

Bone marrow concentrate improves joint transplants

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Credit: University of Missouri-Columbia

Biologic joint restoration using donor tissue instead of traditional metal and plastic may be an option for active patients with joint defects. Although recovery from a biologic joint repair is typically longer than traditional replacement, successful biologic restoration allows patients to return to full activity. However, in some cases, the transplanted bone

does not heal correctly. Researchers at the University of Missouri School of Medicine found in a group of patients that treating donor grafts with bone marrow aspirate concentrate (BMC) before surgery improves bone integration and speeds recovery.

"Surgeons performing biologic joint restoration surgeries typically only wash the donor bone to remove the marrow as a pretreatment before implanting the graft," said James Cook, D.V.M., Ph.D., O.T.S.C., the William and Kathryn Allen Distinguished Chair in Orthopaedic Surgery at the MU School of Medicine. "Once implanted, the recipient's bone has to grow into the donor bone for the surgery to be successful. This graft integration involves a long process called 'creeping substitution' that can take more than a year to complete. The first six months are the most critical for success, so we have been studying ways to make this process better and faster."

Cook's team compared 17 biologic knee joint grafts implanted without BMC to 29 grafts pretreated with BMC. Post-surgical X-ray images at six weeks, three months and six months were compared for graft integration and healing.

The grafts pretreated with BMC achieved 43 percent bone integration at six weeks, compared to 25 percent of those not treated. Likewise, at three months, pretreated grafts achieved 67 percent integration, compared to 50 percent of the untreated grafts. At six months, the researchers observed that the pretreated grafts were more than 84 percent fully integrated, compared to 74 percent of untreated grafts.

Cook, who also serves as director of operations and research at MU Health Care's Mizzou BioJointSM Center and director of the Thompson Laboratory for Regenerative Orthopaedics, led a pre-clinical study earlier in 2017 that showed BMC provides cells to infiltrate the donor bone and release proteins important to bone healing. In this current

study, the researchers reviewed biologic knee replacement outcomes related to BMC use in humans.

"To pretreat a graft with BMC, the patient's bone marrow is collected at the start of the procedure," Cook said. "It is processed in the operating room using a centrifuge to make a powerful concentrate containing the patient's cells and proteins. The resulting BMC is used to saturate the donor bone before it is implanted into the patient's joint."

"The use of BMC is approved by the Food and Drug Administration for bone healing therapies," Cook said. "It has not been used specifically for biologic joint restoration procedures. I believe this is the first clinical study to directly examine the effects of BMC on bone integration for biologic joint restoration surgeries. Our data show that donor grafts pretreated with BMC were associated with earlier and better bone [integration](#). This means that pretreatment with BMC reduces the risk of [bone graft](#) failure and improves the patients' chances for long term success."

Biologic joint replacement cost varies based on factors such as the extent of repair needed. More extensive repairs can exceed \$100,000. BMC cost can exceed \$1,000. Most health insurance policies cover the procedure.

Although the results are favorable, Cook noted the study has limitations, including the size of the patient sample studied.

"Moving forward, we will verify that similar results can be obtained in a larger patient population," Cook said. "We also want to see if the same positive outcomes can be achieved in other joints, such as hips, shoulders and ankles. However, based on the results of our two studies, we now pretreat all our biologic joint restoration grafts with BMC."

The study, "Effects of Autogenous Bone Marrow Aspirate Concentrate on Radiographic Integration of Femoral Condylar Osteochondral Allografts," recently was published in *The American Journal of Sports Medicine*.

More information: Lasun O. Oladeji et al, Effects of Autogenous Bone Marrow Aspirate Concentrate on Radiographic Integration of Femoral Condylar Osteochondral Allografts, *The American Journal of Sports Medicine* (2017). [DOI: 10.1177/0363546517715725](https://doi.org/10.1177/0363546517715725)

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