AUTOLOGOUS ADIPOSE DERIVED MESENCHYMAL STEM CELLS FOR TREATMENT OF OSTEOARTHRITIS AND RENAL DISEASE

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Key Points
• Which cases are candidates for stem cell treatment – for osteoarthritis and renal disease
• How do stem cells work? Mechanisms of action for osteoarthritis and renal disease

Mesenchymal stem cells have an array of mechanisms of action and therefore the potential for therapeutic use in various diseases. Osteoarthritis results in decreased mobility secondary to pain from changes such as degradation of cartilage, effusion, and scar tissue formation. These changes also have secondary effects on the surrounding muscles and ligaments as well as sensitizing the central nervous system.

The mechanisms of actions of mesenchymal stem cells for the use of osteoarthritis are thought to be numerous. Experimental studies have shown that mesenchymal stem cells can inhibit scar tissue, suppress apoptosis, stimulate resident stem cells, and both directly and indirectly reduce pain.

If the microenvironment of the osteoarthritic joint can be improved and pain subsequently reduced, there is the possibility to improve mobility, decrease lameness, and potentially slow the degradation process. An overview will be given of my clinical experience on the use of stem cells for osteoarthritis of the elbows and hips.

The feline renal study investigates minimally invasive administration of autologous adipose mesenchymal stem cell delivery in cats with IRIS stage 3 chronic kidney disease. Stem cells are thought to repair or improve renal tissue by a paracrine effect through the release of chemical mediators. In the chronic phases of kidney disease, spontaneous healing processes are limited. Stem cell therapy may have the potential to improve the overall function of the kidneys.

The aims of the study are to investigate the safety and efficacy of autologous mesenchymal stem cell delivery injected via the renal artery compared to intravenous injection or placebo. The hypothesis is that patients receiving intra-arterial injection will engraft more stem cells than those that receive intravenous injection and the progression of chronic kidney disease will be delayed in patients receiving stem cell infusion when compared to placebo.

Experimental studies have shown higher colonization of stem cells with intra-arterial stem cell infusion for myocardial disease and acute cerebral injury, as well as the safety and reliability of intra-arterial injection of mesenchymal stem cells into the renal artery. A higher engraftment of glomeruli has also been shown experimentally with intra-arterial injection, compared to the first pass elimination at the pulmonary capillary bed of those using intravenous injection.

The first phase is a pilot study including 6 cats. Intra-arterial injection of stem cells are delivered into the renal artery minimally invasively to investigate the safety of intra-arterial delivery. Imaging, glomerular filtration rate (GFR), and creatinine are monitored for 3 months. Cats completing the pilot study are then enrolled into phase two. The second phase includes 3 groups: placebo, intravenous delivery, and intra-arterial delivery. Long term follow up of these three groups will occur over a minimum of two years to evaluate efficacy. Stem cells are administered on day 3, 14, and 90. Two year follow up will compare CBC, biochemistry profile, urinalysis and urine culture, blood pressure, urine protein/creatinine ratio, abdominal ultrasound, and GFR.