependency unit		
ICC	intercostal catheter		
ICP	intracranial pressure		
ICU	intensive care unit		
INR	international normalised ratio		

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The information contained in this case note review booklet has been prepared by the Royal Australasian College of Surgeons ACT and Victorian Audit of Surgical Mortality Management Committee, which is a declared quality improvement activity. The Australian and New Zealand Audit of Surgical Mortality, including the ACT and Victorian Audit of Surgical Mortality, also have protection under the Commonwealth Qualified Privilege Scheme under Part VC of the Health Insurance Act 1973.



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# Notes

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