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Improving Functionality through Regenerative Medicine

By: Yolanda Scott, MD
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It's hard to keep up with the speed of technology, especially with how fast it's progressing in the 21st century, but with advancements comes new ideas and better ways to expand upon old methods. This thought extends to medicine and how quickly our ideas of treatment have grown. The newest trend is regenerative medicine which involves the use of new products such as stem cells. Like technology, this field of regenerative medicine is also growing rapidly. At its core, regenerative medicine is the delivery of a specific product to a damaged or degenerative tissue with the hopes of restoring tissue and organ function (1). If current treatment options have been tried and proven to be inadequate, regenerative medicine can now be considered as another option to improve functionality.

Despite it being considered a relatively new field of medicine, regenerative medicine has been around for several decades. It began as "tissue engineering" in 1933 with the transfer of mice tumor cells into the abdominal cavity of a chick to study pancreatic β cells. In 1988 and 1990, A UCLA symposium coined the term tissue engineering to designate an emerging technology (2). Under the umbrella of regenerative medicine are sev-

eral forms of treatment; and though many feel that regenerative medicine is synonymous with stem cells, there are various cell products that are used for this purpose.

The defining characteristics of a stem cell is its ability to create more cells, that resemble the cells around it based on its environment. Think of a stem cell as a blank canvas that can take on the shape and function of the other cells it is close to. For example, a stem cell can be placed around cardiac (heart) cells and become an actual functioning cardiac cell.

There are two types of stem cells, embryonic and non-embryonic. Embryonic stem cells (ESC) are obtained from embryos, whereas non-embryonic stem cells (NESC) are derived from essentially any adult tissue such as placenta, blood, the umbilical cord, and adipose tissue just to name a few. When we think about stem cell treatment in the United States, most of the treatments discussed are related to non-embryonic stem cell treatment.

Platelet Rich Plasma treatment, or PRP is very popular given its association with professional athletes. PRP is a patient's own blood that is spun down in a machine which will allow for the blood to separate into its various parts. The plasma, which

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contains growth factors and platelets, is drawn from the solution and injected into tendons, ligaments, muscles and joints due to its healing property. There have been several studies publishing the benefits of PRP treatment, and its presence helps increase treatment options for specific musculoskeletal ailments.

Stem cells are also obtained from adipose tissue. Adipose tissue stem cells are obtained via needle biopsy or liposuction. The sample must be minced, profusely washed and chemically treated and then incubated for 30 minute and neutralized. This process is similar for both bone marrow and placental stem cells which also have to be aspirated and harvested appropriately prior to usage.

Each option for stem cells has their own risk and benefits, for example, adipose and bone marrow obtained stem cells have more available stem cells when compared to PRP, but the latter is easier to obtain and utilize. The benefits of amniotic tissue has been used for wound healing, and adipose stem cells have been utilized in surgeries to speed up tissue repair.

As progressive as stem cell treatment is, it unfortunately is not covered by most commercial insurance policies. There is an out of pocket cost that can be anywhere from a few hundred to several thousand dollars. The procedure begins with the isolation of stem cells which can be laborious, but the price for an injection of stem cells into a major joint may be significantly less when compared to a joint replacement. If a patient has exhausted all forms of conservative treatment, then stem cell treatment can be discussed as a potential alternative to surgery. It is very important, however, to understand that regenerative medicine is in its infancy and a great deal of research still needs to be done before the use of these products become accepted as the standard of care.

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1)Bunel, B, Flaatt Mette, et al.Methods 2008 June; 2(2): 115-120

2)Crisan M, Yap , Castelilla L, et al. A perivascular origin for mesenchymal stem cells in multiple human organs. Cell Stem Cell 2008 301-313



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