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General Surgery - Topic 6 - Surgical infections

Surgical Infections

- A surgical infection affects a wound, an operated organ, an implant or another site that may require surgical treatment.

Definitions and Routes of Infection

- **Contamination** means that microbes are present, while **infection** means that they invade or multiply with a harmful host response.
- Colonisation of a wound or device does not always require antibiotics.
- Microbes can enter from the patient's skin or gut, an infected organ, the environment or contaminated equipment.
- Bloodstream spread can infect a distant surgical site or implant.

Organisms and Predisposing Factors

Likely Organisms

- Staphylococcus aureus and streptococci are important causes of skin and soft-tissue infection.
- Enteric Gram-negative organisms and anaerobes are important after bowel contamination.
- The likely flora after urinary, biliary or respiratory procedures depend on the organ, obstruction and previous treatment.
- Hospital exposure, previous antibiotics and known colonisation can increase the risk of resistant organisms.
- Diabetes, immune suppression or prolonged intensive care may broaden the range of relevant pathogens.

Setting	Important likely organisms
A clean skin incision or soft-tissue abscess	Staphylococci and streptococci are important.
Bowel spillage or an intra-abdominal collection	Enteric Gram-negative organisms and anaerobes are important.
An infected implant	Staphylococci, including coagulase-negative species, may form biofilm.
A hospital-acquired or previously treated infection	The local resistance pattern and earlier cultures become especially important.

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Host and Local Factors

- Poor perfusion reduces oxygen delivery, immune function and antibiotic delivery to tissue.
- Dead tissue, haematoma, foreign material and obstructed drainage favour microbial growth.
- Malnutrition, poor glucose control, obesity, smoking and immune suppression can increase risk.
- A long procedure, unnecessary tissue trauma, hypothermia and breaks in asepsis can increase surgical-site infection risk.

Biofilm and Implant Infection

- A biofilm is a community of microbes attached to a surface within a protective matrix.
- Biofilms can form on prostheses, sutures and catheters and make infection difficult to eradicate with antibiotics alone.
- Treatment may require removal, exchange or carefully selected retention of the device with specialist management.

Patterns of Infection

1. Cellulitis and Abscess

A. Cellulitis

- Cellulitis is a spreading infection of the skin and subcutaneous tissue without a defined pus cavity.
- Diffuse erythema, warmth and tenderness are typical, while fluctuation suggests an associated collection.

B. Abscess

- An abscess is a localised collection of pus that usually needs drainage.
- An abscess may coexist with surrounding cellulitis, so both source control and antibiotics may be needed.

2. Surgical-Site Infection

A. Superficial Incisional Infection

- A superficial incisional infection affects the skin and subcutaneous tissue of the incision.
- Local pain, erythema or purulent drainage may be present, but the wound still needs assessment for deeper involvement.

B. Deep Incisional Infection

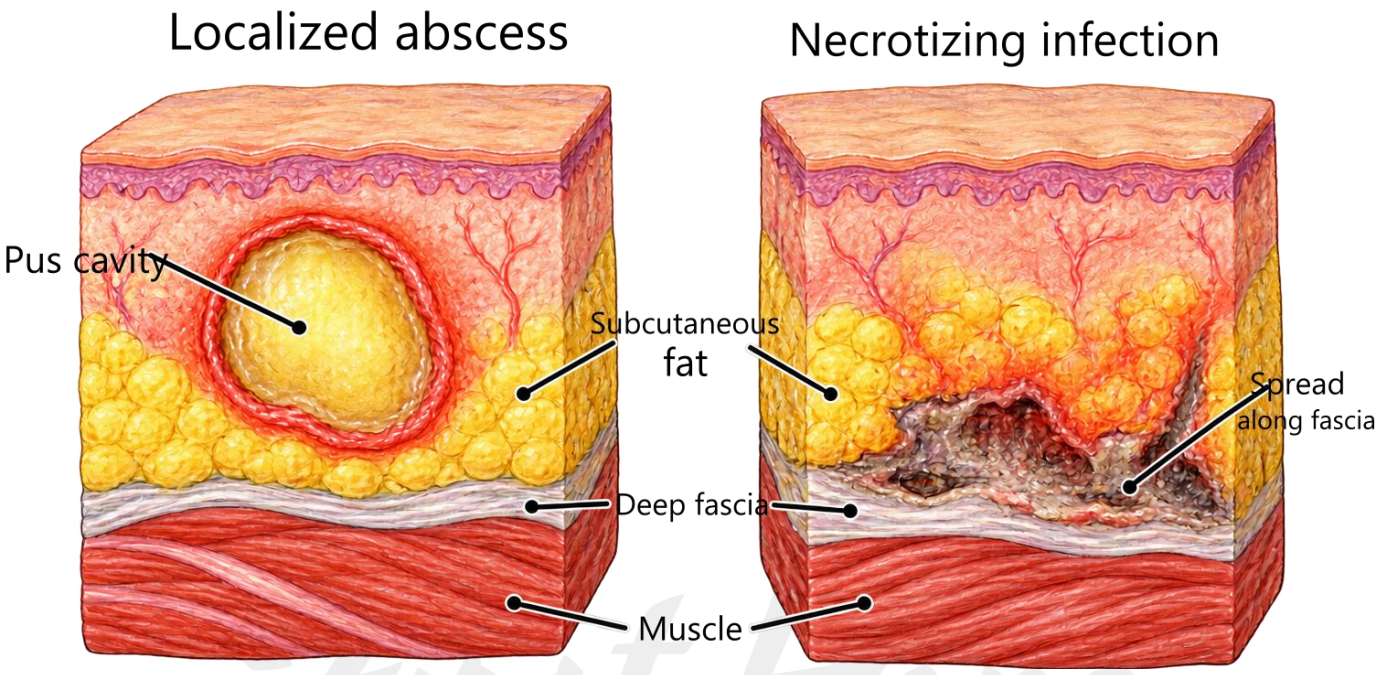
- A deep incisional infection involves deeper soft tissues such as fascia or muscle.
- Deep tenderness, wound separation or systemic illness may require imaging and operative assessment.

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C. Organ-Space Infection

- An organ-space infection affects an operated anatomical space or organ beyond the incision.
- A clean-looking skin incision does not exclude a deep collection or an anastomotic leak.

3. Necrotising Infection



A localised abscess forms a pus cavity, while a necrotising infection spreads through deeper tissue planes

- A necrotising soft-tissue infection spreads rapidly through deeper tissue and causes tissue death.
- It can be polymicrobial or caused by a single aggressive organism such as group A streptococcus.
- Fournier gangrene is a necrotising infection involving the perineal or genital region.
- Clostridial myonecrosis damages muscle and can cause severe toxicity and gas formation.

Recognition and Treatment

History and Examination

History and Predisposing Risks

- Ask about the operation, wound or injury, onset of symptoms, discharge, fever and progression of pain.
- Record antibiotics, allergies, previous resistant organisms and immune or vascular risk factors.

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Wound, Severity and Alternative Diagnoses

- Examine the wound and look for fluctuance, spreading erythema, discharge, tenderness and tissue viability.
- Assess vital signs, consciousness, capillary refill, urine output and other evidence of organ dysfunction.
- Consider alternative diagnoses such as a haematoma, contact dermatitis or venous thrombosis.

Danger Signs

- Severe pain out of proportion to visible findings can be an early sign of necrotising infection.
- Rapid progression, skin discolouration, bullae, crepitus, reduced sensation or systemic toxicity require urgent escalation.
- Absence of gas or fever does not exclude a serious deep infection.
- A low laboratory risk score cannot safely rule out necrotising infection when clinical suspicion is high.
- Hypotension, confusion, oliguria or rising lactate may indicate sepsis-associated organ dysfunction.

Investigations

Laboratory Tests and Microbial Sampling

- Obtain blood count, renal function, electrolytes, glucose and lactate when the severity warrants them.
- Collect blood cultures in suspected sepsis and send a suitable deep specimen or pus sample from the infected site.
- Take cultures before antibiotics when this will not substantially delay urgent treatment.

Imaging, Urgent Surgery and Interpretation

- Ultrasound can identify a superficial collection, while CT may help define a deep collection or an organ-space source.
- Imaging must not delay urgent exploration when necrotising infection is strongly suspected.
- Interpret microbial growth alongside the sampling method and clinical features because contamination can mislead.

The Three Treatment Priorities

1. Resuscitation and Organ Support

- Treat airway, breathing and circulation problems while obtaining urgent surgical and anaesthetic help.

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- Give oxygen for hypoxaemia and provide intravenous fluid guided by perfusion and the risk of overload.
- Septic shock requires urgent antimicrobial treatment, source control and vasopressor support when indicated.
- Monitor glucose, renal function, urine output and the response to treatment.

2. Source Control

Drainage, Debridement and Device Removal

- Drain pus, debride dead tissue, relieve an infected obstruction and repair or divert a leaking viscus when necessary.
- An infected device may need removal or exchange after specialist assessment.

Abscesses and Necrotising Infection

- A small uncomplicated cutaneous abscess may be treated by drainage, with antibiotics selected according to risk and clinical severity.
- Antibiotics alone are often inadequate when there is a significant undrained collection.
- Necrotising infection needs immediate operative debridement and planned reassessment for further surgery.

3. Appropriate Antimicrobial Treatment

- Choose initial treatment according to the suspected source, severity, likely organisms, prior cultures and local resistance patterns.
- Use intravenous treatment when severe illness, poor absorption or the infection site requires it.
- Adjust the dose for renal function, body size and relevant drug interactions.
- Review cultures and clinical response to narrow treatment, change the route or stop unnecessary antibiotics.

Examples of Therapeutic Choices

Clinical setting	Treatment principle
Non-purulent cellulitis without severe illness	Use an agent active against the likely streptococci and susceptible staphylococci.
A purulent abscess	Drain the collection and add suitable antibiotics when systemic illness, surrounding infection or host risk warrants them.
Severe polymicrobial necrotising infection	Urgent surgery is combined with broad intravenous Gram-positive, Gram-negative and anaerobic coverage.

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