The risk of implantation syndrome can largely be prevented

The implantation of prostheses, in particular the implantation of cemented hip stems, can in rare cases be associated with serious cardiorespiratory compromise. This ranges from cardiopulmonary collapse due to a drastic fall in blood pressure, pulmonary hypertension and /or cardiac arrhythmia to intraoperative cardiac arrest. Although this complication is caused by fat/bone marrow and can also occur with uncemented hip implants it is known as bone cement implantation syndrome (BCIS). The incidence of hypoxia and/or hypotension is more common in cemented procedures (28% compared to 17% in uncemented), but severe cases are rare.

Why is there a reaction to femoral instrumentation?
It is assumed that the syndrome is a multifactorial event triggered by pressuration. Pressuriation means the application of pressure on the proximal end of the intramedullar bone cement layer and the subsequent placement of hip prosthesis. The increased intramedullary pressure in the femoral canal, leads to fat emboli in important pulmonary and cardiac vessels which reduce the blood circulation and trigger a possible inflammatory reaction.
The degree of contamination of the intramedullary canal has a considerable influence on the development of embolism. If the femoral canal is not adequately cleaned after reaming, there are large amounts of bone debris, coagulated blood and fat present. These are pushed laterally into the vascular system at the moment of cementing and stem implantation. Another risk factor is the porosity of the bone: the more porous, the more permeable the bone is to the contaminating particles.

Who is at risk?
While studies from the USA show that the risk of developing serious implantation syndrome with non-pathological fractures is approximately six in 10,000 patients (0.06%) with femoral neck fractures the risk increases ten times (up to 6.9 %). Besides that, advanced age, male gender, cardiovascular disease and diuretic medication are additional risk factors. Therefore it is very important to identify patients at risk and act accordingly.

How can the risk be minimised?
The risk for this complication can be minimised with a good interdisciplinary teamwork and OR communication, some precautions in anesthesiology and the adaptation of surgical techniques in patients at high risk.

Adaptation of surgical technique in patients at high risk

- Careful cleaning of the bone bed with extensive use of pulse lavage and adequate irrigation pressure (particularly in the intramedullary canal).
- Use of distal plug and retrograde bone cement application using a cement gun (optionally a suction catheter is placed). No or only dosed proximal pressurisation of the bone cement depending on the risk of the patient (take particular care with patients with femoral neck fractures) and very gentle insertion of the prothesis.
- Notify anaesthetist of every step of the cementing process, especially when bone cement is applied, before pressurization and when the prosthesis is inserted

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