4.2 Hypersensitivity reactions in association to arthroplasty

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Some patients undergoing arthroplasty may develop clinical complications that are not explained by common causes like infection or mechanical problems. Reactions as local or generalized eczema, urticaria, impaired wound or osseous healing, seroma formation and implant loosening are seen in some cases [4,5,6,10].

In such patients hypersensitivity reactions may be the underlying cause. Typical elicitors are metals like Ni, Cr or Co which are known to induce contact sensitivity. According to a recent german study cutaneous metal sensitisation rates in the general population are: to Ni 13.1% (females 20.4%, males 5.8%), to Co 2.4% (females 3.4%, males 1.4%) and to Cr 1.1% (females 1.5%, males 0.7%) [8]. Occasionally hypersensitivity reactions have been seen to Tantalum and Vanadium [1,10], as well as rarely to Titanium [7,11]. But also bone cement components (acrylates, additives like benzoyl peroxide, p-toluidine, antibiotics) may provoke hypersensitivity reactions [3,12]. However, in patients with endoprosthesis related complications not only allergological work-up is rarely performed but in the case of allergological testing, bone cement components are often neglected.

But apart from allergological diagnostics by patch test, which may not always detect hypersensitivity [2,9] and assessment of lymphocyte reactivity, also analysis of perimplantar tissue may indicate T-cellular hyperresponsiveness [9,13]. Based on a series of patients, characteristic clinical and in vitro findings will be presented.

Case 1

A 73-year-old female patient had developed eczema at the left knee two months after implantation of a cemented Co-Cr-based knee arthroplasty. With the exception of a diabetes mellitus and an arterial hypertension the patient was at good health. There was no history of preceding allergy. At examination, the left knee was swollen, warm and showed local eczema. Patch testing to standard series, additional implant metals and bone cement components gave a + reaction (D3) to benzoyl peroxide and to molybdenum chloride. Since eczema disseminated and the left knee was increasingly painful, a revision surgery was performed. Upon introduction of a titanium based, cement free endoprosthesis eczema still continued over the next weeks and then gradually resolved.

Case 2

At the age of 66 a female patient received an uncemented CoCrMo-based right knee arthroplasty. Within few weeks she developed pain, recurrent swelling and erythema/eczema at the knee and proximal part of the lower leg (Fig. 1a).
There was no history of pre-existing allergic disease nor of cutaneous intolerance of metallic daily use articles. Upon patch testing an isolated Co-allergy was shown (Fig. 1b) and in vitro lymphocyte hyperreactivity to Co was found. Since symptoms persisted and initial loosening was suspected, revision surgery was done.

Case 3

A 55-years-old male had developed increasing pain, local seroma formation and implant loosening following a metal-to-metal arthroplasty of the right hip. Patch testing showed no metal allergy. Upon revision surgery periimplantar tissue was obtained and gave no signs of infection, but showed dense lymphocytic infiltrate (Fig. 2). In addition prevalence of memory-type T-cells was found. Furthermore, out of periprosthetic tissue, Co-reactive T-cells could be expanded. Thus, a periimplantar metal- (Co-) hypersensitivity was concluded [9].

Figure 1a, b: (a) Local swelling and erythema upon right knee arthroplasty (b) Isolated Co-contact allergy in the same patient.

Figure 2: Periimplantar tissue showing metallic debris and dense T-cellular infiltrate (anti-CD3-stain). [from 9]