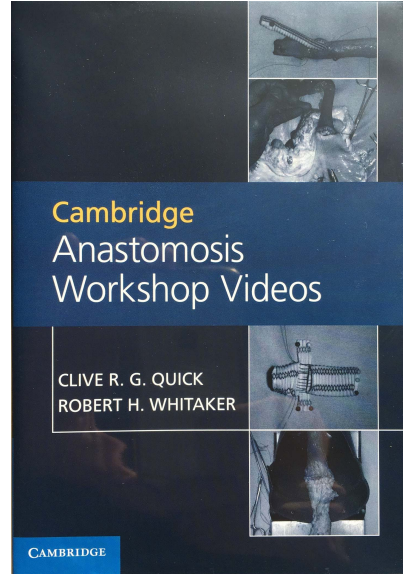




The continuing need for open anastomosis skills training in the laparoscopic era

Clive Quick, Robert Whitaker and Joanna Reed, Cambridge and Colchester UK



Introduction

The ability to fashion technically excellent anastomoses is a fundamental part of the tool kit of most surgeons, including laparoscopic surgeons. Anastomotic leaks (ALs) after gastrointestinal surgery cause substantial morbidity and mortality and poor long-term outcomes. Few studies have been published on leak rates and none has attempted to quantify the role of **surgeon competence**. Even the authoritative 2016 ASGBI review of colorectal anastomosis leakage (1) stated ‘Due to low quality evidence across multiple domains of risk factors, assessment and management of ALs ... it was agreed that formal grading/strength of recommendation would be inappropriate, due to the lack of high quality evidence’

A postoperative leak also negatively impacts **oncologic outcome** in patients undergoing curative resection for colorectal cancer. Studies report morbidity increases between 20% and 30% and mortality increases of 7% to 12%. (1)

The same principles underlie the fashioning of all anastomoses, whether laparoscopic or hand-sewn, and trainees must understand the principles of blood supply, tissue handling, knotting, suture placement and tissue tension. Many bowel anastomoses during laparoscopic surgery are performed **outside the body cavity**, as in open surgery. Increasingly, gastrointestinal, urological and a few vascular anastomoses are performed wholly laparoscopically, but surgical trainees’ are gaining far less experience of carrying out anastomoses because of shortened training, shorter working hours, popular demands for consultant delivered care and increased laparoscopic surgery. We aim to show that realistic training simulations have a greater part to play in the laparoscopic era.

Continuing need for open surgery, particularly in emergency laparotomy

When laparoscopic surgeons have to revert to open surgery because of technical difficulty, haemorrhage or a hostile abdomen, hand-sewing skills are required. The second year report of the NELA audit (2) involving 23,000 operations showed that only 13% of emergency laparotomies were even begun laparoscopically and only 7% were completed laparoscopically. Nearly all emergency laparotomies in England and Wales remain primary open procedures (2), and operating surgeons must be trained and capable of performing such anastomoses.

Anastomotic leakage or dehiscence

- Anastomotic leaks are a major and under-recognised cause of post-surgical morbidity as well as mortality
- They are expensive in terms of harm to patients and hospital expenditure and are often fatal
- The biggest factor in anastomotic leak rate is probably **operator technique**, but authentic figures are impossible to obtain and the available ones are almost certainly an underestimate of the frequency and severity of the complications caused

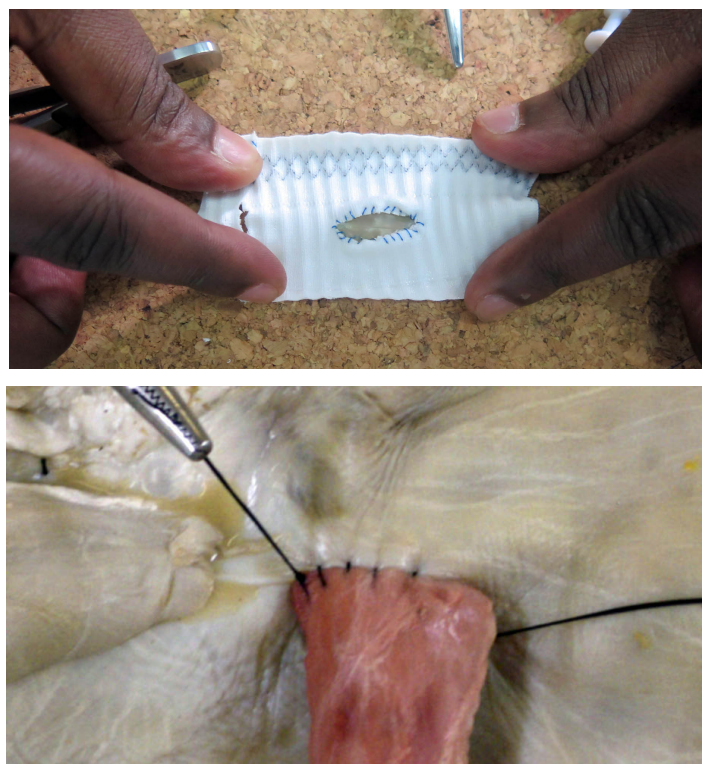
How do surgeons learn appropriately high standards and how to implement them?

Traditionally surgical techniques are learnt by apprenticeship on live patients: watching and assisting a more senior surgeon, then performing part and later all of the operation under supervision, and repeating all of this several times with increasing responsibility given to the trainee. During such live training, the key principles and techniques should be demonstrated and explained. The disadvantages of this approach are:

- Lack of a structured, progressive learning programme
- The whole range of principles and procedures may not be covered because of the vicissitudes of clinical practice
- Patients may be too ill to be ‘practised upon’
- Time constraints may mean the operation needs completing quickly to get the next patient on the table or to finish the list on time
- Not all trainers are good teachers and some have bad or inconsistent habits
- Trainers may not themselves fully understand their methods i.e. their ‘expert systems’ competencies.

The intercollegiate basic surgical skills course

This provides a ‘kick start’ to surgeons wishing to undertake anastomoses but gives them only basic competence; more training and experience is needed to undertake safe anastomoses. The Royal Colleges of Surgeons recognise the effectiveness of lab training for surgical skills and have made several such courses mandatory, including this one. However **advanced practical anastomosis training is not yet mandatory** and the number of advanced courses have declined since their high point 30 years ago



What is needed to teach good, safe and precise advanced anastomosis techniques that can be learnt easily and reliably?

- The trainer must understand the importance of the kinesiology (i.e. studied movement) of surgical techniques
- The baseline principles behind making secure knots, tissue handling and manipulation and use of instruments need to be taught and monitored under controlled lab conditions
- Trainees need to practice a wide range of techniques on life-like animal material in a lab with formative assessment before entering further training during live operations

Training surgical techniques in a lab - the Cambridge Anastomosis Workshop (CAW)

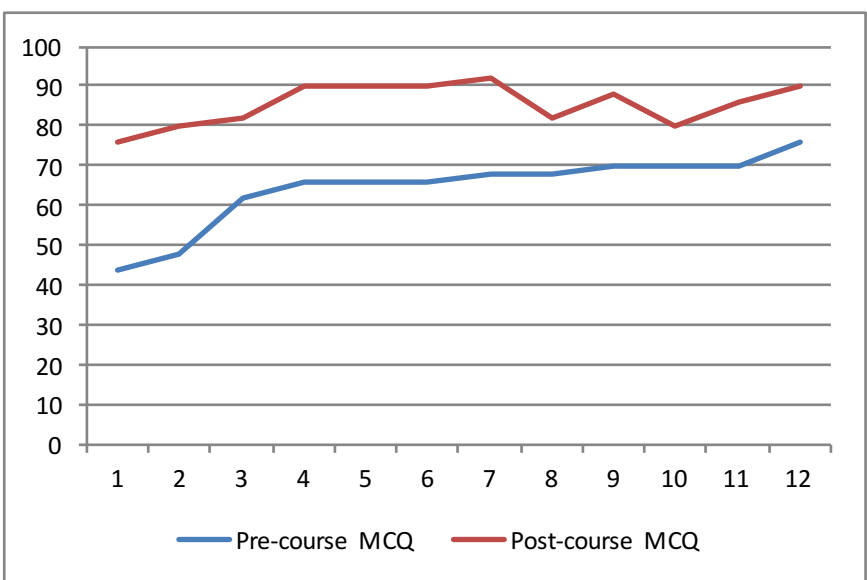
The Cambridge Anastomosis Workshop has run annually since 1983. It is a progressive workshop and has shown its effectiveness in raising standards in surgeons **in the era of open surgery**, as evidenced by direct observation, formal and informal feedback, and latterly by pre- and post-workshop MCQs. The manual and a set of 4 DVDs is published by CUP and is used in the workshop to demonstrate techniques and to act as a reference source.

The CAW is an intensive 4-day workshop that has trained more than 700 surgical trainees and senior gynae-oncologists in a wide range of intermediate-to-advanced open anastomoses of small and large bowel, oesophagus, stomach, blood vessels, bladder and ureter (*see workshop programme, right*).

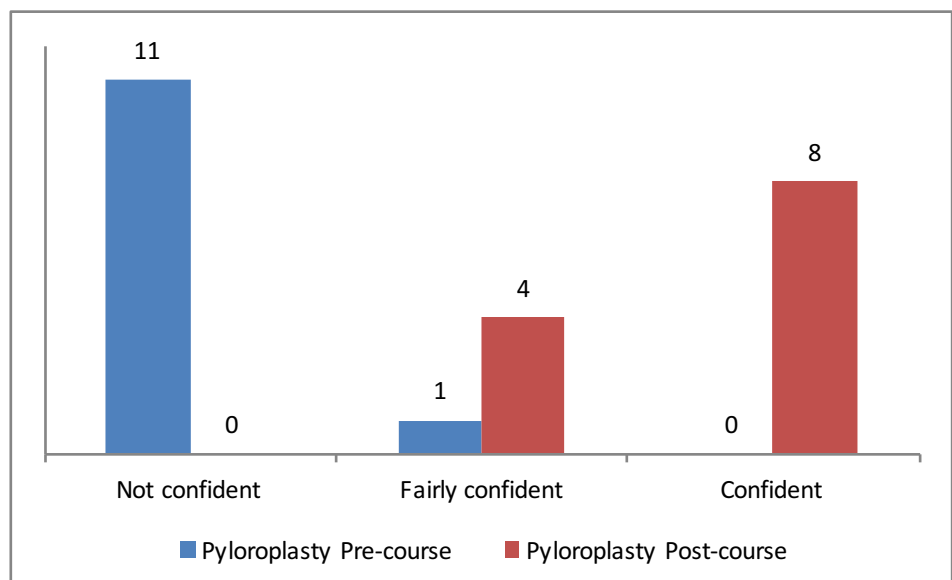
During the workshop, a range of basic skills and anastomoses are first demonstrated individually, then performed under close scrutiny, without time constraints and with real time feedback. More than 20 anastomoses are performed during the four days and a very large experience can be acquired in a short time.

Prepared pig material is a far better substitute for human material than synthetic matter and gives a realistic ‘feel’. Completed anastomoses can be minutely inspected in all facets for defects and faulty technique, including from the luminal surface, and can be tested for integrity under water pressure. Any technique proving difficult can be repeated until mastered.

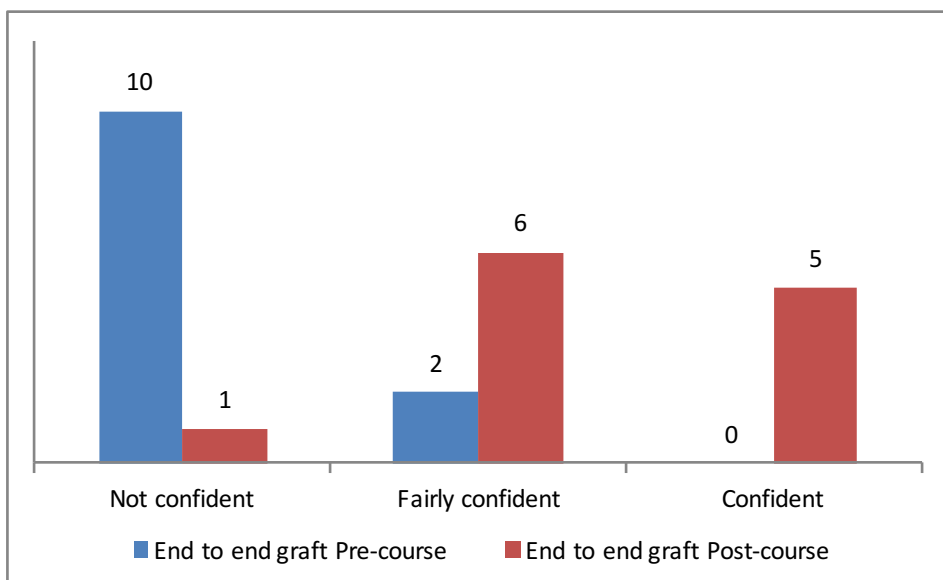
Pre- and post-workshop MCQ and confidence form results



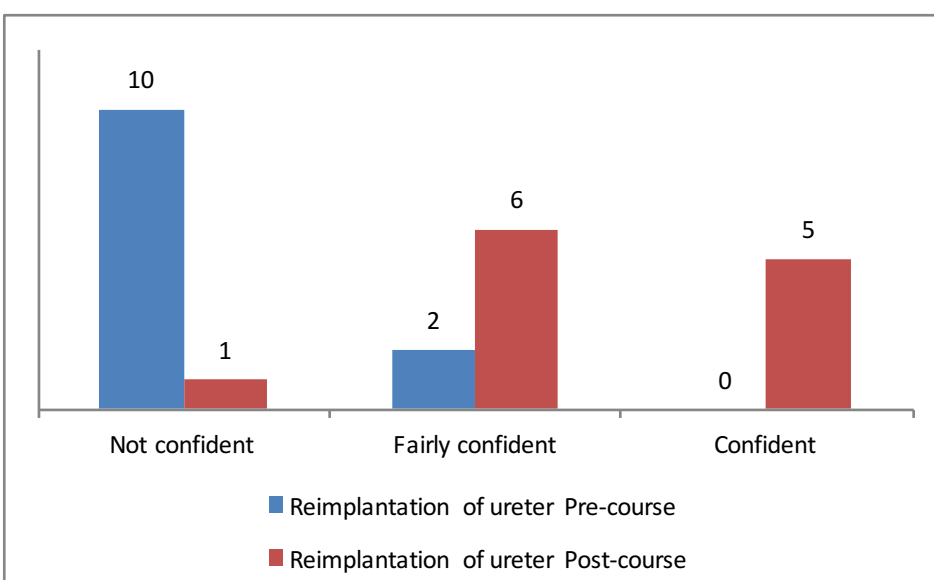
Percentage results from pre- and post-workshop MCQs for trainees 1-12



Pre- and post-workshop confidence in performing pyloroplasty, 12 trainees



Pre- and post-workshop confidence in performing end-to-end arterial anastomosis



Pre- and post-workshop confidence in performing ureteric re-implantation

CAMBRIDGE ANASTOMOSIS WORKSHOP PROGRAMME	
Day 1	BASIC PRINCIPLES
	Knotting
	Using a needle holder
	Precision suturing
	SMALL BOWEL
	End-to-end anastomoses with and without rotation
	Side-to-side anastomosis
	SMALL BOWEL TO COLON
	Hand closure of small bowel end
	Side-to-end SB to colon
	ARTERIAL 1 – PRINCIPLES AND BASIC TECHNIQUES
	Principles of arterial technique
	Closure of arteriotomy
	Patch graft
Day 2	STOMACH & Oesophagus
	Pyloroplasty
	Gastro-enterostomy
	Polya-type gastrectomy
	Gastro-oesophageal anastomosis
	COLORECTAL 1 - Anatomical approaches to colonic surgery
Day 3	COLORECTAL 2
	Low colorectal anastomosis using pelvic simulator
	Principles of stapling
	Low rectal and other stapled anastomoses
	UROLOGY
	Principles
	End-to-end ureteric anastomoses
	Procedures for shortened ureter – bladder hitch & re-implant
	Bladder closure
	Iliac conduit
Day 4	ARTERIAL 2 - GRAFTING
	End-to-end grafting using artery and prosthesis
	End-to-side grafting
	Femoro-popliteal bypass
	Abdominal aortic aneurysm grafting and sac closure

Contact: Clive Quick:
c.r.q@btinternet.com

Outcome measurement

At the start of the workshop, trainees complete forms about themselves, their experience and their **confidence level** for undertaking various anastomoses; they also take an **MCQ exam**. The last two are repeated at the end of the course to provide objective assessments of progress.

Beneficial outcomes in the short term have been determined by showing improved knowledge in the MCQ papers taken before and after the workshop, by recording increased confidence levels after the course for all anastomoses covered, by trainers’ observation of improved understanding and technical ability during the course and by almost universally positive feedback from participants.

Long term comparison of pre- and post- workshop anastomotic leak rates might be instructive but is proving difficult to implement.

Results

- In every courses, all participants bar one have proved technically competent, with very obvious improvements in approach and technique as each course progressed
- Anastomoses could be thoroughly tested by instilling water via a tap or syringe as well as inspecting them minutely by cutting them open. Both methods provided effective visual feedback on the quality of surgery
- Subjectively, the engagement and enjoyment of the trainees is evident. Many comment they’d never experienced a workshop like this and they recognised its value to them.

Conclusions

1. In this laparoscopic era, surgeons need a thorough grounding in basic techniques, and formative training in a range of anastomotic techniques; these are difficult or impossible to learn on patients
2. The surgical principles underlying anastomotic surgery must be mastered to minimise operator incompetence
3. Recognising a good or poorly done anastomosis is the next stage, then knowing what to do to rescue the situation. This has to be taught in a lab, not on a patient
4. There is a change in attitude in many trainees on the workshop towards producing excellent work rather than merely satisfactory
5. We recommend that such courses become mandatory during surgical training to arm future surgeons with the skills they must have, and to reassure the public that they are in safe hands

Comment from participant:

“You have made an indelible mark on surgery with this workshop”

References:

1. PREVENTION, DIAGNOSIS AND MANAGEMENT OF COLORECTAL ANASTOMOTIC LEAKAGE ISSUES IN PROFESSIONAL PRACTICE 2016, F D McDermott, S Arora, J Smith, R J C Steele, G L Carlson and D C Winter (on behalf of the joint ASGBI/ACPGBI Anastomotic Leakage Working Group)
2. The Second Patient Report of the National Emergency Laparotomy Audit (NELA) published July 2016 J Am Coll Surg 2009; 208, Issue 2, pp 269–278