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Stemming the Tide of Unnecessary Stem Cell Injections

Story from the front lines:

An elderly woman was transferred to a hospital for an abdominal wall necrotizing soft tissue infection. About three weeks prior, she underwent liposuction for collection of adipose stem cells for planned injection for knee osteoarthritis. Two weeks after the procedure, she developed erythema and swelling at her surgical sites and was prescribed doxycycline; however, with development of pain and worsening erythema, she presented to her local hospital, where she underwent debridement, with concern for necrotizing soft tissue infection. When the infection continued to progress, she was transferred for additional management, and ultimately underwent four additional debridement procedures followed by rotation skin flaps and wound vacuum placement. Initial broad spectrum antimicrobial coverage was ultimately narrowed to linezolid, and unfortunately her course was further complicated by profound anemia and neutropenia, attributed to drug toxicity. As a result, she required prolonged hospitalization as she was monitored for hematopoietic recovery.

Teachable Moment:

Osteoarthritis is a common ailment in older adults, associated with significant discomfort and functional limitation, and the knee is the joint most frequently associated with disability and pain. The Framingham Osteoarthritis study evaluated the Framingham Heart Study cohort (age range 63-94) for knee osteoarthritis symptoms and imaging findings of disease, with weight-bearing radiographs demonstrating evidence of arthritis in 34% of women and 31% of men, and reported symptomatic disease in 11% of women and 7% of men.ⁱ In 2014, the Osteoarthritis Research Society International published guidelines for non-operative management of knee osteoarthritis, evaluating available evidence for a number of treatment modalities, and recommending a variety of therapies including oral and topical NSAIDs, SNRI, acetaminophen, exercise programs, weight loss, supportive devices, and corticosteroid injections. Of note, stem cell therapy was not addressed.ⁱⁱ However, stem cell therapy for knee arthritis, as well as a numerous other conditions, is increasingly offered at clinics across the United States. In order to characterize this developing market, Turner and Knoepfler conducted an internet search to identify centers offering stem cell therapies across the country, finding 351 businesses operating 571 widely distributed clinics, at increased concentrations in several geographic locations including California, Texas, Arizona, Colorado, New York, and Florida. 61% reported using adipose derived stem cells, 48% bone marrow derived, about 20% from allogenic sources (amniotic, placental, or umbilical materials), 4% from peripheral blood. The most frequently advertised conditions treated were orthopedic and pain, but claims spanned a broad range of conditions including neurologic, respiratory, cardiovascular, liver, and renal disease, aging, insomnia, and cosmetic indications.ⁱⁱⁱ While a number of pre-clinical and clinical studies report on potential and observed benefits of adipose derived stem cell therapy for knee osteoarthritis, this has not yet been demonstrated in high quality clinical trials. A 2017 systematic review found five RCTs and one nRCT, including a total of 155 study and 155 control patients; five of the studies reported positive outcomes in patient reported symptoms, imaging, and histologic findings; however, using the Cochrane risk of bias tool, the authors found all included studies at “high risk” of bias due to issues with inadequate blinding and possible selection and detection bias.^{iv}

Our patient experienced a series of complications after undergoing a procedure with yet unproven clinical benefits. While there is increasing interest in stem cell therapy for osteoarthritis, amongst other conditions, based on theoretical potential of stem cells to stimulate tissue regeneration and slow or reverse the progression of disease, high quality clinical evidence is lacking. Accepted procedures for patient selection, method of obtaining stem cells, dose or frequency of administration, and clear anticipated benefits have not yet been established.^v

ⁱ Felson, D.T. et al. “The prevalence of knee osteoarthritis in the elderly: The Framingham osteoarthritis study.” *Arthritis and Rheumatism* 30.8(1987): 914-918.

ⁱⁱ McAlidon, T.E. et al. “OARSI guidelines for the non-surgical management of knee osteoarthritis.” *Osteoarthritis and Cartilage*. 22 (2014) 363-388.

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- ⁱⁱⁱ Turner, Leigh and Paul Knoepfler. "Selling stem-cells in the USA: addressing the direct-to-consumer industry." *Cell Stem Cell* 19 (2016) 154-157.
- ^{iv} Pas, H.I. et al. "Stem cell injections in knee osteoarthritis: a systematic review." *Br J Sports Med* 51 (2017) 1125-1133.
- ^v Marks, P.W. et al. "Clarifying stem-cell therapy's benefit and risks." *N Engl J Med* 376.11 (2017) 1007-1009.