Medical Xpress

Brittle-bone babies helped by fetal stem cell grafts

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Osteogeneis imperfecta (OI) is a congenital bone disease that causes stunted growth and repeated, painful fracturing. Ultrasound scans can reveal fractures already in the fetus, and now an international team of researchers from Sweden, Singapore and Taiwan have treated two babies in utero by injecting bone-forming stem cells. The longitudinal results of the treatment are published in the journal *Stem Cells Translational Medicine*.

The babies were treated with mesenchymal stem cells, connective tissue cells that can form and improve bone tissue. The stem cells were extracted from the livers of donors and although they were completely unmatched genetically, there was no rejection and the transplanted cells were accepted as self.

Back in 2005, a paper was published from Karolinska Institutet in Sweden describing how stem cells were given to a female fetus. The present study describes how the girl suffered a large number of fractures and developed scoliosis up to the age of eight, whereupon the researchers decided to give her a fresh stem cell graft from the same donor. For the next two years the girl suffered no new fractures and improved her growth rate. Today she takes dance lessons and participates more in PE at school.

Another unborn baby with OI, a girl from Taiwan, was also given stem cell transplantation by the Karolinska Institutet team and their colleagues from Singapore. The girl subsequently followed a normal and fracture-

free growth trajectory until the age of one, when it levelled off. She was given a fresh stem cell treatment and her growth resumed. The girl started to walk and has since not suffered any new fractures. Today she is four years old.

"We believe that the stem cells have helped to relieve the disease since none of the children broke bones for a period following the grafts, and both increased their growth rate," says study leader Dr Cecilia Götherström, researcher at Karolinska Institutet's Department of Clinical Sciences, Intervention and Technology. "Today, the children are doing much better than if the transplantations had not been given. OI is a very rare disease and lacks effective treatment, and a combined international effort is needed to examine whether stem cell grafts can alleviate the disease."

The researchers have also identified a patient, a boy from Canada, who was born with OI caused by exactly the same mutation as the Swedish girl had. The boy was not given stem cell therapy and was born with severe and widespread bone damage, including numerous fractures and kyphosis of the thoracic vertebrae, which causes such over-curvature of the spine that it impairs breathing. The boy died of pneumonia within his first 5 months.

Participating institutions in Singapore have been the National University Hospotal, and the KK Women's and Children's Hospital. Collaborating partner of Taiwan was the Chang Gung Memorial Hospital in Linkou. Researchers of several universities and hospitals in Sweden, Canada and the USA also took part in the work. The study was financed with a grant from the Swedish Society for Medical Research, and two of the participating researchers received a salary from the Singaporean Ministry of Health.

More information: 'Pre and postnatal transplantation of fetal

mesenchymal stem cells in osteogenesis imperfecta: a two-center experience', Cecilia Götherström, Magnus Westgren, S W Steven Shaw, Eva Åström, Arijit Biswas, Peter H Byers, Citra N Z Mattar, Gail E Graham, Jahan Taslimi, Uwe Ewald, Nicholas M Fisk, Allen E J Yeoh, Ju-Li Lin, Po-Jen Cheng, Mahesh Choolani, Katarina Le Blanc and Jerry K Y Chan, Stem Cells Translational Medicine, advance online publication 16 December 2013.

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