Before arthroplasty

History of hypersensitivity to metals or potential bone cement components

- yes
  - Allergy yes
    - Consider “hypoallergenic” implant material
  - Allergy no
    - “Standard” implant material
- no
  - No (prophetic) allergy test

Arthroplasty with complications

Detection of “conventional” elicitors

- no/suspicion of allergy (after exclusion of infection)
  - Allergy diagnostics
    - Patch test
      - Allergy yes
      - Allergy no
    - Histology
      - suggestive of hypersensitivity
      - other pathology
      - positive
      - Integrate history, clinical picture and diagnostic findings to verify potential allergy
  - Plan treatment accordingly
- yes
  - LTT*

*) Lymphocyte transformation test can be performed in parallel. Until now for scientific purposes, clinical significance has to be evaluated case by case.
**Histopathological endoprosthesis particle algorithm**

**Wear particles BBR –**
- **Macro abrasive particles** (partially detached, chemically or mechanically)
  - Polymethyl methacrylate (PMMA) ≈ 0.1–2 mm
  - Polyethylene (PE) macro particulate ≥ 1 mm, POL +++
  - Ceramic macro particle – in prosthesis fractures ≥1 mm POL +/–
  - Silicone particle ≈ 0.5–22 mm POL +/-
  - Carbon fiber ≥ 3 mm POL –
- **Micro abrasion particles**
  - POL +/-
  - Oil Red O – BBR –
- **Microparticular PE < 1 µm (oil red ++)**
- ** metall non-ferrous particles**
  - blackish/intensely black ≈ 1 µm
  - Pure metal and/or alloys and surface coatings
  - Titanium
  - Cobalt
  - Nickel**
  - Chromium
  - Molybdenum
  - Tantalum
  - Zirconium
  - Niobium
  - Barium sulfate
  - Zirconium dioxide
  - X-ray contrast media (additive to PMMA)

**Non-wear particles**
- **Bleeding residues BBR +++**
  - Hemosiderin/iron granuloma <1 µm –> 0.5 mm
  - Gandy Gamma body ≈ 0.5–2 mm
- **Crystal deposition**
  - CPPA (calcium pyrophosphate) POL ++, ≈ 0.1 µm
  - Urate <50 µm –> 3 mm, native: POL ++
- **Calcious deposits**
  - Basic calcium phosphate <1 µm –> 0.5 mm
  - Calcium carbonate (lime): POL – ≥ 1 mm
  - Bone trabecula fragments: POL – ≥ 1 mm
- **Particle corrosion**
  - Cobalt, molybdenum, chromium (BBR-)
  - Solid precipitates: Oxides, chlorides, phosphates and others
  - Yellowish to greenish, 0.5 µg–0.5 mm
  - Iron/steel alloy (BBR+), <1 µg –> 0.5 mm
  - – ceramic ≈ 0.2 µm–1 µm brownisch/gray/light
  - – Aluminium oxide
  - – Zirconium oxide
  - – Yttrium oxide
  - – Niobium oxide

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**Literature:**