# Combining adult stem cells with hormone may speed bone fracture healing

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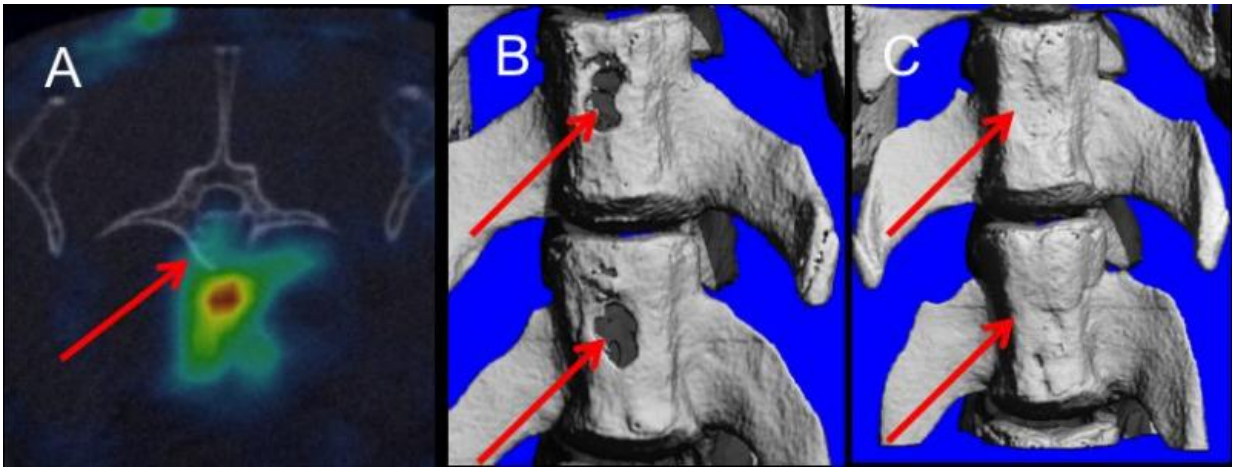


A- Labeled stem cells target spinal bone fracture; B- Two spinal bone fractures; C- Complete healing of spinal bone fractures eight weeks post treatment with stem cells and PTH. Credit: Cedars-Sinai Board of Governors Regenerative Medicine Institute

A combination of adult stem cells and parathyroid hormone significantly increased new bone formation in laboratory animals and may speed the healing process for human bone fractures caused by osteoporosis, a new study shows.

The study is published online by *Molecular Therapy*, a peer-reviewed journal in the Nature Publishing Group. Researchers used a combination

of mesenchymal stem cells, which are derived from bone marrow taken from adults, and parathyroid hormone, also called PTH, which regulates human calcium levels essential for strong and healthy bones.

For 21 days, laboratory rats and pigs with vertebral fractures received daily injections of PTH. During the same period, the animals also were injected with five doses of stem cells. The study shows that the combination therapy significantly enhanced the stem cells' migration to the area of the bone fracture and increased the formation of new, healthy bone.

"We have known that used separately, both the stem cells and the hormone each have an effect on the healing process involved in bone fractures," said Dan Gazit, DMD, PhD, co-director of the Skeletal Regeneration and Stem Cell Therapy Program in the Department of Surgery and Cedars-Sinai Board of Governors Regenerative Medicine Institute. "Now, we have learned that the stem cells and PTH are much stronger combined than they are separately."

Said study co-author Zulma Gazit, PhD, co-director of the Skeletal Regeneration and Stem Cell Therapy Program: "We found that the combination has a synergistic effect, like one plus one equals three."

The researchers hope to use the findings to develop new treatments for patients with osteoporosis and patients who have spinal compression fractures, caused by weak bones.

Vertebral compression fractures account for more than 750,000 injuries each year in the US - twice as many as hip fractures. They often are a result of a severe jolt to the spine, or a weakening of the spine due to osteoporosis. Approximately 10 million Americans and 200 million globally are diagnosed with osteoporosis, a chronic and life-threatening disease that primarily affects older women and is characterized by

decrease in bone mass that causes bone brittleness. Another 34 million Americans have low bone mass, which increases vulnerability to bone fractures.

Existing treatments consist of lifestyle adjustments, such as exercise, which contributes to healthy bones, and medications to prevent bones from shattering as a result of a fall or an accident. But those measures focus on prevention, leaving few options to help bones heal.

"Currently, there aren't many good options for treatment," Zulma Gazit said. "So our goal is to develop a biological treatment that not only promotes healing but also stimulates normal bone production."

The therapeutic effect of the stem cells-PTH combination was compared to the results of stem cell therapy alone, PTH injections alone and no treatment.

Bone regeneration in vertebral defects was monitored at several different times after surgery by performing Computed Tomography, a computerized X-ray scanner that creates cross-sectional pictures of internal organs, bones and other structures.

"We saw increased bone volume density and healthy bone formation only in the lab animals treated with both stem cells and hormone therapy," Zulma Gazit said. "Over the course of the study, we saw three-to-four times more healing in the groups that were treated with the combination."

The next step in the research is to work toward developing a clinical trial that would test the combination therapy in humans, said Gadi Pelled, PhD, assistant professor at the Skeletal Regeneration and Stem Cell Therapy Program and senior co-author of the study.

Provided by Cedars-Sinai Medical Center