Non-Responding Knee Pain with Osteoarthritis, Meniscus and Ligament Tears Treated with Ultrasound Guided Autologous, Micro-Fragmented and Minimally Manipulated Adipose Tissue

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Abstract
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Figure 1. VAS scale 0 - 10 with 10 being worst pain.

Figure 2. Range of motion 0 - 153 degrees.

Figure 3. KOOS pain score 0 - 100. 100 is no pain.
Figure 4. KOOSADL score 0-100. 100 perfect score.

Figure 5. Quadriceps strength in lbs./in².

Figure 6. KOOS symptoms and stiffness 0-100. 100 perfect score.
In most cases where patients have failed the current standards of non-surgical care, the only option is joint replacement, particularly for elderly patients [1]. In this panorama, regenerative medicine may give a new option for those who are not candidates for surgery, do not want surgery, or are unable to have surgery due to concomitant medical conditions. Here, the biological deployment of fat graft may potentially prove a viable option to reduce pain, restore function, improve quality of life, and show promise in halting the degenerative process.

Lipogems® system has been developed to improve the classical fat graft lipofilling technique [15] with the aim of providing transplantable clusters of liposarcoma with reduced size to improve engraftment. The system is a disposable kit for the aspiration, processing, and reinjection of autologous adipose tissue in both human and veterinary medicine [18][23]. Its core is a disposable and closed device filled with saline solution that progressively reduces the size of the clusters.
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24 of adipose tissue by means of mild mechanical forces and eliminates oil and blood residues responsible for the inflammation processes. The technique is non-traumatic and intra-operatively provides micro-fragmented fat in a short time (15-20 minutes), without expansion and/or enzymatic treatment. The vasculo-stromal niches of Lipogems® survive in the site of the injection and improve tissue health benefits [23]. Micro-fragmented clusters contain small, intact adipocytes that may play an important role in cell paracrine action.

The positive clinical outcome, in a joint that would have been considered resilient to improvement, with the potential repair and regeneration of the cartilage is very promising. Adipose tissue has been positively highlighted in different studies detailing a cascade of events including signaling, trophic, immunomodulatory, mitogenic, anti-microbial, anti-scarring, and anti-apoptotic properties that contribute to potential regenerative mechanisms. While more studies are required to validate the effectiveness of this approach for the treatment of knee pain, this data is very encouraging.

Theories as to mechanism of action may include the micro-fragmented adipose tissue providing volume, support, cushioning, filling of soft tissue defects or potential healing and regenerative capabilities. Additional mechanisms may include direct differentiation and chondrogenesis, regenerative signaling by activated perivascular cells tissue repair, signaling of trophic and paracrine mediators [19], activation of opioid receptors [24], pain reduction, down-regulation of destructive cytokines in the microenvironment, reduction of the arthrogenic muscle inhibition [25], exosome initiated cascades or a combination of all these.

The improvement in measured outcomes for pain, KOOS, MRI imaging, quadriceps strength and range of motion showing sustained gains up to 2.5 years support these theories. The results in this case report supported with other case studies about the regenerative potential of micro-fragmented adipose tissue in the treatment of knee pain and joint degeneration are encouraging.

Fat tissue transfer with Lipogems harvesting device appears to provide a viable option for the painful knee after the initial diagnosis including advanced osteoarthritis in those patients who fail conventional treatments, and do not want or are not candidates for surgery.

8. Conclusion

References