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| **MODULE TITLE:** | **ARTERIAL, VENOUS & LYMPHATIC SYSTEMS** | **7-Nov-2016** |
| **DEVELOPED BY:** | **David Adams, Alan Saunder, Ivan Thompson** | |
| **REVIEWED BY:** | **Alan Saunder (2010) Michael Fink, Damien Mosquera, Alan Saunder, Kellee Slater, Tom Wilson (2013). Gabriella Vasica (2016).** | |

**Module Rationale and Objectives**

The general surgeon is expected to be able to assess and manage commonly occurring vascular diseases that can occur as a single entity, or as a co-morbidity or complication associated with other diseases. They also expected to be able to recognise the need and appropriate time to refer such patients to other professionals.

The graduating trainee will be able to:

- describe common surgical pathologies of atherosclerosis, acute ischaemia and reperfusion injury, aneurysmal disease, systemic complications of diabetic disease, venous insufficiency, and thrombosis
- identify and recognise the symptoms and signs of these conditions
- describe and select appropriate diagnostic testing
- identify appropriate treatment options, and their indications and contraindications
- recognise, assess and treat any common vascular conditions likely to be encountered in consultative general surgical practice
- dissect and expose the abdominal aorta and all major peripheral blood vessels
- select appropriate investigative tools and monitoring techniques in a cost-effective and useful manner recognising risks and complications of their use
- appraise and interpret investigative imaging against patient's needs
- understand risks and benefits of common vascular medications
- recognise which conditions to refer on to a specialised vascular service
- acknowledge their own limitations
- communicate information to patients (and their family) about procedures, outcomes, and risks associated with surgery in ways that encourage their participation in informed decision making (consent)

**Anatomy, Physiology, Pathology**

Trainees should have thorough knowledge of the normal embryology, anatomy, physiology, and pathology, of:

- arterial
- venous
- lymphatic systems

**Suggested Reading**

Trainees who are preparing to sit the Generic and Clinical Examinations need to refer to the recommended reading list on the RACS website at www.surgeons.org

For the Fellowship examination, there are no prescribed texts.

Trainees are expected to keep abreast of the current literature, including textbooks, journal articles, consensus guidelines and other on-line resources.

**Learning Opportunities and Methods**

If state-based and/or local hospital courses/meetings are available, trainees are strongly advised to avail themselves of these opportunities. This also includes practising procedures on simulation equipment where applicable.

Trainees are encouraged to present their research at national and/or accredited regional training days, in order to fulfil the research requirement.

Trainees are encouraged to gain exposure to vascular surgery when available.

**How this module will be assessed**

The Generic and Clinical Examinations; Fellowship examination (written and viva voce sections); Trainee evaluation forms and logbooks; SEAM (where applicable).

**Definitions**

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| *Operative Management - Knows:* | Trainees are required to be familiar with the indications, benefits and limitations of the procedure; trainees should be able to describe the relevant operative techniques involved in performing the procedure; trainees are encouraged to at least observe and preferably assist in these procedures. |
| *Operative Management - Does:* | In addition to the above, trainees must be competent at performing the procedure. |

| SET LEVEL | MEDICAL EXPERTISE | JUDGEMENT / CLINICAL DECISION MAKING | | | TECHNICAL EXPERTISE | |
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| | ANATOMY PHYSIOLOGY PATHOLOGY | CLINICAL ASSESSMENT | INVESTIGATIONS | PRINCIPLES OF MANAGEMENT | OPERATIVE MANAGEMENT - KNOWS - | OPERATIVE MANAGEMENT - DOES - |
| **Acute ischaemia** | | | | | | |
| Early SET | ▪ Outline pathological causes of acute ischemia<br>▪ Describe the local and systemic effects of acute ischemia<br>▪ Outline mechanisms of trauma that lead to vascular injury and/or haemorrhage | ▪ Identify the medical conditions that contribute to or arise from vascular disease<br>▪ Recognising when it is safe to manage conservatively, at least initially<br>▪ Appreciate clinical assessments of limb viability and the features of compartment syndrome requiring urgent intervention | ▪ Review the relevance of non-invasive and invasive imaging<br>▪ Recognise which limbs require prompt treatment and no investigation | ▪ Implement emergency treatment | | ▪ Fasciotomy<br>- leg |
| Mid SET | ▪ Outline the anatomical points of access for treatment of acute ischemia<br>▪ Understand the mechanisms of reperfusion phenomena | | | ▪ Formulate multimodality therapy including:<br>- medical<br>- radiological<br>- surgical treatment<br>▪ Recognise indications and complications of thrombolysis | ▪ Appreciate the role of endovascular treatment including thrombolysis<br>▪ Embolectomy:<br>- brachial<br>- femoral | |
| **Peripheral vascular disease (chronic)** | | | | | | |
| Early SET | ▪ Outline causes and anatomical distribution of arterial lesions causing chronic ischaemia | ▪ Identify vascular risk factors, differential diagnoses, and conditions arising from vascular disease<br>▪ Review the clinical features in the history and the examination findings including ABPI | ▪ Appreciate relative roles of non-invasive versus invasive imaging<br>▪ Review appropriate investigations to plan risk factor management | ▪ Advocate correction of personal risk factors of lifestyle change to improve results of all treatment | | |
| Mid SET | ▪ Outline the local pathological sequelae of chronic ischaemia and appreciate the systemic conditions that contribute to the chronic limb ischemia | ▪ Be able to take a comprehensive history and examination of all arterial risk factors | | ▪ Formulate multimodality therapy including:<br>- medical<br>- radiological<br>- surgical treatment<br>▪ Recognise indications for conservative versus interventional treatment<br>▪ Differentiate between radiological and surgical options and discuss their limitations | ▪ Peripheral vascular reconstruction/ bypass procedures<br>▪ Dissection and isolation of vessels in the groin<br>▪ Arterial anastomosis<br>▪ Arteriotomy closure | ▪ Below knee amputation<br>▪ Above knee amputation |

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| **Aneurysmal disease** | | | | | | |
| Early SET | ▪ Recognise the common sites of aneurysmal disease<br>▪ Outline pathological basis of abdominal aortic aneurysmal disease<br>▪ Review pathophysiological sequelae of aneurysmal disease<br>▪ Differentiate between true and false aneurysm | ▪ Identify and recognise the symptoms, signs, and differential diagnoses of ruptured intra abdominal aneurysm<br>▪ Assess for presence of peripheral aneurysm | ▪ Review the relevance of non-invasive and invasive imaging | ▪ Justify screening for aortic aneurysm | | |
| Mid SET | ▪ Outline anatomical and pathophysiological features that may exclude aneurysmal repair | ▪ Identify the clinical characteristics and complications of aneurysms that require treatment | | ▪ Discuss/describe:<br>- indications for treatment of AAA<br>- management of incidentally identified aneurysm<br>- impact of concomitant medical conditions on management in elective and emergent situations<br>- endoluminal and open techniques for AAA repair<br>▪ Define role of conservative management of AAA<br>▪ Formulate the management AAA in the presence of other intra-abdominal pathologies<br>▪ Complications of AAA repair:<br>- colonic ischaemia | ▪ Exposure of aorta and Common iliac arteries | |
| Late SET | | | | | ▪ Repair of AAA<br>▪ Clamp neck of AAA | |
| **Diabetic vascular disease** | | | | | | |
| Early SET | ▪ Outline the pathophysiological effects of diabetes on the vascular system and the foot | ▪ Review the clinical presentation of diabetic foot disease including:<br>- ulceration<br>- digital gangrene<br>- sepsis<br>▪ Discuss the application and limitation of ABPI in diabetic disease<br>▪ Aggressive approach to diabetic foot care, importance of early recognition of at risk and prevention | ▪ Review the relevance of non-invasive and invasive imaging | ▪ Describe:<br>- general medical management of diabetes<br>- care of diabetic foot/limb<br>- indications for and level of amputation<br>- multidisciplinary approach to diabetic foot disease | ▪ Role of primary closure versus secondary healing | ▪ Digital amputations |

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| **Diabetic vascular disease (continued)** | | | | | | |
| Mid SET | ▪ Describe the relative effect of neuropathy versus vasculopathy | ▪ Recognise clinical features of diabetic neuropathy | | ▪ Revascularisation procedures<br>▪ Role of “off-loading “strategies | ▪ Appreciate appropriate application of Negative Pressure Wound Therapy (NPWT)<br>▪ Transmetatarsal amputations | |
| **Vascular access** | | | | | | |
| Early SET | ▪ Outline the anatomy of vessels used for central vascular access (venous only) | ▪ Evaluate access site suitability | ▪ Assess clinical tests for adequacy of blood supply and describe the place of imaging | ▪ Protection of future vascular access sites | | ▪ Central line insertion |
| Mid SET | ▪ Outline the anatomy of arteries and veins used for haemodialysis access | ▪ Clinical testing of access sites | | ▪ Review indications for establishing vascular access<br>▪ Discuss the relative merits of vascular versus peritoneal dialysis techniques; **See also Transplant Module**<br>▪ Discuss the complications of access procedures and their management | ▪ Arterio-venous anastomosis<br>▪ Portacath and/or Hickman's insertion (including complications of CVL insertion) | |
| Late SET | | | | | ▪ Arterio venous graft access techniques | |
| **Venous disease (including varicose veins)** | | | | | | |
| Early SET | ▪ Outline the underlying causes<br>▪ Describe the anatomy of the deep, superficial and perforating venous systems<br>▪ Define the pathophysiology of venous ulceration | ▪ Review the clinical features in the history and the examination findings<br>▪ Appreciate the limitations of clinical assessment<br>▪ Exclude concomitant arterial disease | ▪ Discuss the role of duplex in assessing venous disease<br>▪ ABIs in venous ulcer assessment | ▪ List and evaluate the modalities available for treatment of varicose veins<br>▪ Discuss the role of compression therapy in venous disease<br>▪ Review various operative techniques<br>▪ Consider non vascular aetiologies of ulceration; **See also Skin & Soft Tissue Module** | ▪ Varicose vein surgery | |
| Mid SET | | | | ▪ Explain/perform the treatment of complications of chronic venous stasis | | |
| Late SET | | | | | ▪ Operations for recurrent varicose veins | |

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| **Thrombo-embolic disease (DVT and PE)** | | | | | | |
| Early SET | ▪ Outline pathophysiology of VTE<br>▪ Summarise the causes of hypercoagulable states | ▪ Review the clinical features of lower limb DVT<br>▪ Describe presentation of axillary vein thrombosis<br>▪ Australasian guidelines on prevention and treatment of DVT/PE<br>▪ Contraindications to anticoagulation and how this is managed | ▪ Review the place of medical imaging and relevant laboratory investigations | ▪ Evaluate methods of thromboprophylaxis and risk assessment/stratification of DVT formation<br>▪ Describe:<br>- emergency treatment<br>- indications for anticoagulation and thrombolysis<br>▪ Evaluate the role of radiological intervention and surgery for DVT | | |
| **Superficial thrombophlebitis** | | | | | | |
| Early SET | ▪ Outline pathophysiology<br>▪ Summarise the cause of hypercoagulable states | ▪ Review the clinical features of lower limb SVT | ▪ Review the place of medical imaging and relevant laboratory investigations | ▪ Discuss management options | ▪ High saphenous ligations | |
| **Mesenteric ischaemia**<br>**▪ acute** | | | | | | |
| Early SET | ▪ Outline relevant anatomy, and pathophysiology | ▪ Differentiate the clinical features of acute and chronic mesenteric ischaemia | ▪ Review laboratory investigations and place of medical imaging | ▪ Review the:<br>- importance of early recognition<br>- recognition of associated medical conditions<br>- medical and surgical therapy options | ▪ Laparotomy<br>- resection of nonviable bowel | |
| Late SET | | | | | ▪ Mesenteric embolectomy/ revascularisation procedures | ▪ Role of secondary laparotomy<br>▪ Laparotomy<br>▪ Resection of nonviable bowel |
| **Vascular trauma** | | | | | | |
| Early SET | ▪ Describe the anatomy of vessels most vulnerable to trauma, including iatrogenic | ▪ Recognise common patterns of vascular injury<br>▪ Differentiate hard and soft signs of vascular injury | ▪ Indications for investigations, combination injures<br>▪ Interpret relevant investigations<br>▪ Recognise relevance or timing of investigations versus immediate surgery | | | |

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| **Vascular trauma (continued)** | | | | | | |
| Mid SET | | | | ▪ Outline methods of vascular repair<br>▪ Describe an approach to stab injuries to neck, groin and upper limbs<br>▪ Appraise approaches to and management of thoracic injuries including widened mediastinum | ▪ Exposure of major abdominal vessels | |
| **Lymphatic disease** | | | | | | |
| Early SET | ▪ Delineate normal anatomy, embryology and function | | | | | |
| Mid SET | ▪ Identify the etiology and pathogenesis of lymphodema and lymphocele<br>▪ Understand microbiology of cellulitis in lymphedematous limbs | ▪ Assessment and differential diagnosis of the swollen limb, especially the unilateral | | ▪ Describe conservative management options and prevention; **See also Breast Module**<br>▪ Manage complications of lymphatic disease, especially cellulitis | | |
| **Variant anatomy and non-anatomical reconstruction** | | | | | | |
| Mid SET | ▪ Describe common vascular anomalies and their surgical relevance | | | ▪ Explain the surgical implications of non-anatomic reconstruction | | |