

Case Report

Intradiscal Injection of Hematopoietic Stem Cells in an Attempt to Rejuvenate the Intervertebral Discs

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ABSTRACT

This study is a prospective analysis of 10 patients who underwent intradiscal injection of hematopoietic precursor stem cells (HSCs) obtained from their pelvic bone marrow in an attempt to rejuvenate the disc. Several studies in animals express the ability to regrow disc tissue with possible regenerative effects. No human studies have been done to date. Patients were randomly offered the option of this study, and ten patients with confirmed disc pain via provocative discograms underwent intradiscal HSC injections. After the intradiscal injection of HSCs, all of the patients underwent a 2-week course of hyperbaric oxygen therapy. These patients were followed up at 6- and 12-month intervals to determine their degree of pain relief from this procedure. Of the 10 patients, none achieved any improvement of their discogenic low back pain after 1 year. In conclusion, although animal studies suggest possible regeneration of disc via HSC injections, living human studies reveal that this effect does not correlate with reduced pain, and thus intradiscal HSC injection appears to be of little value.

INTRODUCTION

DISCOGENIC PAIN is a common cause of low back pain. Most conventional therapies for discogenic pain involve insertion of metal prosthetics such as artificial discs (ADR) or fusions. Other treatments include endoscopic discectomies, nucleoplasties, or intradiscal electro-thermolation (IDET). Recent animal studies have offered hope that insertion of hematopoietic stem cells (HSCs) into the discs might rejuvenate the disc matrix (1,2). To date, no human studies have been done utilizing HSCs. Our study attempts to determine if there is any valid usage of HSCs in the treatment of discogenic pain.

MATERIALS AND METHODS

Our study is a prospective analysis of 10 individuals who underwent intradiscal injections of HSCs obtained

from their pelvic bone marrow. The study consisted of 5 men and 5 women, whose ages ranged from 32 to 74 years of age. Patients were randomly offered the option of the study protocol and thus no preselection guidelines were used. All of the patients had attempted an endoscopic discectomy as an attempt to eliminate their low back pain and their next option was either a fusion or artificial disc replacement surgery. Patients were randomly offered the option of the study protocol and thus no preselection guidelines were used. The patients all agreed to no further treatment until 1 year after the study. All of the patients underwent repeat discograms to confirm that their pain was indeed still discogenic in nature. The repeat discograms and stem cell injections were delayed until the patients were at least 3 months post the endoscopic discectomy so that the endoscopic discectomy could be ruled out as a source of improvement.

The procedure was as follows. In a sterile environment, the patient was prepped and draped, and 1 cc of local li-

docaine was employed as local anesthetic. A 22-gauge 8-inch spinal needle was inserted into the discs that were confirmed to be problematic by prior discograms. The placement was confirmed by fluoroscopy and no dye was inserted into the discs. Using a specialized bone marrow aspiration needle, the needle was inserted into the pelvic crest until bone marrow aspirate was obtained. A total of 5 cc of bone marrow aspirate was obtained. This is the same HSC tissue that has been described in other studies (1). Next, 1 cc of HSCs were inserted into each of the problematic discs. Patients then underwent a 2-week course of hyperbaric oxygen therapy to assist in oxygen delivery to the discs, which are known for their poor blood flow. The hyperbaric oxygen therapy consisted of daily treatment (Monday through Friday) of 100% oxygen at 2 atmospheres for 2 weeks. Patients were given the following restrictions for 1 month—no lifting greater than 10 pounds and no excessive bending. Patients were then followed up at 6-month intervals.

RESULTS

Of the 10 patients who underwent the intradiscal HSC injection, 0 (zero) patients (0%) reported a visual analog score (VAS) reduction in their pain at 1 year post injection. No other treatments occurred between the date of injection of HSCs and until 1-year post injection. After the 1-year anniversary of the study, 7 (75%) of the original 10 patients underwent fusion surgery and 1 (10%) underwent ADR surgery. The remainder continued with conservative therapy.

In the literature, several studies express the possibilities of disc rejuvenation with mesenchymal stem cell (MSC) injection. A study by Sakai and associates revealed that MSCs injected into rabbits decelerated the degeneration of the disc structure (2,3). A study by Steck and associates revealed that MSCs could differentiate into disc-type tissue (4). Finally, a study by Zhang et al. expressed that transplanted MSCs not only could survive within the discs of living rabbits but also actually increased proteoglycan levels, which are believed to be important to the structure of the disc (5). Given this literature, which suggests that MSCs might improve the viability of the disc structure, our study attempted to determine whether or not the HSCs, which are also precursor tissues, actually improved long-term pain outcomes in living humans. Unfortunately, our study suggests that HSCs are not a viable treatment option because none of the 10 patients who underwent injection

of HSCs developed any improvement. Most of these patients eventually underwent fusion or ADR-type surgeries.

CONCLUSION

Even though MSCs have been suggested as a possible treatment modality for degenerative discs, our study reveals that HSCs, which are similar precursor cells, are of no benefit in living human subjects. We hypothesize that the HSCs cannot survive in the oxygen-poor environment of the disc, even with hyperbaric oxygen therapy.

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