The abdominal catastrophe: poo, pus and peritonitis…

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Case study.
An acutely unwell septic 65-year old man with a history of smoking, obesity and diabetes underwent a 3-hour emergency abdominal operation (laparotomy) for faecal peritonitis from a perforated sigmoid colon caused by diverticular disease: the sigmoid colon was removed and a colostomy was formed. Suffering breakdown (dehiscence) of the midline wound he remained in hospital for one month requiring radiological intervention for drainage of abdominal abscesses and prolonged courses of antibiotics.

Six months later he underwent a planned reversal of the colostomy, the colon being joined (anastomosed) to the rectum. Owing to the difficulty of the operation the surgeon raised another stoma (a loop ileostomy) in order to 'protect' the anastomosis by diverting the faecal stream away from it; the midline hernia which had resulted from the original dehiscence was repaired using a mesh. Unfortunately, the anastomosis leaked and the surgeon took the patient back to theatre 10 days after the operation in order to disconnect the anastomosis and to bring up an end colostomy again, thereby leaving the patient with two stomas.

One week later intestinal content from an overlooked small bowel injury was seen to be discharging from the midline wound which broke down and required specialist treatment with a collection bag (wound manager) as well as intravenous total parenteral nutrition (TPN). After 6 months in hospital a fistula (enterocutaneous fistula) had matured in the midline and the patient was allowed home with arrangements for home TPN and rehabilitation *(Figure 1)*. After a further 6 months the patient underwent complex but successful reconstructive surgery leaving him with an end colostomy.

Opinion and introduction.
This case illustrates a typical patient seen in most hospitals around the UK every day of the year. The patient was sick and had significant concomitant medical illness and underwent a difficult operation complicated by wound failure. A challenging reversal procedure resulted in further multiple life-changing complications, most of which, arguably, could have been avoided.

There is a traditional surgical aphorism handed down from trainer to trainee which reads: "Good surgeons know how to operate, better ones when to operate and the best when not to operate". To a large extent, this encompasses the range of issues associated with emergency abdominal surgery and how different surgeons approach the difficult abdomen. My own specialist clinical interest lies in this particular field and my Expert Witness practice reflects this: abdominal surgical problems tend to come to the attention of medical negligence lawyers not because complications of surgery arise per se, or because a surgeon lacks the skills to do an operation, but on account of:

- failure to recognise that a problem or complication has occurred
- failure to accept that a problem has occurred and to take responsibility for it
- failure to seek help or alternative opinions
- failure of decision-making resulting in an even worse clinical problem

This article will explore some of these aspects and will look at some of the commonest surgical conditions and procedures which tend to come up in Clinical Negligence work relating to abdominal surgery.

Abdominal surgery: elective vs emergency surgery.
Elective surgery refers to a planned operation for which the patient has been physically and mentally prepared and a date set and agreed. Time is usually given for optimising the patient's health and fitness, perhaps modifying existing medication, seeking an anaesthetic opinion and carrying out various assessments to make sure that the patient is in the best condition possible for their surgery, particularly with respect to heart and lung function. This is particularly relevant if a patient is to undergo a planned operation for bowel cancer, for example, potentially associated with a long operating time, a long painful incision and reduced post-operative mobility.

The situation in emergency surgery is quite different. There is little time for optimisation when the patient is septic with physiological derangement and requires emergency intervention to remove a perforated colon which is leaking faeces into the abdomen. It follows that the outcome for emergency surgery, in terms of morbidity and mortality, is likely to be far less favourable.

Complications from elective surgery occur unexpectedly even in the best hands. This may convert an otherwise controlled situation in a relatively well individual recovering from a bowel operation, for example, into an emergency scenario and a progressively septic patient requiring surgical re-intervention for an anastomotic leak (failure of a join between bowel ends resulting in leakage of faecal fluid into the abdomen or pelvis).

The frailty and obesity epidemic.
UK society is increasingly aged and frail as life is extended with highly effective drugs for the treatment

of serious medical conditions, such as heart failure, ischaemic heart disease and lung disease: the term "frailty epidemic" has been coined for a good reason. Frailty is not age-specific and many younger patients may be classified as frail using well-accepted scoring systems.[1] For frail patients undergoing EL outcomes may be poor: there is a linear dose-response relationship between increasing frailty and worse outcomes after surgical admission: each incremental step of worsening frailty is associated with an 80% increase in 90-day mortality. [2,3]

A less active, over-indulgent population has also generated an "obesity epidemic", further complicating the landscape with respect to surgical decision-making and operative difficulty. Expectations for a favourable surgical outcome, therefore, particularly in the emergency setting, may have to be adjusted for many individuals.

The Emergency Laparotomy: background and scale of the problem.

A laparotomy is an open operation on the abdomen, in which an incision is made (usually up and down in the midline) to gain access to the abdominal cavity and its contained organs. An Emergency Laparotomy (EL) is a laparotomy undertaken for an acute unexpected abdominal problem.

Setting the standard.

In the UK around 30,000 ELs are undertaken each year. Since 2015 data on all ELs undertaken have been recorded in a national database known as the National Emergency Laparotomy Audit (NELA) (www.nela.org.uk) and all UK Hospital Trusts are expected to submit data. By collecting data in this way it has been possible not only to analyse surgical activity across the UK but to set benchmarks for practice with a view to improving performance in key areas. This has been possible by focussing on and measuring critical components of outcome, such as prompt management of sepsis, timely access to an operating theatre when required, admission to an Intensive Care Unit (ICU) for those patients predicted to have a mortality risk of >5% within 30 days of EL and involvement of Consultant Surgeons and Consultant Anaesthetists.

Best outcomes following EL seem to be associated with the following:

- a consultant-delivered service
- multi-disciplinary teamwork
- prompt recognition of illness and risk assessment
- prompt implementation of sepsis treatment
- prompt and appropriate investigation
- timely surgery where necessary
- Critical Care admission for high-risk patients

Overall outcomes for emergency laparotomy have improved since the inception of NELA and the average 30-day mortality rate (the proportion of patients who die within 30 days of an operation) across the UK has fallen from 11.8% to 8.7%.

Mortality rates following EL are around five times greater than that seen in patients undergoing major elective surgery. Whilst better overall outcomes for EL are encouraging, there is still considerable room for improvement in certain areas. In the latest (8th) NELA report (covering the period December 2020 to November 2021), for example, the following results are of some concern:

Figure 1

Clinical image showing the consequences of abdominal catastrophe and surgical misadventure prior to eventual reconstructive surgery. There is a loop ileostomy (and large hernia) in the right lower abdomen and an end colostomy in the left lower abdomen. In the middle of the abdomen there is a large defect which has been allowed to heal by secondary intention and in which there is a mature enterocutaneous fistula; at the edges of the defect remnants of non-absorbable mesh can be seen.

• Almost one-third of patients needing immediate surgery did not get to the operating theatre in the recommended time frame.

• Patients with sepsis suspected at time of arrival in hospital waited a median of 15.6 hours from time of admission to surgery

• More than three-quarters of patients with suspected sepsis did not receive antibiotics within the recommended 1 hour

• Median time to antibiotics in patients with suspected sepsis was 3 hours from arrival in hospital

• Over two-thirds of elderly or frail patients did not have input from a Geriatric Specialist.

The main pathologies encountered and emergency operations performed.
In the NELA reports the top 10 reasons for patients to undergo laparotomy are:

- adhesions (scar tissue between bowel loops)
- perforation of small bowel
- perforation of colon
- intestinal ischaemia (reduced blood supply to the bowel)
- abscess
- colorectal cancer
- localised malignancy
- incarcerated (stuck, non-reducible) hernia
- diverticulitis (inflammation+/-perforation of part of the colon)
- perforated peptic ulcer (affecting duodenum or stomach)

Correspondingly, the commonest operations undertaken to deal with these problems are:

- adhesiolysis (division of adhesions)
- small bowel and large bowel resections
- formation of stomas
- repair of peptic ulcer
- exploratory and re-look laparotomy

Recognition of illness & treatment of sepsis.
Delivering care to patients requiring EL requires skill and organisation and ensuring that appropriate senior decision-makers (Consultants) are involved in the right place at the right time. EL care should be a multidisciplinary effort which starts at the moment of presentation - recognition of illness and good communication alone are likely to minimise delays and bring about major improvements in standards of care and survival for these patients. The following are noteworthy:

• Some patients requiring EL will have peritonitis (severe infection within the abdomen) and sepsis. These are life-threatening conditions, in which survival is improved when antibiotics are given and necessary surgical treatment carried out without delay.

• Sepsis is defined as life-threatening organ dysfunction caused by dysregulated host response to infection. It can lead to shock, multiple organ failure and death especially if not recognised early and treated promptly.[4] Sepsis has a mortality rate >10%.

• Septic shock is defined as a subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone. Septic shock is associated with hospital mortality rates >40%.

• Recognition of illness and prompt treatment of sepsis should start as early as possible: in the Emergency Department, Surgical Emergency Units or on the wards.

• The NEWS-2 scoring system (https://www.rcplondon.ac.uk/projects/outputs/national-early-warning-score-news-2) is in widespread usage across all UK hospitals, particularly by nurses, and is a consistently reliable tool for recognition of physiological deterioration, prompting alert of seniors and escalation of care. In this EL pathway the NEWS-2 score it is used to stratify patients into risk categories.

• The Sepsis Six Care Bundle (https://www.sepsistrust.org/professional-resources/clinical/) consists of the following elements: which should be instigated when sepsis is suspected:

  - o Ensure senior clinician attends
  - o Give oxygen if required
  - o Obtain IV access, take bloods
  - o Give IV antibiotics
  - o Give IV fluids
  - o Monitor the patient

The Surviving Sepsis Campaign has driven this focus on prompt management of sepsis and international guidelines are established.[5] Early recognition and prompt management with delivery of the Sepsis [6] Bundle prevents further multiplication of pathogenic bacteria and release of toxins which aggravate immune system activation, inflammation and organ dysfunction. [6] Furthermore, time to appropriate antibiotic therapy in patients with sepsis is an independent determinant of post-infection ICU and hospital lengths of stay.[7]

Assessment of mortality risk
The risk of death and complications varies between individuals and an objective assessment of risk should be made and documented before surgery. This helps patients and their relatives appreciate the implications of different treatment options. Assessment of risk also aids communication between clinicians, so that plans can be made by the multidisciplinary team to provide appropriate levels of care based on each patient's risk.

For EL patients the NELA risk prediction tool (https://data.nela.org.uk/riskcalculator/) is now the most widely recommended for use, predicting the risk of mortality within 30 days of EL using various objective measures of organ function, laboratory tests and findings at operation. On the strength of this, it is recommended that patients undergoing EL with a predicted 30-day mortality risk of ≥5% are high-risk (HR) patients and this should mandate:

- o Consultant Surgeon presence in theatre
- o Consultant Anaesthetist presence in theatre
- o Admission to Critical Care post-operatively

Despite the obvious benefit of risk assessment, the NELA 7 report showed that 15% of EL patients across the UK are still not having a formal assessment of risk.

Urgency of surgery

Many operations are time-sensitive and survival is increased if delays to arrival in theatre can be minimised. For patients with peritonitis, delay of a few hours can substantially increase the risk of death. It has been estimated that over the first 24 hours after hospital admission, each hour of surgical delay before emergency abdominal surgery is associated with a 2.2% decrease in 90-day survival.[8]

Clinicians typically categorise patients according to urgency. The National Confidential Enquiry into Perioperative Deaths (NCEPOD) has recommended that patients reach an operating theatre within a specified time after a decision has been made to operate, depending upon their clinical condition which will reflect underlying pathology (https://ncepod.org.uk/classification.html).

The NELA reports show that success in getting patients to theatre within the intended timescales for these subcategories across the UK has fallen off. For NELA Year 7 the proportions of patients reaching theatre in time were 68.4%, 85.2% and 79.7% for IMMEDIATE (within 2h), URGENT (2-6h) and URGENT (6-18h), respectively, compared with 73.1%, 86.4% and 81.3% for the NELA report 3 years earlier. This is disappointing and must reflect delays in pathways as well as insufficient capacity in operating theatres.

Admission to Critical Care (ICU or HDU) for HR patients

Critical Care admission allows close observation of those at risk of deterioration following EL, and, when necessary, offers advanced treatments or organ support. It is well established that HR elective surgical patients should not be nursed on a general ward immediately after surgery, and the same standards of care should be provided for patients undergoing emergency bowel surgery. For emergency patients, admission to Critical Care is mandated for all patients with a NELA predicted 30-day mortality rate >5% in an attempt to improve outcomes for these most unwell patients. This is an important metric for all UK hospital trusts across the UK and significant deviations should be explicable.

The conduct of Emergency Laparotomy

The presence of senior clinicians (surgeons and anaesthetists) at EL is likely to result in better outcomes. A NELA predicted 30-day mortality rate of 5% or more mandates the presence of a consultant surgeon and consultant anaesthetist: on-call arrangements across the UK stipulate that these on-call clinicians are freed from elective work in order to be able to dedicate their efforts to the management of emergency patients and every hospital should have 24-hour availability of a consultant surgeon and consultant anaesthetist.

Pre-operative optimisation of a patient's condition should be undertaken as far as possible and this is usually supervised by an anaesthetist once it is understood that the patient requires EL. Fluids, oxygen and antibiotics are administered as necessary and support for the circulatory system may be required with the help of certain drugs to boost the blood pressure.

It is likely from pre-operative radiological imaging (ideally with the use of CT scans) that the surgeon knows what to expect when he/she opens the abdomen, usually through a generous midline incision, and will have thought through the initial steps and a plan of action. The priorities at EL for acute colorectal problems include the following:

- confirmation of diagnosis
- control of contamination
- cessation of bleeding
- resection of pathology

Subsequent steps mostly depend upon the findings coupled with the response of the patient to surgery and anaesthesia; this is where collaborative decision-making between surgeon and anaesthetist is crucial. An unstable septic patient who has had peritonitis from a perforated colon, for example, should not have a prolonged heroic operation: once contamination has been dealt with and controlled by copious abdominal washout and removal of the source of the contamination, surgeons and anaesthetists need to be prepared to 'bale out' at this point, the priority being to correct the patient's physiology in a Critical Care environment. Sometimes this will mean leaving the abdomen open (known as a laparostomy) with a view to returning to the operating theatre 24-48 hours later, once the patient is in a more favourable physiological state, in order to do definitive repairs and to control the abdomen.

This is known as Damage Control Surgery and was first implemented several decades ago as a means of managing patients who had sustained severe trauma and remains in common usage in this scenario by civilian and military trauma surgeons. The approach has been successfully adopted by General Surgeons dealing with non-trauma acute abdominal emergencies as has been discussed, as the physiological mayhem which ensues bears many similarities to the trauma situation.

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My main clinical work, expertise, interests and research involve the following:

- bowel (colorectal) cancer
- inflammatory bowel disease (Crohn's disease and ulcerative colitis)
- diverticular disease and diverticulitis
- intestinal ischaemia
- intestinal and abdominal wall failure
- abdominal sepsis, emergency abdominal surgery and the abdominal catastrophe
- proctological disorders, including haemorrhoids, anal fistula, anal fissure

I undertake Clinical Negligence work, preparing medicolegal reports on breach of duty and causation and condition and prognosis. My claimant:defendant split is 80:20. I am prepared to undertake medical examinations. I have undertaken Joint Expert work and I am prepared and trained to appear in Court as necessary. I have obtained the Cardiff University Bond Solon Certificate and I am on the UK Register of Expert Witnesses. During the Covid pandemic I have undertaken remote medicolegal work conducting meetings with solicitors, Counsel and other Experts.

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