Adipose-derived stem cells improve the viability of nucleus pulposus cells in degenerated intervertebral discs.

Song K¹, Gu T², Shuang F³, Tang J¹, Ren D¹, Qin J¹, Hou S¹.

Abstract

Patients with degenerative disc disease (DDD) experience serious clinical symptoms, including chronic low back pain. A series of therapies have been developed to treat DDD, including physical therapy and surgical treatment. However, the therapeutic effect of such treatments has remained insufficient. Recently, stem cell-based therapy, in which stem cells are injected into the nucleus pulposus in degenerated intervertebral disc tissue, has appeared to be effective in the treatment of DDD. In the present study, the effect of adipose-derived stem cells on degenerated nucleus pulposus cells was investigated using a co-culture system to evaluate the biological activity of degenerated nucleus pulposus cells. Human degenerated nucleus pulposus tissue was obtained from surgical specimens and the adipose-derived stem cells were derived from adipose tissue. The degenerated nucleus pulposus cells were cultured in a mono-culture or in a co-culture with adipose-derived stem cells using 0.4-µm Transwell inserts. The results indicated that adipose-derived stem cells were able to stimulate matrix synthesis and the cell proliferation of degenerated nucleus pulposus cells, promoting the restoration of nucleus pulposus cells in the degenerated intervertebral disc.

PMID: 26059030   DOI: 10.3892/mmr.2015.3895

[PubMed - indexed for MEDLINE]
Treatment of discogenic back pain with autologous bone marrow concentrate injection with minimum two year follow-up.

Pettine K1, Suzuki R2, Sand T2, Murphy M3,4.

Abstract

PURPOSE: The purpose of this study is to assess safety and feasibility of intradiscal bone marrow concentrate (BMC) injections to treat discogenic pain as an alternative to surgery.

METHODS: A total of 26 patients (11 male, 15 female, aged 18-61 years, 13 single level, 13 two level) that met inclusion criteria of chronic (>6 months) discogenic low back pain, degenerative disc pathology assessed by magnetic resonance imaging (MRI) with modified Pfirrmann grade of IV-VII at one or two levels, candidate for surgical intervention (failed conservative treatment and radiologic findings) and a visual analogue scale (VAS) pain score of 40 mm or more at initial visit. Initial Oswestry Disability Index (ODI) and VAS pain score average was 56.5 % and 80.1 mm (0-100), respectively. Adverse event reporting, ODI score, VAS pain score, MRI radiographic changes, progression to surgery and cellular analysis of BMC were noted. Retrospective cell analysis by flow cytometry and colony forming unit-fibroblast (CFU-F) assays were performed to characterise each patient's BMC and compare with clinical outcomes. The BMC was injected into the nucleus pulposus of the symptomatic disc(s) under fluoroscopic guidance. Patients were evaluated clinically prior to treatment and at three, six, 12 and 24 months and radiographically prior to treatment and at 12 months.

RESULTS: There were no complications from the percutaneous bone marrow aspiration or disc injection. Of 26 patients, 24 (92 %) avoided surgery through 12 months, while 21 (81 %) avoided surgery through two years. Of the 21 surviving patients, the average ODI and VAS scores were reduced to 19.9 and 27.0 at three months and sustained to 18.3 and 22.9 at 24 months, respectively (p ≤ 0.001). Twenty patients had follow-up MRI at 12 months,
whom eight had improved by at least one Pfirrmann grade, while none of the discs worsened. Total and rate of pain reduction were linked to mesenchymal stem cell concentration through 12 months. Only five of the 26 patients elected to undergo surgical intervention (fusion or artificial disc replacement) by the two year milestone.

CONCLUSIONS: This study provides evidence of safety and feasibility in the non-surgical treatment of discogenic pain with autologous BMC, with durable pain relief (71% VAS reduction) and ODI improvements (> 64%) through two years.

KEYWORDS: Bone marrow concentrate; Discogenic pain; Intervertebral disc injection; Mesenchymal stem cells

PMID: 26156727 DOI: 10.1007/s00264-015-2886-4

[Indexe for MEDLINE]
Effects of the intradiscal implantation of stromal vascular fraction plus platelet rich plasma in patients with degenerative disc disease.

Kristin C¹, Robert S², Michelle P³.

Abstract

BACKGROUND: Stromal vascular fraction (SVF) can easily be obtained from a mini-liposapirate procedure of fat tissue and platelet rich plasma (PRP) can be obtained from peripheral blood. The SVF contains a mixture of cells including ADSCs and growth factors and has been depleted of the adipocyte (fat cell) population. We evaluated the safety and efficacy of administering SVF and PRP intra-discally into patients with degenerative disc disease.

METHODS: A total of 15 patients underwent a local tumescent liposuction procedure to remove approximately 60 ml of fat tissue. The fat was separated to isolate the SVF and the cells were delivered into the disc nucleus of patients with degenerative disc disease. The subjects were then monitored for adverse events, range of motion, visual analog scale (VAS), present pain intensity (PPI), Oswestry Disability Index (ODI), Beck Depression Inventory (BDI), Dallas Pain Questionnaire and Short Form (SF)-12 scores over a period of 6 months. Safety events were followed for 12 months.

RESULTS: No severe adverse events (SAEs) were reported during a 12 month follow up period with no incidences of infection. Patients demonstrated statistically significant improvements in several parameters including flexion, pain ratings, VAS, PPI, and short form questionnaires. In addition, both ODI and BDI data was trending positive and a majority of patients reported improvements in their Dallas Pain Questionnaire scores.

CONCLUSIONS: Overall, patients were pleased with the treatment results. More importantly, the procedure demonstrated a strong safety profile with no severe adverse events or complications linked to the therapy. Trial registration NCT02097862. Name of registry: www.clinicaltrials.gov . https://clinicaltrials.gov/ct2/show/NCT02097862?term=bioheart&rank=6 . Date of registration: March 25, 2014; Date of enrollment: March 2014.