Stems Cells and Spinal Conditions
What Are Stem Cells?

The unique and fascinating stem cells that are part of nearly every multi-cellular organism were discovered more than 40 years ago when researchers discovered that bone marrow contains different types of stem cells. Stem cells are early-stage cells, capable of continuously dividing and developing into other specialized types of cells. Humans consist of more than 200 types of cells and stem cells have the ability to turn into any of these functioning cells including muscle cells, bone cells, liver cells, skin cells, nerve cells, etc. They are basically a “blank slate” that does not yet have a specific function and therefore can ultimately be programmed to perform any one of a number of specialized tasks.

What is a stem cell?

A single cell that can replicate itself, or...

differentiate into many cell types.

There are two types of stem cells, adult and embryonic. Embryonic stem cells are derived from embryos at a developmental stage, while adult stem cells are undifferentiated cells that reside in adult tissues such as bone marrow, fat cells, umbilical cords and other areas. The primary purpose of adult stem cells is to act as a repair system for the body. The cells replenish specialized cells, while maintaining the normal turnover of regenerative organs, such as blood, skin or intestinal tissues.

Adult stem cell therapies have been used to successfully treat conditions such as leukemia and related bone/blood cancers for many years. For example, because bone marrow contains stem cells, bone marrow transplants are used to replace stem cells that are damaged or destroyed as a result of chemotherapy. Due to its non-controversial nature, adult stem cell research is receiving increased U.S. government funding. Currently, there are no mainstream human embryonic stem cell therapies.

What is Regenerative Medicine?

Stem cell research is advancing our knowledge of the development of an organism from a single cell and is also explaining how healthy cells have the ability to replace damaged cells in adult organisms. This promising area of science is leading researchers to investigate the possibility of cell-based therapies to treat disease, which is often referred to as regenerative medicine. Regenerative medicine is the science that focuses on the use of adult stem cells and how they can be utilized to regenerate tissues and improve function of existing tissues or organs.

Specifically, doctors use regenerative medicine to speed up healing and aid in the repair of injuries that may not heal on their own. In clinical trials, regenerative therapies are showing promise in their ability to heal broken bones, burns, blindness, deafness, heart damage, nerve damage, Parkinson’s and other conditions. Regenerative medicine may result in extended healthy life spans and repair some of the damage caused by aging.

Scientific researchers and medical doctors hope to make the concept of regeneration into reality by continuing research on developing therapies to restore lost, damaged, or aging cells and tissues in the human body.
The purpose of any surgical procedure involving the spine is to eliminate pain caused by joints that have deteriorated due to degeneration. One of the most reliable ways to reduce pain from degeneration is to combine the joints together through a fusion, which requires two bones, separated by a joint, to be fused together. Spinal fusions have been used for years to treat many conditions of the lumbar spine and the technological advancements that have been made in fixation devices have improved the results dramatically.

During a spinal fusion, a bone graft is used to join two or more vertebrae and help the vertebrae grow together to create a solid piece of bone during the healing process. Typically, the bone graft is taken from the pelvis (autologous) at the time of surgery, but it may also be obtained from a donor through a bone bank (allograft). Autologous bone from the patient’s own pelvis is the optimal method for this procedure, but it requires extra surgery to remove bone, which can be uncomfortable and painful after surgery.

An alternative to traditional spinal fusion is to obtain adult stem cells through bone marrow aspiration or liposuction. This method concentrates adult stem cells from the patient’s bone marrow or fat tissue. It is done within minutes through a simple surgical technique during the spinal procedure and creates little discomfort for the patient. The extracted adult stem cells are then implanted back into the patient at the fusion site through a carrier to promote the fusion to occur.

Each patient should take the time to review and discuss treatment options with their doctor.
Frequently Asked Questions

What is the difference between adult stem cells and embryonic stem cells?
Adult and embryonic stem cells differ from one another in several ways. Embryonic stem cells are derived from embryos and are found in the blastocyst three to four days after fertilization. Adult stem cells are taken from a variety of adult tissues including bone marrow, blood, fat, umbilical cords and most other mature tissues. Adult stem cells have been shown to form many tissue types and have a track record in clinical settings.

One major advantage of using adult stem cells is that they are the patient's own cells. The use of the patient's own adult stem cells nearly eliminates the potential for immune system rejection. This represents a significant advantage, as immune rejection can happen with embryonic stem cells and can only be cured with immunosuppressive drugs.

Are there ethical issues associated with the harvesting of adult stem cells?
No. Human stem cells do not present the ethical dilemma that embryonic stem cells do because harvesting them does not destroy the donor or involve an embryo. Many people wrongly associate controversy with all stem cells due to misconception that all stem cells are of embryonic origin.

Where do adult stem cells come from?
In adults, stem cells are present within various tissues and organ systems, the most common being bone marrow and fat tissue. Other sources include the liver, epidermis, retina, skeletal muscle, intestine, brain, placenta, umbilical cord and dental pulp.

How are stem cells used in surgical procedures?
Stem cell transplants are used to treat people whose stem cells have been damaged by disease or for the treatment of a disease. Stem cell transplants can benefit a variety of both cancerous and non-cancerous diseases.

A stem cell transplant is a complex procedure to replace unhealthy stem cells with healthy ones. These healthy stem cells take hold in the body and begin normal production of more cells and specialization into specific types of cells. Stem cells “recognize” their surroundings and grow into the correct tissue types as needed.

Will my body reject the stem cells?
No. Adult stem cells are non-immunogenic. These stem cells come from your own body so there is no issue with rejection.