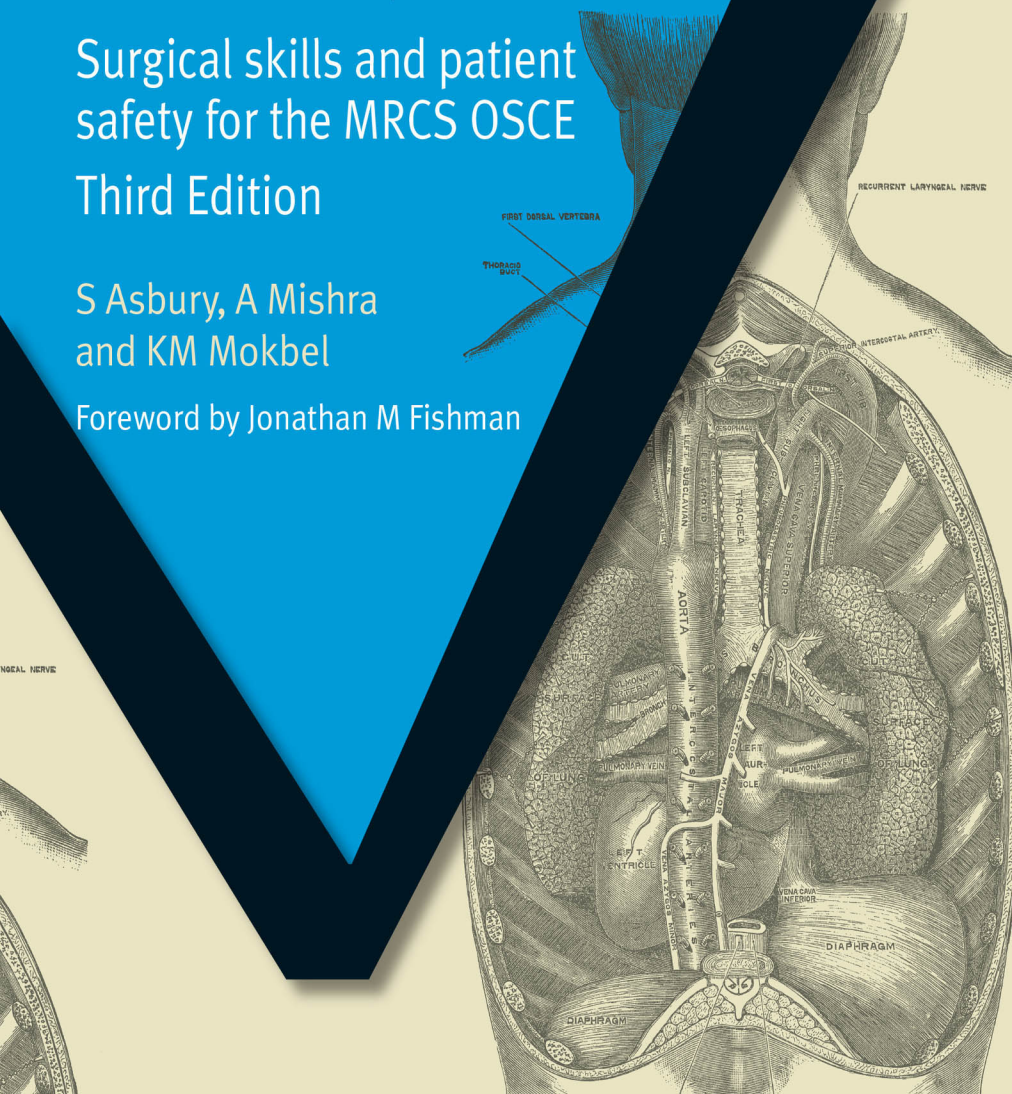


Principles of Operative Surgery

Third Edition

S Asbury, A Mishra
and KM Mokbel

Foreword by Jonathan M Fishman



Principles of Operative Surgery

Surgical skills and patient safety for the MRCS OSCE

Third Edition

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Foreword to the third edition

The MRCS examination has long been regarded as the gold standard, against which all surgeons are assessed. In recent years, there has been a change in the format of the exam from *viva voce* and clinical elements being tested as separate entities, to the creation of a unified Objective Structured Clinical Examination (OSCE), which now forms the MRCS Part B examination. Success in the MRCS Part B examination confers Membership of the Royal College of Surgeons, which is an essential pre-requisite for entry into higher surgical training (ST3 grade and beyond).

The new OSCE exam includes stations that were previously tested in the old-style *viva voce* (including surgical anatomy, surgical pathology, critical care, applied surgical sciences) and clinical examinations (history taking, physical examination skills, communications skills). However, the new OSCE exam also places an increasing emphasis on two key areas that were previously untested in the MRCS examination – namely patient safety and surgical skills – in line with the requirements set by the Postgraduate Medical Education and Training Board (PMETB) and the General Medical Council (GMC).

The authors are to be congratulated on producing an updated version of a highly successful text, which has long been held in high esteem by many previous candidates taking the MRCS exam. This book will form an invaluable aid for those preparing for the OSCE exam, in particular preparing for the patient safety and surgical skills stations, as well as the applied surgical sciences.

It should be borne in mind that assessment of patient safety and surgical skills requires more than just a test of knowledge alone, but also an ability to demonstrate such skills in a simulated or real-life setting. Nonetheless, this book goes a long way to bridging the gap between theory and practice.

Patient safety and surgical skills permeate all aspects of surgical care and practice and their relevance is not just confined to the MRCS exam. This book will form a most useful guide, not just in preparation for the MRCS OSCE exam, but also for higher surgical and further training in general.

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January 2010

Preface to the third edition

The MRCS Viva is, perhaps, the most feared component of the Intercollegiate Membership exam. The candidate has to face his or her examiners, knowing that they can spot a bluff, point out a fault, identify a weak point and single it out. The candidate faces all of this and all against the clock! Seen another way, however, it is an opportunity to interact with those who are examining, to demonstrate intelligence and ability, and to reflect your true working practice in a way that is not possible in a written exam.

In the Viva the examiners have the opportunity to assess the following:

- the candidate's ability to communicate with professional colleagues
- the candidate's ability to comprehend the questions asked, analyse them and answer them logically
- the candidate's ability to make safe clinical decisions
- the candidate's honesty and professional bearing.

It is worth remembering that not having read the latest paper on a condition will not fail a candidate, whereas describing an unsafe practice (or failure to describe safe practice) will.

This book provides an ideal revision guide for preparation for any oral examination in operative surgery. It covers common general surgical operations and other topics much loved by examiners, such as screening, audit and medical statistics, as well as trauma management and life-saving procedures. Various laparoscopic operations and other recent advances in surgery, such as robotics, have also been described.

Many of the topics in this book have been collected from candidates who have sat the MRCS in the last three years, and some have been obtained from examiners who have set the questions.

Many of the questions asked in this book are real questions, and others have been put in as teaching points about the various conditions. The book will be most effective if used with the help of a colleague who can play the role of the examiner.

Although this book has been written primarily for the MRCS examination in the UK, it will undoubtedly be valuable for candidates preparing for undergraduate surgical finals, the certifying examinations of the American Board of General Surgery in the USA, the Australian Fellowship and the Canadian Board examinations.

Good luck!

S Asbury
A Mishra
KM Mokbel
December 2005

Tips for passing the Viva

- Dress smartly but conservatively. Avoid casual jackets, loud suits, club ties (the examiner may belong to a different club...) or short skirts.
- Make sure that your hair is tidy and that you have remembered to shave.
- Appear confident, smile and engage with the examiners. You want to persuade them that you could look after their mother safely and sensibly. Do not antagonise or argue with them.
- Use concise, clear and simple English, in an audible voice.
- When you are asked to describe an operation, use a methodical system for describing your actions. You should be familiar with the operations that you describe, and it is a good idea to get to theatre before the exam to see operations – that way you can visualise each step. The examiner may ask you to omit certain steps, but a practical scheme is as follows.

Preoperative preparation

- 1 Preoperative discussion with the patient and obtaining informed consent.
- 2 Marking the site/side.
- 3 Special measures such as bowel preparation for bowel surgery, stoma nurse input, informing the ITU, antibiotic prophylaxis.

In theatre

- 1 Anaesthetic – local, regional or general.
- 2 Positioning the patient on the table.
- 3 Skin cleansing and drapes.

- 4 Incision (anatomy and layers dissected through).
- 5 Initial assessment of findings.
- 6 Procedure (including recognised difficulties and hazards).
- 7 Haemostasis.
- 8 Drains (if required).
- 9 Closure (including type of suture).

Postoperative care

- 1 Investigations.
- 2 Nursing care.
- 3 Physiotherapy.

- If a question goes badly, do not get downhearted or flustered. You will have at least three questions in each Viva, and two Vivas in front of the same examiners, so there is time to recover and prove yourself! Take a deep breath, answer honestly and move on.



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Acute limb ischaemia

A 74-year-old man attends Accident and Emergency with a letter from his GP telling you that she suspects an acutely ischaemic leg. What signs would you expect to see in the leg?

In an acute presentation, one would expect the limb to be:

- painful
- pale
- pulseless
- paralysed
- paraesthetic
- (perishingly) cold.

What can cause acute ischaemia?

- **Embolus:** most commonly in a previously normal limb.
- **Thrombosis:** as a result of a pre-existing stenosis or aneurysm, or occlusion of a major collateral or arterial bypass graft.
- **Trauma.**

How would you assess the cause in this patient?

First take a history to establish the onset and duration of the current symptoms, any previous peripheral vascular disease or cardiac disease, and risk factors for disease.

Then perform a full examination of the patient, particularly the cardiovascular system, including checking for an aortic aneurysm. Examine the

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affected leg and then compare the appearance, sensation, motor function and pulses with those of the contralateral limb. The level at which pulses become absent in either limb will help to identify the cause of obstruction.

Then perform hand-held Doppler flowmetry to identify pulses that are not palpable.

How would you manage this patient if an embolus was the cause of the ischaemia?

Embolus occlusion is a surgical emergency which requires immediate surgical intervention if the limb is salvageable. Management would be as follows.

- Initial resuscitation with oxygen, judicious intravenous fluids and analgesia.
- Establishing the source of the embolus, checking electrolytes, cardiac enzymes and an ECG, particularly for cardiac abnormalities (e.g. atrial fibrillation).
- Administration of continuous intravenous heparin to prevent thrombus propagation both proximally and distally to the embolus.
- Embolectomy under local or general anaesthesia.

What are the operative principles of an embolectomy?

- The involved artery (usually the femoral artery) is exposed and held by vascular slings. A transverse arteriotomy is made and any extruding clot is removed.
- All bleeding vessels are controlled with clamps or vascular slings.
- A suitable size of Fogarty catheter is selected and the uninflated catheter is passed beyond the site of remaining embolus and extension of thrombus. The catheter balloon is inflated and the catheter is slowly withdrawn through the arteriotomy with the remaining embolus and clot. This manoeuvre is repeated until free flow of blood is achieved.
- The same procedure is performed in the opposite direction.
- The affected foot is observed for a change in colour indicating reperfusion. If there is any doubt, an on-table angiogram can be performed by injecting radio-opaque contrast distally through the arteriotomy.
- Heparinised saline is introduced into the vessels through the arteriotomy, which is then closed with Prolene sutures.

- A small suction drain is left at the site of the arteriotomy to prevent haematoma formation, and the wound is then closed.
- If there has been prolonged or severe ischaemia, fasciotomies should be considered.
- Heparin is continued postoperatively.

If there was residual thrombus in distal vessels, what adjunctive procedure would you use in addition to Fogarty thrombectomy?

Consider intra-operative thrombolysis using a thrombolytic agent such as streptokinase, tPA (tissue plasminogen activator) or urokinase intra-arterially in order to restore patency.

How would you manage this patient postoperatively?

Acute limb ischaemia with femoral embolectomy has a mortality rate of approximately 25% in hospital. Postoperative considerations are as follows:

- continued resuscitation and monitoring of the limb
- identification and treatment of cardiac disease
- physiotherapy for the chest and limb, with early mobilisation
- protection of the limb from pressure sores
- continued anticoagulation with heparin for 7 days, and then warfarin for a further 3 months.

In a similar patient with a threatened limb, angiography indicates a thrombosed popliteal aneurysm. What operation would you wish to perform?

This patient requires a femoropopliteal bypass from the distal superficial femoral artery to the below-knee popliteal artery, provided that these are patent.

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What graft types can be used for a femoropopliteal bypass?

- Native:
 - reversed autogenous long saphenous vein graft (preferred)
 - *in-situ* long saphenous vein graft with valve disrupted with a valvulotome.
- Synthetic:
 - PTFE (polytetrafluoroethylene)
 - Dacron
 - glutaraldehyde-tanned, Dacron-supported, human umbilical vein.

What are the complications of a bypass graft?

- Haemorrhage.
- Wound infection.
- Infection of graft.
- Suture-line aneurysm.
- Graft failure due to thrombosis or pseudointimal fibrous hyperplasia.

Airway management

What are the commonest causes of acute airway obstruction?

Above the larynx

- Maxillo-facial trauma (with subsequent haemorrhage).
- Infection – Ludwig’s angina, Quincke tonsillar abscess, tonsillar hypertrophy.
- Foreign bodies, especially in children.
- Neoplasm of the oropharynx or hypopharynx.

At the level of the larynx

- Laryngeal fracture – rare, but indicated if a patient with a neck injury is hoarse with subcutaneous emphysema and a palpable fracture.
- Infection – acute epiglottitis.
- Laryngeal oedema – smoke inhalation, radiotherapy.

Below the larynx

- Congenital – subglottic stenosis.
- Neck trauma – local haemorrhage causing pressure and deviation of the trachea, transection of the trachea or larynx (unlikely to survive until hospital admission).
- Infection – acute laryngotracheobronchitis.

A decreased conscious level will also prevent the patient from protecting their airway and may cause obstruction due to lax muscles and the absence of airway reflexes.

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How would you initially maintain an airway in a trauma situation?

Ensuring steady immobilisation of the cervical spine, perform a jaw thrust, using the fingers beneath the angle of the mandible to bring it forward. As the tongue has attachments to the mandible, it will be pulled forward and prevent hypopharyngeal obstruction. This position also allows a good seal if performing bag-mask-valve ventilation.

A chin lift, with the fingers below the mandible and the thumb behind the incisors lifting the chin forward, performs the same function.

The airway can also be maintained or augmented using adjuncts, such as an oropharyngeal or nasopharyngeal airway.

Are these definitive airways?

No. A definitive airway is defined as follows:

- the presence of a tube in the trachea with an inflated cuff to prevent aspiration
- the tube secured in place
- the tube attached to an oxygen-rich supply.

Can you name some definitive airways?

- Orotracheal tube.
- Nasotracheal tube.
- Cricothyroidotomy.
- Tracheostomy.

When would you wish to secure a definitive airway?

- For relief of obstruction or impending obstruction.
- For protection of the distal airway from aspiration.
- When there is a requirement for ventilation – apnoea.
- To assist ventilation – hypoxia, cyanosis, decreased consciousness.
- For therapeutic hyperventilation – in cases of raised intracranial pressure.
- For facilitation of transfer.

How would you perform a cricothyroidotomy?

The patient is positioned supine with the neck held immobilised. The cricothyroid membrane lies between the cricoid and thyroid cartilages, where a careful stab incision is made through the cricothyroid membrane using a scalpel.

A curved artery forceps is used to dilate the opening, and a small endotracheal or tracheostomy tube is inserted. Intubation is confirmed by auscultation in both axillae and over the stomach. The tube is secured in place with a dressing.

When might you not wish to perform a cricothyroidotomy?

- A surgical cricothyroidotomy is not recommended for children under 12 years of age. This is because of the risk of damage to the cricoid cartilage, which is the only circumferential support to the paediatric trachea.
- The procedure should ideally be avoided in penetrating neck injuries and in laryngotracheal injuries.



Anastomoses

What is an anastomosis?

The word comes from the Greek words 'ανα', meaning without, and 'στομα', meaning a mouth. It is the joining of one tubular viscus or vessel with another in order to re-establish continued through-flow.

Where are anastomoses found in surgery?

- Gastrointestinal surgery:
 - enterocolostomy
 - colorectal anastomosis
 - Roux-en-Y anastomosis.
- Urology:
 - uretero-ureterostomy
 - ureteric bladder reimplantation.
- Transplant surgery.
- Vascular surgery.
- Plastic surgery: microvascular anastomoses in flap surgery.

What factors are essential for a successful bowel anastomosis?

Local factors

- Good blood supply.
- Inverted anastomosis.
- Accurate apposition with good size approximation.
- Tension-free.

Patient factors

- Good bowel preparation.
- Relief of distal obstruction.

- Adequate resuscitation and maintenance of tissue perfusion and oxygenation.
- Good nutritional status.

Surgical factors

- Avoidance of watershed areas.
- Adequate resection with margins free from disease.
- Adequate mobilisation of bowel.
- Use of familiar technique with appropriate sutures.
- Prevention of stenosis.

What methods of bowel anastomosis do you know?

Hand-sutured method

This uses 2/0 or 3/0 Vicryl or PDS to create an end-to-end or end-to-side anastomosis.

- **Two-layer technique.** A seromuscular suture is placed along the posterior wall of the anastomosis. Next an inner wall layer continuous suture is carried out on both walls of the anastomosis. The anterior seromuscular layer then completes and inverts the anastomosis.
- **One-layer extramucosal suture technique.** This may cause less tissue necrosis or narrowing of the lumen.

Stapled method

- **Linear stapling device (GIA stapler).** This is used to create a side-to-side anastomosis. A small enterostomy is created close to the selected anastomosis site to allow the insertion of the separated stapler's jaws. The two handles of the instrument are then locked together and the push bar is actuated. The two handles are then separated and withdrawn, and the enterostomy holes are closed with Vicryl. The stapler inserts four parallel, linear rows of staples and cuts between the two middle rows.
- **Circular stapling device (e.g. an EEA gun).** This is used to unite bowel end to end. The bowel ends are drawn over the anvil and the cartridge with a purse-string of Prolene. The anvil is approximated to the cartridge and the gun is fired to construct the anastomosis with one or two layers of clips. The gun is opened to separate two ends and twisted to free the anastomosis before the stapling device is withdrawn.

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What complications can occur in these anastomoses?

- Anastomotic leakage.
- Bleeding from the anastomosis site with haematoma formation.
- Stenosis:
 - poor technique or mismatched ends
 - recurrent tumour or disease.

What factors may lead to an anastomotic leakage?

Local factors

- Tension at the anastomosis site.
- Contamination.
- Distal obstruction.

Patient factors

- Nutritional deficiency (especially of vitamin C and zinc).
- Immunosuppression (e.g. due to steroids or malignancy).
- Impaired blood flow.
- Inadequate resuscitation.

Surgical factors

- Poor technique and handling of tissues.
- Defect in suturing or stapling.

When would you suspect a leak?

A leak should be ruled out in any deterioration of a patient who has undergone a recent anastomosis.

This includes:

- unexplained pyrexia
- tachycardia
- prolonged ileus
- gastrointestinal contents at a drain site.