Case Report

Autologous, Adult Stem Cell Treatment in Degenerative Joint Disease. A Possible Minimally Invasive Alternative for Artificial Joint Replacement
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Background: A brand new therapy for the treatment of degenerations of joint, muscle and ligament is the regenerative medicine, focusing in particular on the transplantation of autologous adult stem cells. Articular cartilage is a complex and highly complicated tissue and plays a key role in the buffering of heavy mechanical loads that strain articular joints. Lesions, trauma or injury to the cartilage can – in case of failure of the body’s own reparative capacity - lead to degenerative processes that can result in arthritis. Attempts to stimulate the regeneration of cartilage by means of non-invasive methods can induce the production of fibrous cartilage, however not the regeneration of a fully functional, intact and resistant hyaline cartilage that can withstand general or athletic stresses. Many patients experience a temporary palliation of their complaints, but further degeneration of their cartilage can hardly be averted, most likely resulting in artificial joint replacement. Based on new medical findings and against this background, new therapy concepts emerge. Today, autologous adult stem cells are deployed for the therapy of damaged cartilage, articular capsule, ligament and musculature. Cartilage composes of chondrocytes that evolve from mesenchymal stem cells during the embryonic development. According to newest research, mesenchymal adult stem cells can be extracted from bone marrow. Further findings suggest that haemopoietic stem cells are able to differentiate into cartilage-, bone- and muscle-cells in clinical trials1,2,3.

Objective: To determine if autologous, adult stem cells could regenerate painful an active chronic osteoarthritis in the knee with cartilage defects, osteonecrosis and edema.

Design: Case Study.

Setting: Private clinic.

Medical history: 49 year old male patient with a 10 year history of a knee problems and a diagnosis of knee arthritis, edema and osteonecrosis of the left knee, which started in 1998 with a knee locking problem. Active athlete. Arthroscopy with pridie drilling in 2003 showed lesions of approximately 12 to 10 cm². In 2004 the patient underwent an autologous chondrocyte implantation, during which 26 million chondrocytes were implanted. After this procedure the patient discontinued his sports activities and in consequence gained about 20 kg. He reported of severe knee-pain recurrence in 2008. An MRI confirmed an edema and an osteonecrosis of the femoral condyle, which resulted in the conclusion that artificial knee replacement would be the only remaining treatment option. Patient had severe difficulties walking short distances and put any kind of strain on his knee, which strongly limited his daily activities. He relied constantly on pain medication (morphine and NSAID).

Methods: Case treatment with consenting volunteer in which adult, autologous stem cells were isolated from bone marrow aspiration of the iliac crest. The stem cells were injected into the subject’s left knee with MRI proven degenerative joint disease scheduled for treatment with artificial joint replacement.

Bone marrow collection: Manual palpation of the Spina iliaca posterior superior and marking of the puncture point. Injection of regional local anaesthetic (10 ml Xyloanalges 1 %) of the skin and pelvic periost. After a 3 min. residence time a Jamshidi needle is advanced through the corticals of the Spina into the bone marrow array of the pelvis. Here ca. 200 ml bone marrow was collected into special cannulaes. The collected bone marrow was packed in sterile environment and prepared for transportation to a special GMP laboratory, where the stem cells are separated from the bone marrow.

Reimplantation: In compliance with the regulations of the German society for orthopaedics and surgery (Deutsche Gesellschaft für Orthopädie und Chirurgie) for a joint aspiration, following a thorough disinfection and under sterile cover, a hollow needle was introduced into the knee joint in the region of the degenerative changes. The incision was performed in local anaesthesia. The concentrated stem cells were introduced over the hollow needle up to the position of the damage of the femur condyle. Sterile wound cover. Patient was released with a lateral shoe rim for a release of the degenerated part of the knee joint. This release was applied 6 weeks. Furthermore the patient was advised to undergo physical therapy and muscle training that should be implemented 2 weeks after treatment.

Results: At 5 weeks past injection patient reported of significant pain reduction, he was able to discontinue all previous pain medication, incl. morphine. Load capacity and range of motion was
increased and his daily activities were improved. Patient was able to resume his physical activities such as running. An MRI eight months post treatment showed a significant decrease of the cartilage damage and a complete healing of the subchondral edema. Patient has remained pain free until this publication was prepared; he was able to pick up his sport activities.

**Conclusion**: The clinical therapeutic use of adult autologous stem cells for painful degenerative joints has shown to be effective in this single case. Application of this minimally invasive method (joint puncture) was not only able to stop the degenerative process, but also treat it efficiently. The medical conditions of this patient declined within a very short timeframe, as did the cartilage-bone defect. Artificial joint replacement was no longer indicated after this treatment. Therapeutic use of adult autologous stem cells for degenerated joints will expand the current treatment spectrum in the near future.

**Key words**: adult autologous stem cells, osteoarthritis, knee, cartilage defects

**Literature**