Infection post THR

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Introduction

- Background
- Presentation
- Diagnosis
- Management
- Summary
- References

Background

- Major complication
- Clinical and financial burden
- Quoted as ~1%
- 7-16% of THA revisions[1,2]
- 8% of revision procedures 06-07[14]
- 19% cause of failure of 1[0] 03-06[14]

Classification

Fitzgerald et al (1977)

- Stage I
  - Within 6 weeks
- Stage II
  - Delayed, chronic

Classification…

- Stage III
  - Sudden onset, previously well hip, haematogenous spread
- Stage IV
  - Positive culture found at time of revision
  - No previous evidence of infection.

Diagnosis

- High index of clinical suspicion
- Combination of:
  - Clinical evaluation
  - Blood tests
  - Diagnostic imaging
  - Microbiological analysis

Clinical evaluation

- History & Examination
- Predisposing factors
  - PMH
  - Dental work, colonoscopy…
- Delayed wound healing
- Post op superficial wound infection
- General examination
- Wound examination

Blood tests

- White cell count commonly normal
- CRP
  - More sensitive
  - Normal within 3 weeks
- ESR
  - >30
  - Remains elevated for 1 yr
- Both elevated 83% probability of infection[3]

Blood tests…

- Procalcitonin
  - Precursor of calcitonin
  - Highly specific (98%)[5]
- Interleukin 6
  - Pro+anti-inflammatory cytokine
  - Similar sensitivity as CRP[5]
- Increased CRP, IL-6 and Procalcitonin is most sensitive[5]
- Not all units perform tests

Imaging

- Plain radiographs
  - Limited value in acute infection
  - Exclude other causes
  - Sub acute / chronic infection
    - Periostitis
    - Osteopenia
    - Endosteal reaction
    - Osteolysis

Imaging…

- MRI
  - Poor secondary to artefact
  - Possible use in future for bone prosthesis interface
- Bone scan
  - High sensitivity, low specificity for infection.
  - Expensive, time consuming

Imaging…

- Positron emission tomography
  - Shows increased metabolic activity
  - Requires further research

Microbiology

- Commonest organisms
  - Staph aureus
  - Staph epidermidis
  - Gram-negative

Table 11 - Bacteria isolated on cultures during first stage (73 bacteria in 68 patients, 2 patients with 2 or more isolated microorganisms)

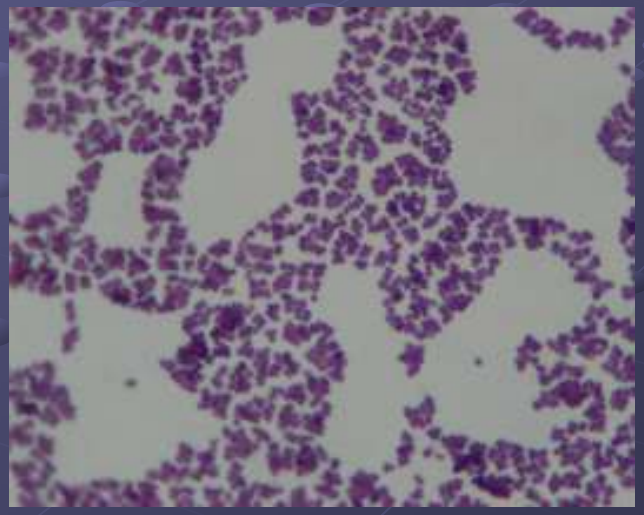
GRAM-POSITIVE BACTERIA	50 (68.5%)
Staphylococcus aureus	23 (31.5%)
Staphylococcus epidermidis, Staphylococcus cohnii and coagulase negative Staphylococci	10 (13.7%)
Enterococcus faecalis	10 (13.7%)
Streptococcus viridans	3 (4.1%)
Streptococcus agalactiae	2 (2.7%)
Corinebacterium sp	1 (1.4%)
Streptococcus mitis	1 (1.4%)
GRAM-NEGATIVE BACTERIA	23 (31.5%)
Escherichia coli	4 (5.5%)
Enterobacter cloacae	4 (5.5%)
Proteus mirabilis	3 (4.1%)
Serratia marcenses	3 (4.1%)
Klebsiella sp	3 (4.1%)
Acinetobacter baumannii	1 (1.4%)
Aeromonas hydrophilia	1 (1.4%)
Citrobacter diversus	1 (1.4%)
Pseudomonas aeruginosa	1 (1.4%)
Providencia sp	1 (1.4%)
Stenotrophomonas maltophilia	1 (1.4%)

Pre-op Aspiration

- Aspirate to obtain C&S
- No antibiotics for 2/52
- 3 samples including one tissue
- Positive test is growth in at least 2 specimens

Intra-operative

- Appearance, unreliable
  - Purulent fluid / effusion
  - Granulation tissue
  - Hyperaemia



- Gram stain
  - Varying sensitivities
  - Interpret with caution

Intra operative…

- Tissue culture
  - Highest standard (94-97% sensitivity)[3]
  - Not always positive.
  - Collection technique vital
    - X5 samples
    - Different tissue planes
    - Clean instruments
    - Clean culture pots
    - Require 3 / 5 definite diagnosis

Intra-operative…

- Frozen section
  - 5-10 WBC's per high power field 96-99% specific for infection[15]
  - Dependent on pathologist

Treatment

- Aims
  - Eradication of infection
  - Pain relief
  - Restoration of function
  - Minimum cost to patient
- MDT approach
  - Musculoskeletal microbiologist

Treatment…

- Antibiotic supression
  - For medically unfit
  - Adding rifampicin increases rates of eradication[4]
  - Potentiates action of other antibiotic for staph
- Operative debridement
  - Acute infection (stage I&III)
  - Arthroscopic Vs open

Treatment…

- Resection arthroplasty
  - Poor functional results
  - Reserved for medically unwell
- Single stage revision
  - Antibiotic loaded cement
  - Acute infection
  - Immunocompetent patients
  - Recurrence 8.3% 10yr[6]
  - Depends on organisms and sensitivities
  - Depends on patient
  - 6/52 antibiotics

Treatment…

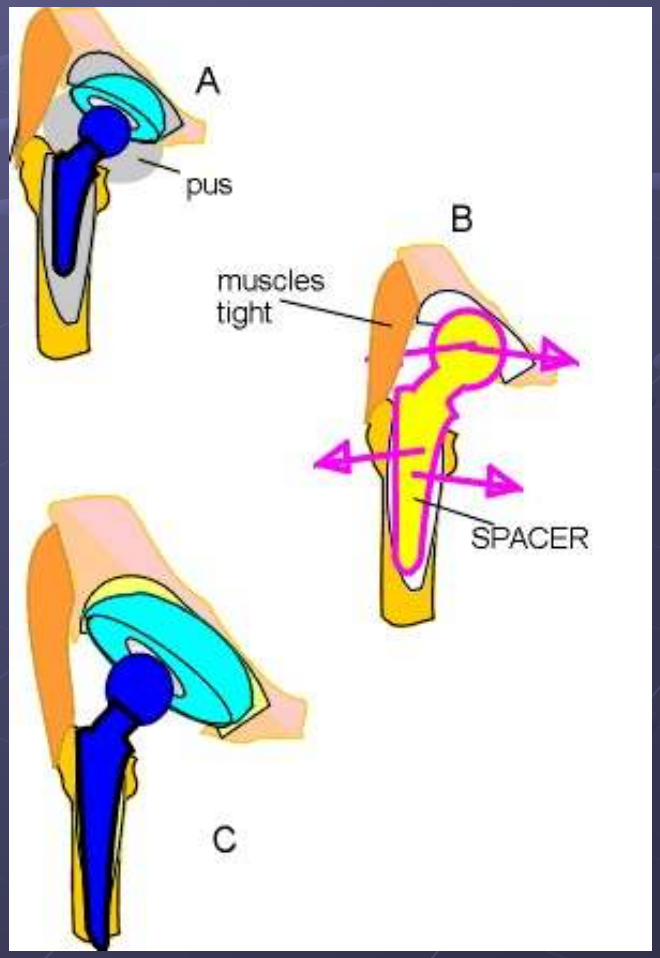
- Two-stage exchange revision
  - Standard in North America
  - Remove infected components
  - 6/52 parentral antibiotics
  - Confirm via ESR / CRP and repeat aspiration
  - Use of spacer (min 6/52)
  - Problems pain, movement

Treatment…

- One stage Vs two stage revision
  - 87.7% success for two stage treatment without prolonged course of antibiotics only antibiotic loaded cement[12]
  - 3% recurrence for two stage revision with pre-op aspiration[17]

Treatment…

- Two stage with spacer
- 1=Removal of prosthesis
  - Insertion of spacer
- 2=Removal of spacer
  - Insertion of revision



Treatment…

- Controversy
  - Timing of procedure-minimum of 6/52
  - Re-infection 9% at 6/52
  - 22% at 22/52[16]
  - ? Use of antibiotic loaded cement at rev
    - Gentamycin loaded cement eradication in 95%[7]
  - Bone stock
    - Allograft not recommended with infection
    - ? Increases rate of infection

Treatment…

- Antibiotic resistance
  - Increased rate of re-infection from 4.8-8%[8]
  - Addition of rifampicin
  - X2 antibiotics in cement
  - 2-3 post op.
- Cemented vs Uncemented Stem
  - Uncemented 18% infection[9]
  - ? As 1st generation implants

Treatment…

- Antibiotic loaded spacers
  - Preserves soft tissue and limb length
  - Eradication of infection 95% at 2yr[10]

  Similar results beads Vs spacer

  Better Harris hip scores

  Decreased hospital stay[11]

Re-infection

- Poor outcome post failed 2 stage revision
- Poor functional outcome
- Few studies
- Ideal method of treatment unknown.

Summary

- Major complication
- Prompt diagnosis & early management (esp stage I & II)
- Quadruple assessment
  - Clinical evaluation
  - Serology
  - Imaging
  - Microbiology

Summary…

- Pre-operative aspiration
- One stage revision controversial
- 2 stage revision using articulated spacer[11] radical debridement of bone and soft tissue+/- antibiotic loaded cement give good results[12]
- Prolonged courses of antibiotics unnecessary?[12]

Thank you

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