Synovial fluid – Aspiration of a joint following total hip replacement

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Clinical information

- Female, age 72.
- Left total hip replacement in 2016
- Attended A&E after a significant fall
- Complains of significant clicking of the left hip over the past 12 months
- X-ray confirmed no dislocation or fracture
- Clinically no clicking or grating felt or heard during manipulation of the joint

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Clinical information

- An aspiration of the joint was performed which yielded 3ml of dark, grey/brown opaque semi viscous fluid.
- The sample was processed in cytology:
- One fixed slide prepared for light microscopy, stained with Papanicolaou
- One wet prepared slide for polarising microscopy, not stained.

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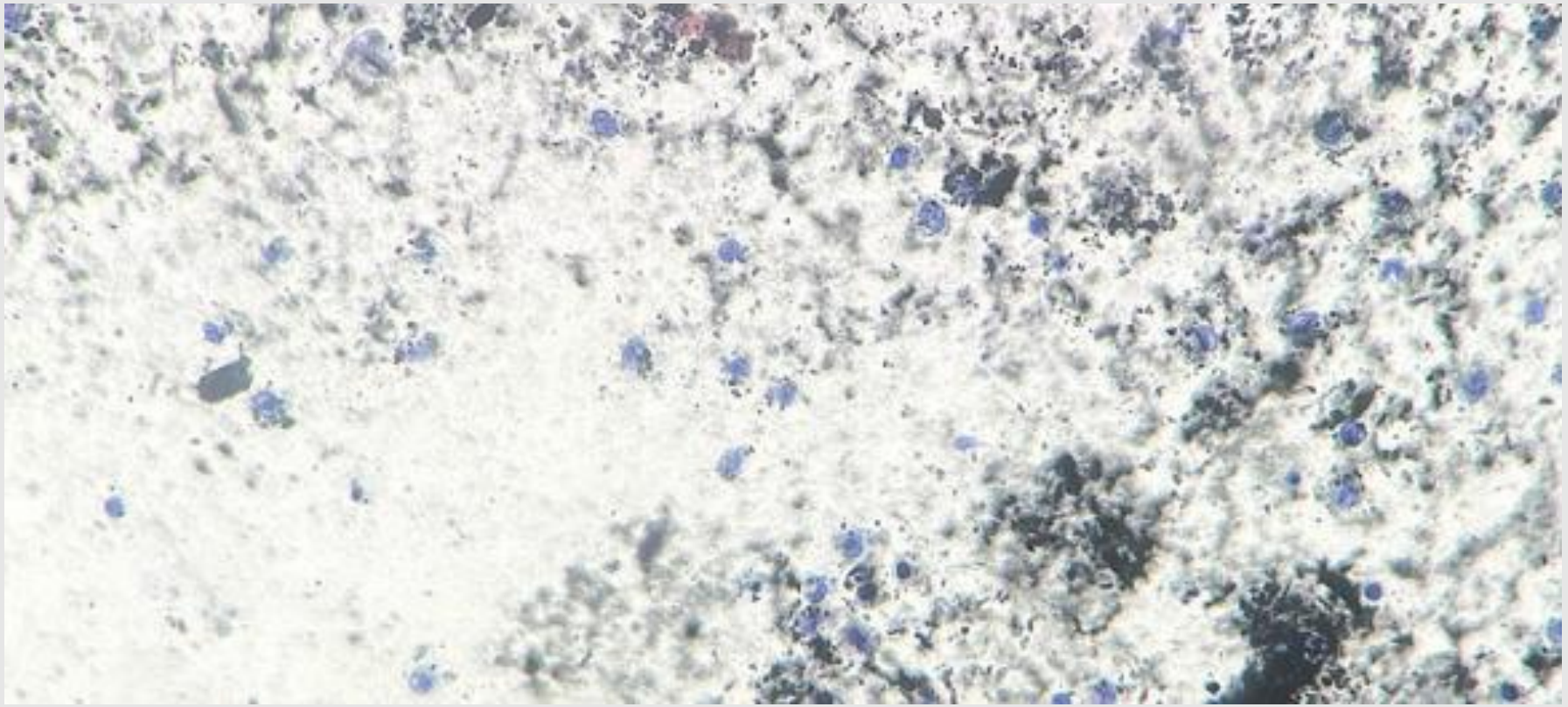
Cytology



Pap X10 Magnification

The Papanicolaou slide showed significant inflammation and black particulate material

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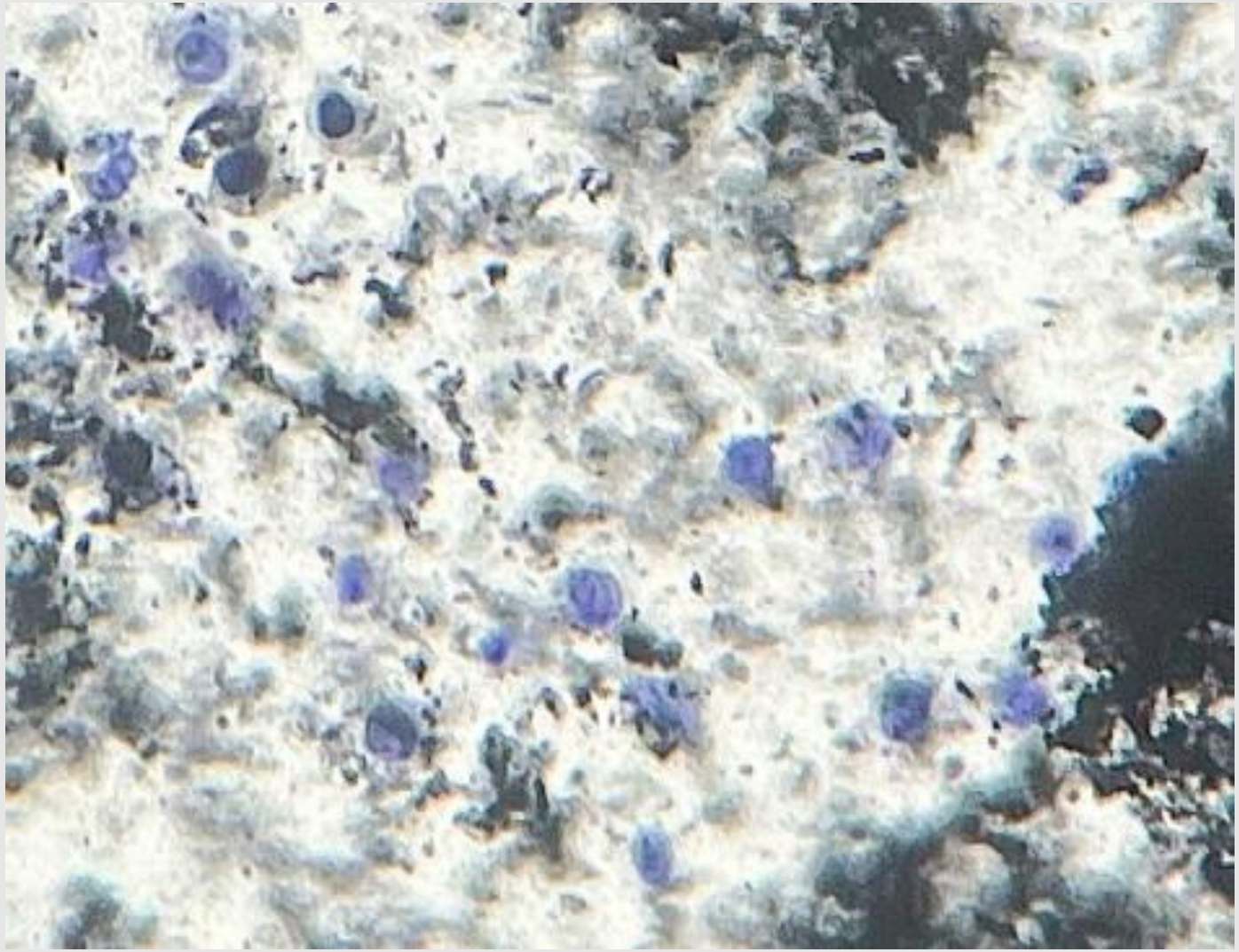
Cytology

Numerous macrophages and occasional synoviocytes.

Black material appearing granular in nature overlying much of the cellular content.



Pap X40 Magnification

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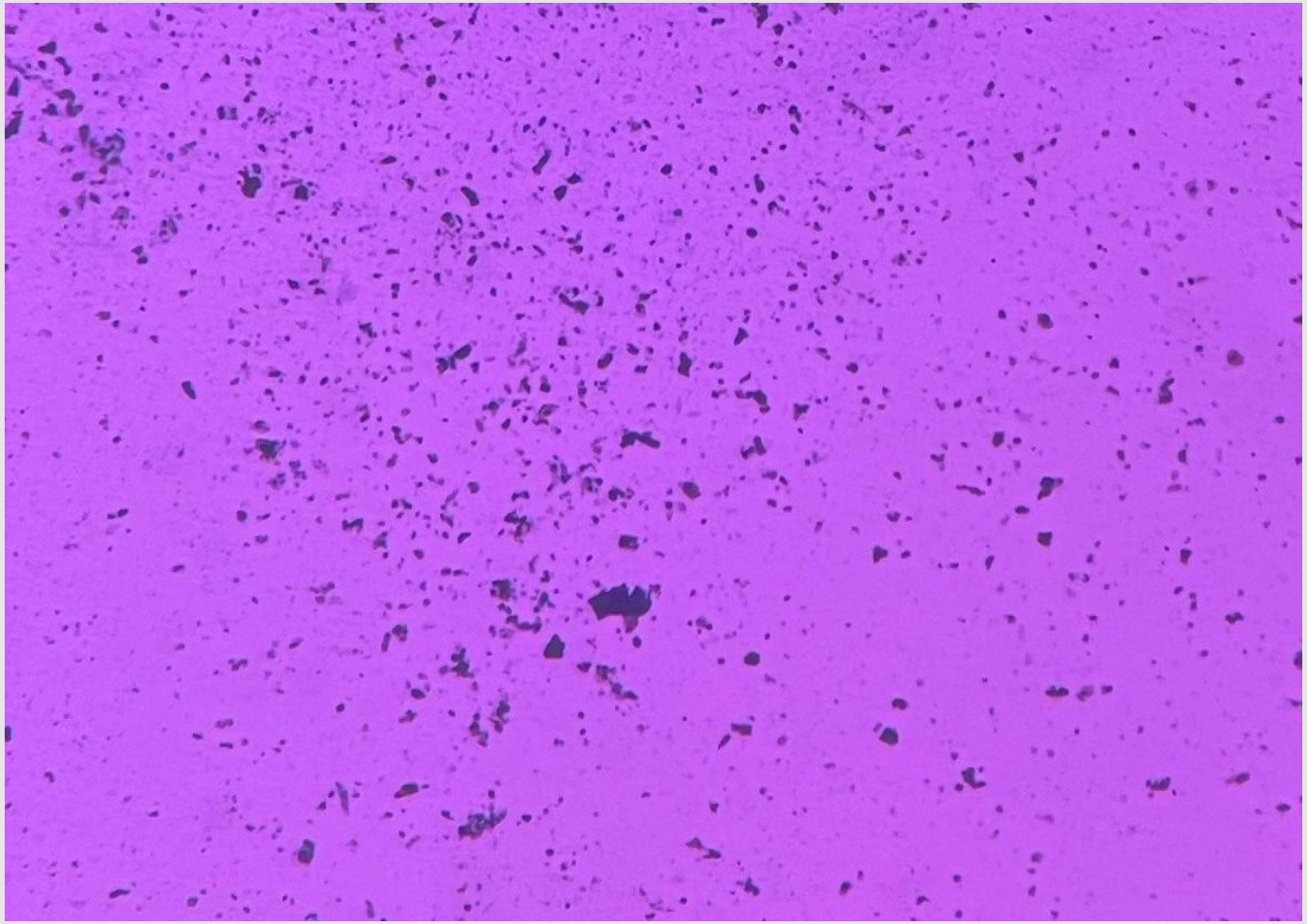
Cytology

The material was not birefringent and did not appear to be crystalline



X4 Magnification, unstained, compensated polarised light

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Possible artefacts

Is this introduced during processing? Granular material could include stain deposit.

Or carbon fragments from pencil?

The volume of material in the sample would suggest this is not the case.

Artefact from pencil X40

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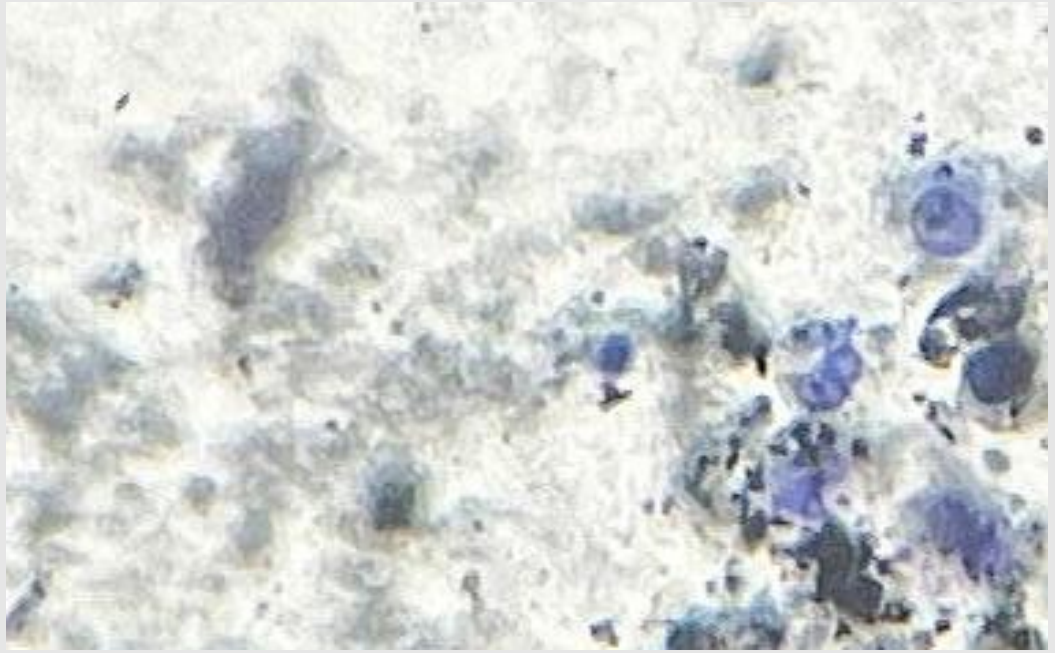
Possible artefacts

Another consideration could be bacterial colonies, as there is debris in the background however the particles seem too large, and concurrent microbiology cultures were negative.



Pap X40

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Cytology

Further investigation of the patient history and clinical communication revealed concerns that the hip joint was failing. There was the possibility of the polyethylene lining being worn or damaged resulting in the metal head of the prosthesis touching the metallic part of the cup in the joint.

This clinical information, together with the macroscopic and microscopic appearances, suggests possible metallosis.

The synovial fluid was reported as containing macrophages, lymphocytes and neutrophils together with abundant black particles, possibly metallic debris.

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Histology & Clinical Correlation

- A CT scan confirmed significant damage to the polyethylene liner of the prosthetic joint.
- The patient underwent a revision of the total hip replacement.
- Histology received multiple pieces of soft tissue, which in parts had a black appearance……

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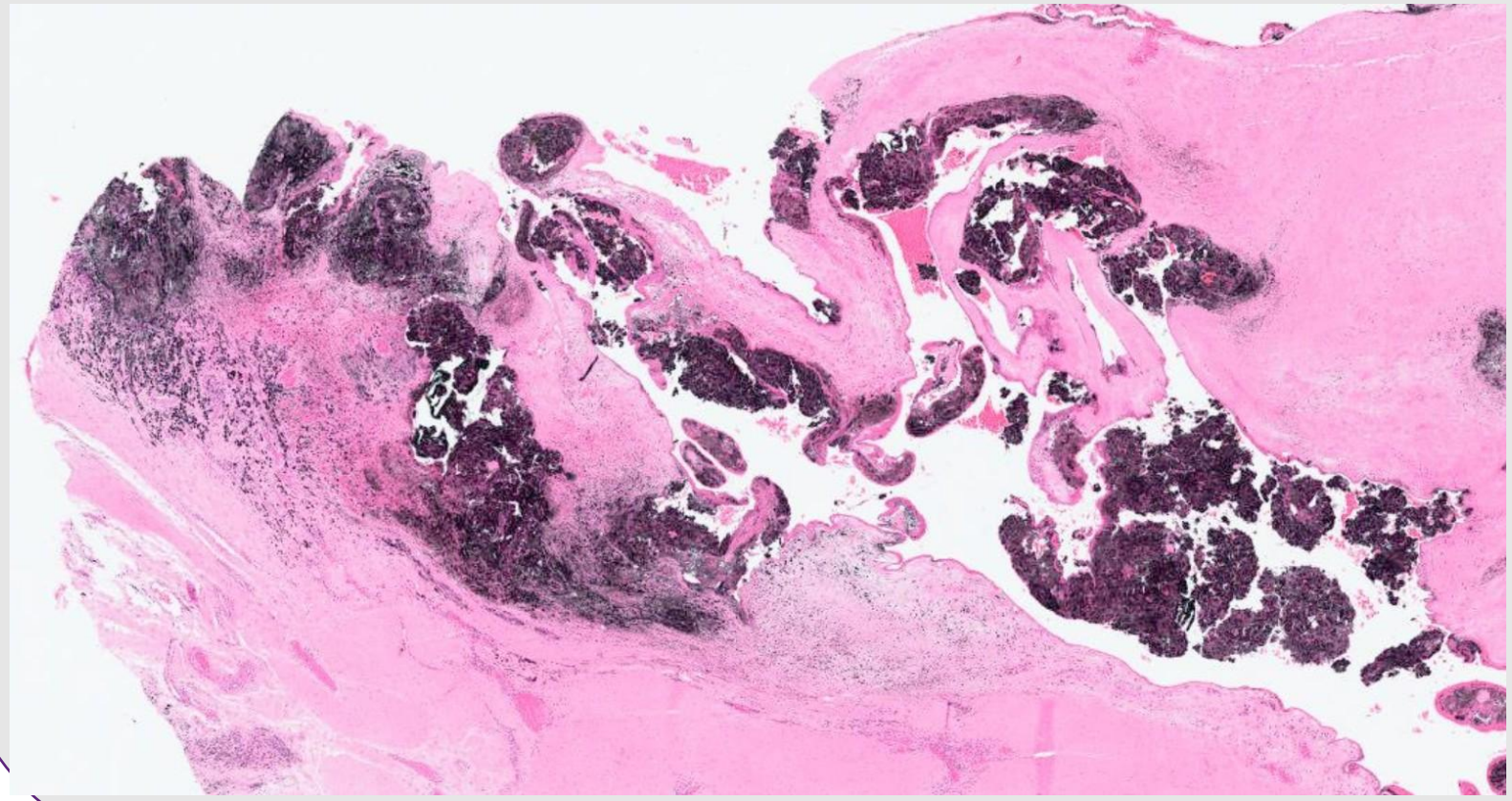
Outcome

…… abundant black metallic debris with multinucleated giant cells in the synovial lining. Histology consistent with hip joint metallosis and chronic inflammation.



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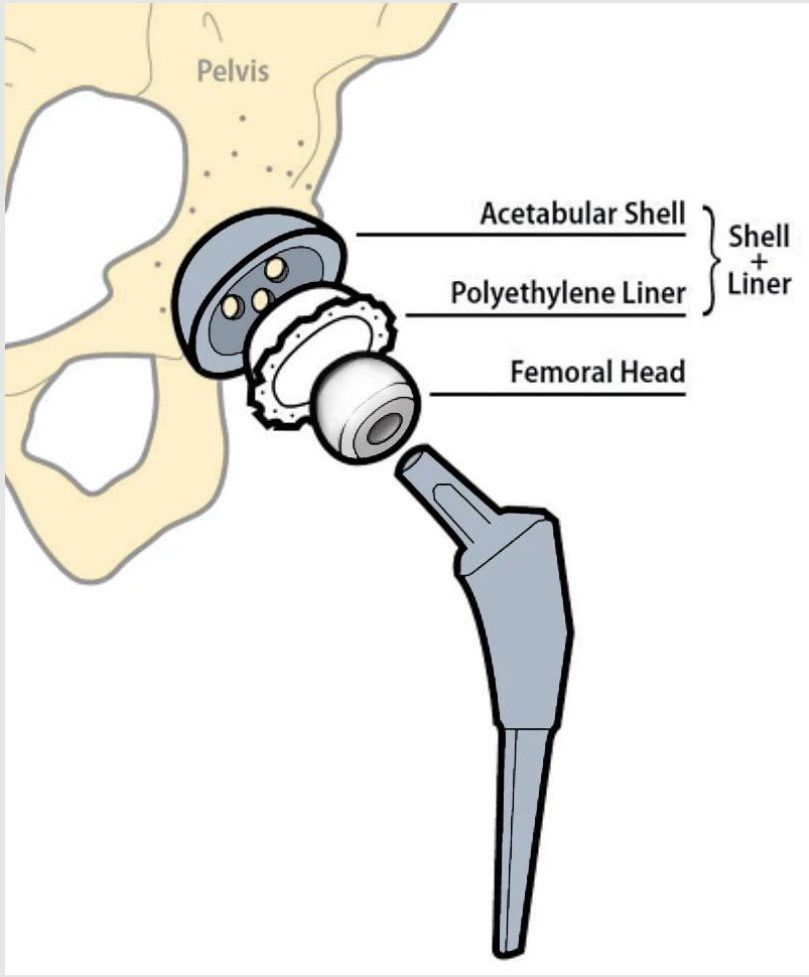
Discussion

Metallosis occurs more often in metal-on-metal joint replacements, but can occur with non-metallic prosthesis. As in this case damage to the non-metallic liner component causes contact of the metal parts of the prosthesis – the acetabular shell and femoral head.

Clinical and radiological findings together with the macroscopic appearance of the fluid are virtually diagnostic but can be confirmed with cytology/histology.



https://www.researchgate.net/profile/Henrik-Palm/publication/277335777/figure/fig1/AS:391982632456193@1470467350381/Schematic-diagram-of-a-total-hip-replacement-indicating-the-different-segments-defined.png

Discussion

- When a joint fails the composition of the synovial fluid can change. Fully functional prosthetic joints usually contain synovial fluid which is highly viscous, colourless or pale yellow. When the prosthesis fails, the synovial fluid can become increasingly cellular containing up to 90% large mononuclear cells. The numerous macrophages and synoviocytes are phagocytic.
- Metal particles found in fluid from joint prosthesis failure are tiny black spheroids which may be intra- or extracellular. Polyethylene particles are birefringent and angular.
- Treatment is typically replacement of the prosthesis and excision of the synovium to eliminate the metallic particles.

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Discussion

- Locally, metallosis can cause inflammation and the release of cytokines – similar presenting symptoms to infectious causes. In addition, there may be fibrosis, local necrosis and soft tissue disruption.
- Metal particles caused by the erosion of the joint can be absorbed systemically and cause varied symptoms depending on the type of metal, size of particles, volume and time of exposure.
- Pseudotumours can develop from reaction to wear debris. They often form as granulomatous or cystic lesions and are neither infective or neoplastic in nature. Treatment for pain, soft tissue and bone destruction caused as a result of pseudotumours is surgical.

References

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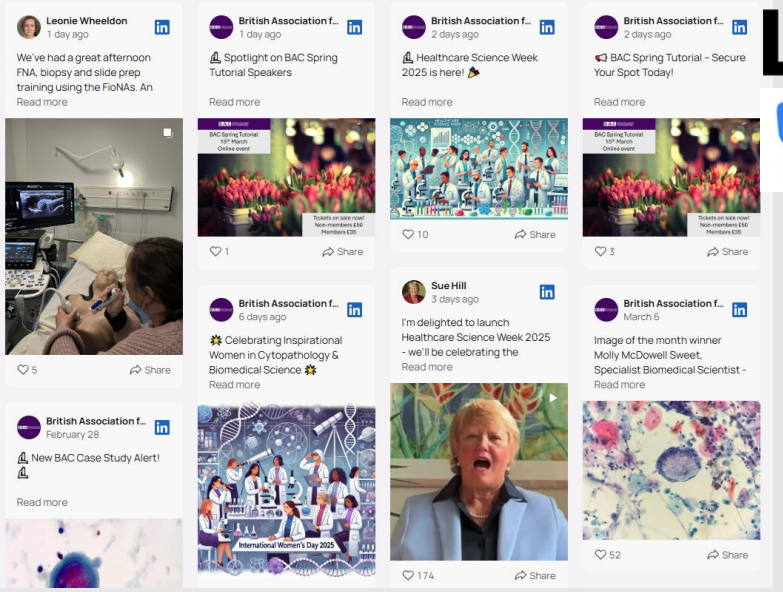
2. Oliveira CA, Candelaria IS, Oliveira PB Figueiredo A and Caseiro-Alves F. Metallosis: A diagnosis not only in patients with metal-on-metal prostheses. European Journal of Radiology Open 2 (2015) 3-6

3. Pescador D, Calero-Paniagua I, Sanchez-Gonzalez M and Montilla C. Metallosis as a Cause of Pain and Inflammation in a Patient with a Knee Replacement: A Case Description. Reumatol Clin. 2016; 12 (2): 112-113

4. Daniel J, Holland J, Quiglet L, Spargue S and Bhandari M. Current Concepts Review: Pseudotumours Associated wth Total Hip Arthroplasty. J Bone Joint Surg An 212; 94:86-93



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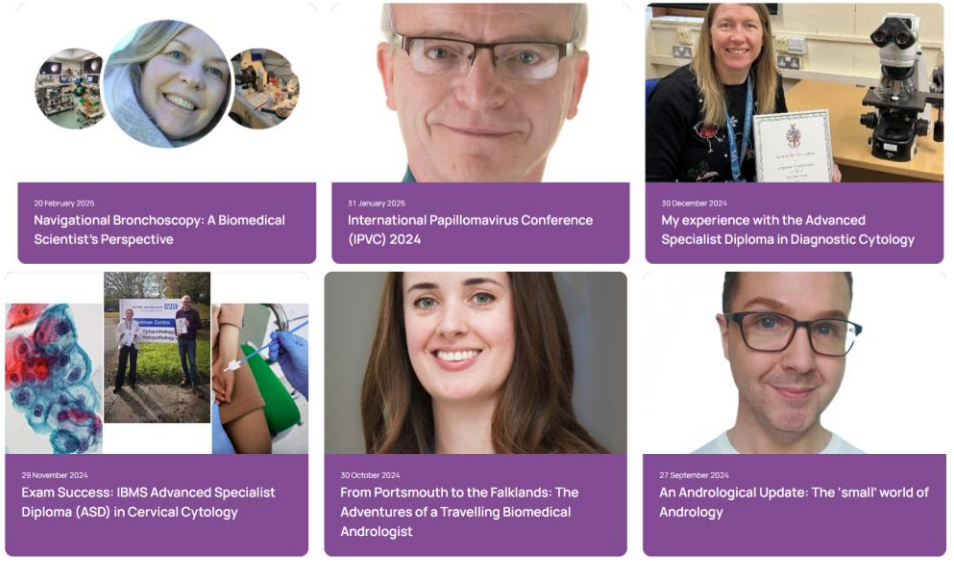

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