Adverse Local Tissue Responses to MoM Hip Implants

An interview with Joshua J. Jacobs, MD

Maureen Leahy

Joshua J. Jacobs, MD, first vice-president of the AAOS and chair of the department of orthopaedic surgery at Rush University Medical Center in Chicago, is a recognized expert on bearing surfaces used in hip and knee implants.

In the wake of recent developments in the controversy surrounding metal-on-metal (MoM) bearings, AAOS Now spoke with Dr. Jacobs about the adverse local tissue responses (ALTRs) that have been reported in some patients with MoM hip implants.

AAOS Now: Dr. Jacobs, ALTRs have been observed in some patients with MoM implants. Can you tell us what causes them?

Dr. Jacobs: First of all, it’s important to note that most patients with MoM implants are doing well, and ALTRs need to be understood in that context. With that being said, ALTRs have been associated with both total hip replacement and hip resurfacing MoM systems.

Generally, it is believed that these responses are a reaction to the debris generated from the implant. This includes wear or corrosion debris generated from the bearing surfaces, corrosion
debris generated from modular MoM junctions such as the head-neck junction, or corrosion debris from the very small wear particles (nanoparticles) that exist in the joint. MoM bearings use a cobalt-based alloy composed primarily of cobalt and chromium. When debris from that alloy is generated in large quantities—for example, if the implant is malpositioned or loose—it can cause an ALTR. Whether it is the cobalt or the chromium that is actually causing the response is difficult to tease out—both are capable of eliciting a cellular response.

**AAOS Now: What are the different types of ALTRs?**

**Dr. Jacobs:** One type of ALTR is a soft-tissue mass with or without an effusion that has been termed a “pseudotumor.” This term has not been precisely defined and the histologic appearance varies. Tissue necrosis can be a prominent feature.

Another type is known as ALVAL (aseptic lymphocyte-dominated vasculitis-associated lesion). The term was coined by Hans G. Willert, MD, to describe an intense perivascular lymphatic infiltration that occurs around certain MoM devices. Its histologic appearance is similar to, but not necessarily diagnostic of, a delayed-type hypersensitivity response (Type IV). Although ALVAL is not unique to tissue surrounding MoM implants, the intensity of lymphocytic infiltrate is often greater in association with MoM implants than with other bearing surfaces.

The third ALTR is osteolysis, or bone loss, which was also a problem with earlier generation metal-on-polyethylene devices. Although there is a tendency to consider these three processes—pseudotumors, ALVAL, and osteolysis—as distinct, they often coexist or overlap in an individual patient. It is believed that the character and intensity of the ALTR associated with a particular implant is determined by the amount and type of debris the patient is exposed to and the patient’s individual reactivity to that debris.

**AAOS Now: Why do ALTRs develop in some patients and not in others?**

**Dr. Jacobs:** All implants generate debris. The issue then becomes how much debris is generated and how much the individual host can tolerate. If the debris burden is below the threshold at which the local cells respond, the implants will be tolerated for years and are considered biocompatible. However, that threshold may vary from individual to individual. Metal allergy is one mechanism that may cause a patient to react to debris more readily, and basic science studies have also suggested that some patients may be more reactive to debris due to a genetic basis, independent of an adaptive (allergic) immune response.

A current clinical challenge is how to diagnose metal sensitivity. Unfortunately, current diagnostic tests (patch testing and lymphocyte transformation testing) require more robust validation to establish their predictive value and clinical usefulness.

**AAOS Now: Data from a recent Lancet article show that utilization of MoM hip replacements in the United Kingdom has dramatically fallen off. Can the same be said for usage of MoM implants in the United States?**
Dr. Jacobs: Although we don’t have a U.S. joint replacement registry yet to definitively answer this question—the American Joint Replacement Registry (AJRR) is currently just beyond its pilot phase—my sense is that a similar fall off has occurred in this country in the use of MoM hip replacements.

Data from the U.K. implant registry brought to our attention the fact that some MoM bearings were not performing well; this fact underscores the value of implant registries. An implant registry is needed in the United States to enable us to understand what is happening in our patient population.

The Academy has been actively involved in establishing a joint registry and was instrumental in launching the AJRR, which is a separate organization. The AJRR also has representatives from other stakeholders in the orthopaedic surgical community.

AAOS Now: What about the future of MoM implants? If they were improved and released less debris through wear and corrosion, could they make a comeback?

Dr. Jacobs: Well, it’s certainly possible. I would remind people of the experiences we had with polyethylene. Currently, polyethylenes are in their 3rd or 4th generation. It took a lot of resources and development to refine ultra-high–molecular-weight polyethylenes to have much better wear performance than their predecessors. The improvements in polyethylene technology are resulting in very promising data, at least up to 10 years.

Although the same cycle of iterative innovation hasn’t occurred with MoM bearings, it’s certainly conceivable that improvements in manufacturing, metallurgy, and tribology could result in MoM bearings that are associated with less debris release and less ALTRs. One of the advantages of MoM bearings is the ability to use thinner acetabular components and therefore larger femoral heads. Larger head sizes are associated with less of a tendency to dislocate, which is a common cause for revision surgery after total hip replacement. In addition, hip resurfacing can only be performed with MoM bearings at the present time. Purported benefits of hip resurfacing include ease of revision on the femoral side and fewer restrictions on activities.

AAOS Now: What is the AAOS doing to keep orthopaedic surgeons up-to-date on the developments surrounding MoM implants?

Dr. Jacobs: The AAOS keeps the fellowship up to date on the developments in MoM bearings through evidence-based technology overviews (available on the AAOS website), educational offerings, and communication vehicles such as the Journal of the AAOS, AAOS Now, and AAOS Headline News Now. For example, alerts from the U.S. Food and Drug Administration (FDA) and regulatory agencies around the world have been disseminated to members.

AAOS members have also worked with the FDA on formulating a strategy to inform and guide orthopaedic surgeons and patients who have MoM hip replacements.

AAOS Now: What advice would you give to patients with MoM implants?
Dr. Jacobs: I always advise joint replacement patients to undergo routine surveillance by their orthopaedic surgeon. This is particularly important in patients with MoM bearings, especially those with hip pain. The orthopaedic surgeon is in the best position to advise the individual patient regarding the performance of the implant. I would also advise patients to visit the AAOS patient education website at www.orthoinfo.org—it is a good source of nonbiased and objective orthopaedic information.

Disclosure information: Dr. Jacobs—Implant Protection, Medtronic SofamorDanek, Nuvasive, Zimmer.

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AAOS Now
May 2012 Issue