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

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was over an 8 year postponement of knee replacement after subchondral augmentation with bone marrow derived MSCs. Furthermore, 21 of the 30 patients preferred their 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 31 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