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Editorial

Marrowplasty™ is a Promising Strategy to Delay Total Joint Replacement

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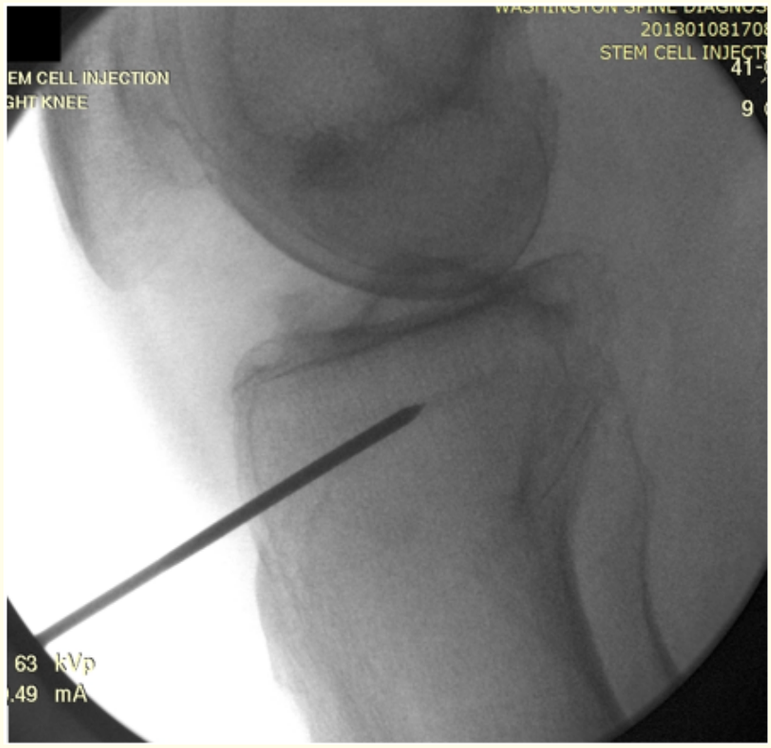
Abnormalities in the bone directly underlying articular cartilage (subchondral bone) have a direct impact on the intra-articular environment. The 'cross-talk' between the articular chondrocytes and the subchondral bone is well described, with subchondral bone marrow edema associated with overlying cartilage loss and abnormality [1,2]. The use of biologic injectables (PRP, stem cells, placental derived products) used intra-articularly is becoming more and more commonplace and the data is suggesting that there is a beneficial effect.



Some authors are now reporting their experiences with intra-osseous injections in combination with intra-articular injections [3,4] or simply subchondral intra-osseous injections [5]. Intraosseous injections induce the synthesis of hyaluronic acid and lubricin by synoviocytes and chondrocytes, preventing chondrocyte apoptosis, cartilage breakdown, and inhibition of the MSC release and migration [6-9]. The results show benefit. Our own experience has been consistent with the reported results, the procedure we refer to as 'marrowplasty™'.

One of the more compelling reports is from Hernigou [10]. He treated 30 patients (60 knees) with bilateral knee osteonecrosis and osteoarthritis. One knee received a subchondral bone marrow augmentation and the other knee a joint replacement surgery. The treatments were randomized for each patient rather than the worse one given surgery and better one stem cells. At 12 years average follow up, 6 of 30 knees with a knee replacement needed additional surgery, 4 of which needed a revision total knee arthroplasty. Of the 30 knees that had subchondral injection of bone marrow derived MSCs, 3 went on to require a TKA at 6,8, and 12 years after the injection. On average, this

was over an 8 year postponement of knee replacement after subchondral augmentation with bone marrow derived MSCs. Furthermore, 21 of the 30 patients preferred the knee with cell therapy over the knee with the total knee replacement. Another aspect that should not be overlooked was the quality of bone that the surgeons dealt with at the time of surgery. Of the 3 knees with cell therapy that went on to surgery, none of them required implants with stems. The 30 knees that had primary TKAs required stems and the ones that went on to revision required extended stems. This is a testament to the quality of subchondral bone.

There isn't enough information to determine which biologic approach is most effective although Hernigou's technique to augment abnormal bone marrow with normal concentrated bone marrow is compelling and logical. Placental derived products are not a logical choice since there are no viable MSCs. Culture-expanded cells are not functionally and transcriptionally equivalent to their *in vivo* counterparts with regard to bone-related signaling pathways, adhesion receptors and signaling molecules and homing capacity [11-14].

If this predictable postponement of total joint replacements holds true, it will be a game changer. Hernigou is still following the 27 of 30 patients who didn't have a knee replacement after a subchondral injection and it will be exciting to see how long the knees last.

Bibliography

1. Roemer FW., *et al*. "Change in MRI-detected subchondral bone marrow lesions is associated with cartilage loss: the MOST Study. A longitudinal multicentre study of knee osteoarthritis". *Annals of the Rheumatic Diseases* 68.9 (2009): 1461-1465.

2. Roemer FW., *et al*. "Subchondral bone marrow lesions are highly associated with, and predict subchondral bone attrition longitudinally: the MOST study". *Osteoarthritis Cartilage* 18.1 (2010): 47-53.

3. Sanchez M., *et al*. "A new strategy to tackle severe knee osteoarthritis: combination of intra-articular and intraosseous injections of platelet rich plasma". *Expert Opinion on Biological Therapy* 16.5 (2016): 627-643.

4. Sanchez M., *et al*. "Intraosseous Infiltration of Platelet-Rich Plasma for Severe Hip Osteoarthritis". *Arthroscopy Techniques* 6.3 (2017): e821-e825.

5. Vad V., *et al*. "Knee Osteoarthritis Treated with Percutaneous Chondral-Bone Interface Optimization: A Pilot Trial". *Surgical Science* 7.1 (2016): 1-12.

6. Sakata R., *et al*. "Stimulation of the superficial zone protein and lubrication in the articular cartilage by human platelet-rich plasma". *The American Journal of Sports Medicine* 43.6 (2015): 1467-1473.

7. Fahy N., *et al*. "Immune modulation to improve tissue engineering outcomes for cartilage repair in the osteoarthritic joint". *Tissue Engineering Part B: Reviews* 21.1 (2015): 55-66.

8. Jiang Y and Tuan R. "Origin and function of cartilage stem/progenitor cells in osteoarthritis". *Nature Reviews Rheumatology* 11.4 (2015): 206-212.

9. Kru¨ger JP., *et al*. "Chondrogenic differentiation of human subchondral progenitor cells is affected by synovial fluid from donors with osteoarthritis or rheumatoid arthritis". *Journal of Orthopaedic Surgery and Research* 7 (2012): 10.

10. Hernigou P., *et al*. "Subchondral stem cell therapy versus contralateral total knee arthroplasty for osteoarthritis following secondary osteonecrosis of the knee". *International Orthopaedics (SICOT)* (2018).

11. Ilas DC., *et al*. "Targeting subchondral bone mesenchymal stem cell activities for intrinsic joint repair in osteoarthritis". *Future Science OA* 3.4 (2017): FSO228.

12. Churchman SM., *et al*. "Transcriptional profile of native CD271+ multipotential stromal cells: evidence for multiple fates, with prominent osteogenic and Wnt pathway signaling activity". *Arthritis and Rheumatology* 64.8 (2012): 2632-2643.

13. Qian H., *et al*. "Primary mesenchymal stem and progenitor cells from bone marrow lack expression of CD44 protein". *Journal of Biological Chemistry* 287.31 (2012): 25795-25807.

14. Morikawa S., *et al*. "Prospective identification, isolation, and systemic transplantation of multipotent mesenchymal stem cells in murine bone marrow". *Journal of Experimental Medicine* 206.11 (2009): 2483-2496.

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