Native Vertebral Osteomyelitis and Discitis in Adults - Microbiology Full Clinical Guideline

Reference number: CG-ANTI/2022/015

Introduction

- The infective and inflammatory processes, mediated by microorganisms on the vertebrae and intervertebral discs, coalesce in the terms vertebral osteomyelitis and discitis, respectively.
- The commonest cause of vertebral osteomyelitis and discitis is *Staphylococcus aureus*.
- *Streptococcus* species, *Enterobacteriaceae* (e.g. *Escherichia coli*), and *Enterococcus* species are other causes.
- The pathogens of vertebral osteomyelitis and discitis are most commonly inoculated through a haematogenous mechanism of transmission. Another focus of infection (e.g. infective endocarditis, urinary tract infection) culminates in bacteraemia; the microorganism disseminates via the blood and inoculates the vertebrae and intervertebral discs.
- Less commonly, inoculation is via local metastasis from infections of the bowel, oesophagus, and aorta; a contiguous mechanism of transmission.
- The pathogens of vertebral osteomyelitis and discitis can also be inoculated directly via spinal procedures, surgery, and trauma; iatrogenic and traumatic mechanisms of transmission.

Differential diagnosis

- The symptoms and signs of vertebral osteomyelitis and discitis can be mimicked by other pathologies.
- Other infectious diseases and non-microbial mimickers include:
    - Spinal epidural abscess; psoas abscess; and
    - Degenerative spine disease; herniated/prolapsed/slipped disc; metastatic tumours; vertebral compression fracture.

Investigation

Radiology

- Clinical suspicion of vertebral osteomyelitis and discitis warrants radiological investigation:
    - Magnetic resonance imaging (MRI) of the spine is first line.
    - If MRI is contraindicated, collaborate with the consultant radiologist with regard to second and third line imaging modalities.

Microbiology

- Symptoms, signs, and/or radiological features of vertebral osteomyelitis and discitis also necessitates microbiology investigation:
    - Biopsy. With the range of Gram positive and Gram negative bacterial pathogens, variations in resistance and susceptibility profiles, variable antibiotic bone penetration, contraindications, side-effects, and with prolonged durations of weeks to months of antimicrobial chemotherapy:
        - Fluoroscopic guided biopsy in theatre or computed tomography (CT) guided biopsy is integral to best practice:

        - Sample for microscopy, culture (bacterial, ± mycobacterial, and fungal), and susceptibilities (MC&S).
    - Blood cultures x 2-3.
    - Methicillin resistant *Staphylococcus aureus* (MRSA) screen.
    - Urine for MC&S.

Histology

- With the differential diagnosis including both infectious and non-infectious mimickers:
    - Biopsy specimen also for histopathologist review.

Blood sciences

- Full blood count (FBC), C reactive protein (CRP), erythrocyte sedimentation rate (ESR), lactate, urea and electrolytes (U&Es), and liver function tests (LFTs).

Treatment

Surgical intervention

- Complications of vertebral osteomyelitis and discitis may include bony collapse and posterior/anterior/lateral extension; with neurological impairment.
- In general, early discussion with the spinal registrar/consultant on call is recommended.
- Immediate discussion with the spinal registrar/consultant on call is required if there are neurological deficits and/or spinal cord compression (threatened or actual).

Empiric, intravenous antibiotics: clinically stable

- If the patient is clinically stable:
    - Start empiric, intravenous antibiotics after the biopsy (or after blood culture positivity, etc.):
        - First line:
            - Co-amoxiclav 1.2 g 8 hourly; **±**
            - If there are clinical concerns regarding the risk of MRSA, glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
        - Second line, if non-immediate without systemic involvement penicillin allergy:
            - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l; **and**
            - Ceftriaxone 2 g 24 hourly.
        - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
            - Ciprofloxacin 400 mg 12 hourly; **and**
            - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.

Empiric, intravenous antibiotics: clinically unstable

- If the patient is clinically unstable (e.g. progressive/severe neurologic stigmata, haemodynamic instability, sepsis, or septic shock):
    - Start empiric intravenous antibiotics before the biopsy:
        - First line:
            - Piperacillin tazobactam 4.5 g 8 hourly; **±**
            - If there are clinical concerns regarding the risk of MRSA, glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
        - Second line, if non-immediate without systemic involvement penicillin allergy:
            - Metronidazole 500 mg 8 hourly; and
            - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l; **and**
            - Ceftazidime 1 g 8 hourly.
        - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
            - Metronidazole 500 mg 8 hourly; and
            - Ciprofloxacin 400 mg 12 hourly; and
            - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.

Directed, intravenous antibiotics (with susceptibilities); no implant/metalwork in situ

- Methicillin susceptible *Staphylococcus aureus* (MSSA), according to susceptibilities:
    - First line:
        - Flucloxacillin 2 g 6 hourly.
    - Second line, if non-immediate without systemic involvement penicillin allergy:
        - Cefuroxime 1.5 g 8 hourly.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
- Methicillin resistant *Staphylococcus aureus* (MRSA), according to susceptibilities:
    - First line:
        - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
    - Second line:
        - Daptomycin 6 mg/kg 24 hourly.
    - Third line:
        - Linezolid* 600 mg 12 hourly (or per oral [absorption 100%]).
    - * In general, maximum duration of treatment 28 days.
- *Streptococcus* species, according to susceptibilities:
    - First line:

        - Benzylpenicillin 2.4 g 6 hourly.
    - Second line, if non-immediate without systemic involvement penicillin allergy:
        - Ceftriaxone 2 g 24 hourly.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
- *Enterobacteriaceae* (e.g. *Escherichia coli*), according to susceptibilities:
    - First line:
        - Penicillin; narrowest spectrum of amoxicillin or co-amoxiclav or piperacillin tazobactam standard dosage.
    - Second line, if non-immediate without systemic involvement penicillin allergy:
        - Cephalosporin; narrowest spectrum of cefuroxime or ceftriaxone standard dosage.
    - Third line, if immediate rapidly evolving or non-immediate with systemic involvement penicillin allergy:
        - Co-trimoxazole 960 mg 12 hourly; **or**
        - Ciprofloxacin 500 mg 12 hourly.
- *Enterococcus* species, according to susceptibilities:
    - First line:
        - Amoxicillin 1 g 6 hourly.
    - Second line:
        - Glycopeptide (vancomycin or teicoplanin), dose as per hospital guidelines, vancomycin target pre dose level 15-20 mg/l, teicoplanin target pre dose level 20-40 mg/l.
    - Third line:
        - Daptomycin 6 mg/kg 24 hourly.

Intravenous to per oral step down, or outpatient parenteral antimicrobial therapy

- After 7-14 days of intravenous antimicrobial chemotherapy, if the patient is afebrile, observations stable, and inflammatory markers downward trending, collaborate with the physician, surgeon, and/or microbiology consultant regarding (i) per oral step down, or (ii) outpatient parenteral antimicrobial therapy (OPAT).
- After 7-14 days of intravenous antimicrobial chemotherapy, if the patient is febrile, observations unstable, and/or inflammatory markers upward trending, collaborate with the physician, surgeon, and/or microbiology consultant regarding investigation and continue intravenous therapy.

Directed, per oral antibiotics (with susceptibilities); no implant/metalwork in situ

- *Staphylococcus aureus*, according to susceptibilities:
    - First line:
        - Ciprofloxacin 500-750** mg 12 hourly; and
        - Rifampicin 300-450** mg 12 hourly.
    - Second line:
        - Clindamycin 300-450** mg 6 hourly; and
        - Rifampicin 300-450** mg 12 hourly.
    - Third line:
        - Doxycycline 100 mg 12 hourly; and

        - Rifampicin 300-450** mg 12 hourly.
- *Streptococcus* species, according to susceptibilities:
    - First line:
        - Amoxicillin 500 mg-1** g 8 hourly.
    - Second line:
        - Clindamycin 300-450** mg 6 hourly.
    - Third line:
        - Doxycycline 100 mg 12 hourly.
- *Enterobacteriaceae* (e.g. *Escherichia coli*), according to susceptibilities:
    - First line:
        - Ciprofloxacin 500 mg 12 hourly.
    - Second line:
        - Co-trimoxazole 960 mg 12 hourly.
    - Third line:
        - Penicillin; narrowest spectrum of:
            - Amoxicillin 1 g 8 hourly; **or**
            - Co-amoxiclav 625 mg 8 hourly plus amoxicillin 500 mg 8 hourly.
- *Enterococcus* species, according to susceptibilities:
    - First line:
        - Amoxicillin 1 g 8 hourly.
    - Second line:
        - Linezolid* 600 mg 12 hourly.
    - Third line:
        - Co-trimoxazole 960 mg 12 hourly.
    - * In general, maximum duration of treatment 28 days.
- ** Final dosage to be tailored to specific parameters of the patient (e.g. weight) and the pathogen (e.g. minimum inhibitory concentration) in collaboration with the microbiology consultant responsible for sterile site investigation or within a microbiology/orthopaedic multi-disciplinary meeting.

Directed, outpatient parenteral antibiotic treatment

- Collaborate with the OPAT consultant.

Empiric, per oral or outpatient parenteral antibiotic treatment

- If there is a diagnosis of vertebral osteomyelitis and discitis, and if the microbiology is negative, collaborate with a microbiologist regarding empiric options.

Duration; no implant/metalwork in situ

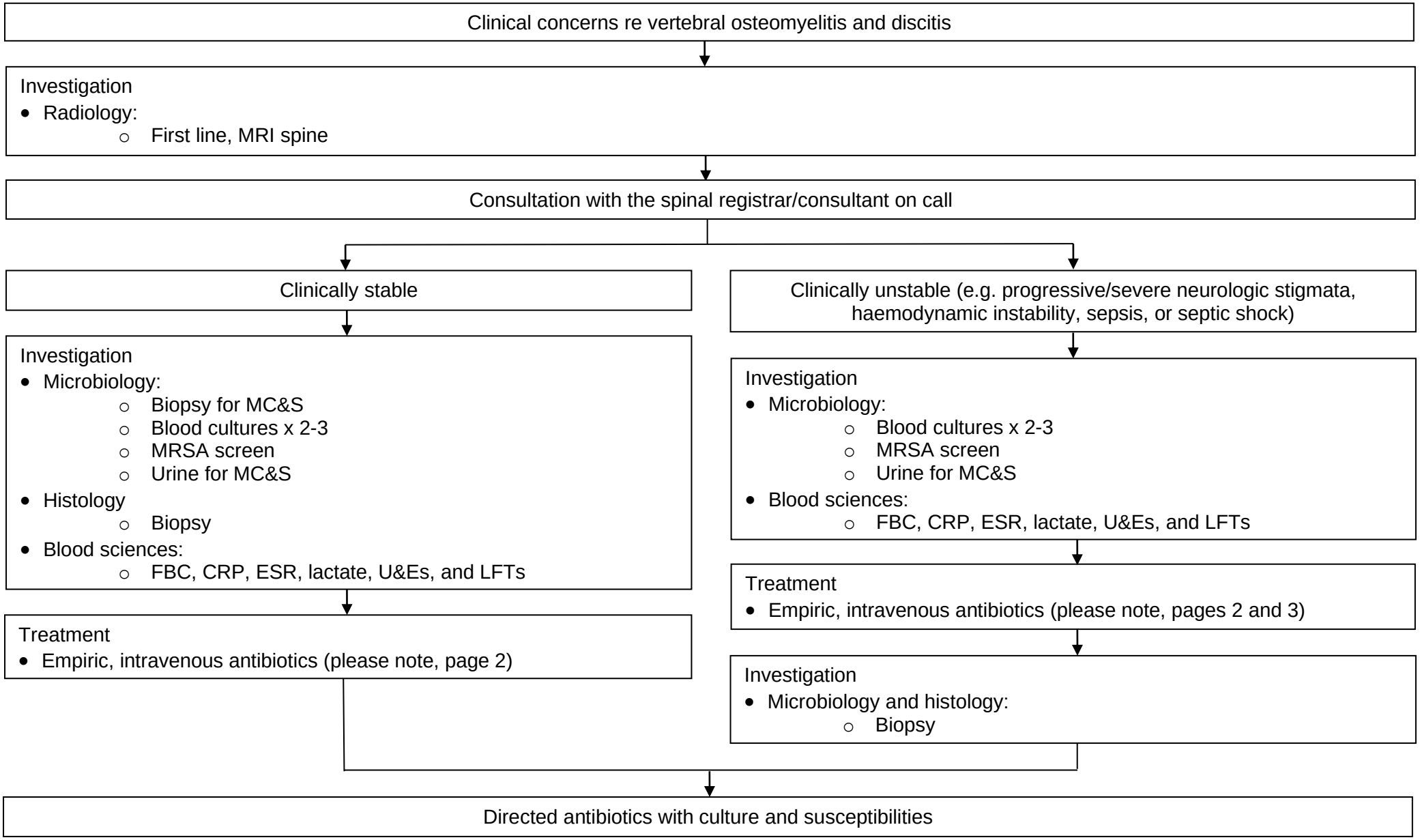
- If for per oral step down or OPAT, monitor bloods (FBC, CRP, U&Es, and LFTs) weekly-fortnightly.

- Minimum course of 6 weeks.
- Prolonged courses of 3 months can be administered; indications include (i) extensive bone destruction, (ii) epidural abscess, and (iii) paravertebral collection.

- Follow up with the medical or surgical team, on intravenous or per oral therapy.

University Hospitals of Derby and Burton NHS Foundation Trust

Management



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Document control

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