Primary teeth stem cells may help repair adult teeth

Children’s cells regenerate pulp in their injured secondary teeth

Stem cell research has been central to many developments in medicine. In a new study, scientists have investigated whether stem cells from primary teeth can help in the regrowth of damaged adult teeth. The promising results of the study highlight the potential of the approach, which could one day be applied in a wide range of dental procedures or even in treating certain systemic diseases.

The research was led by Dr. Songtao Shi, chair and professor of the Department of Anatomy and Cell Biology at the University of Pennsylvania, and Drs. Yan Jin, Kun Xuan and Bei Li from the Fourth Military Medical University in Xi’an, China. “This treatment gives patients sensation back in their teeth. If you give them a warm or cold stimulation, they can feel it; they have living teeth again,” explained Shi. “So far we have follow-up data for two, two and a half, even three years and have shown it’s a safe and effective therapy,” he continued.

Over the past 10 years, Shi and his colleagues have learned more about human deciduous pulp stem cells (hDPSC) and how they could be safely employed to regrow pulp. The study involved 40 children with mixed dentition who had each injured one of their permanent incisors. Thirty of the children were assigned to hDPSC treatment, which involves extracting tissue from a healthy primary tooth and then reproducing the stem cells from the pulp in a laboratory culture. From there, cells were implanted into the injured tooth. The remaining 10 patients received controlled apexification treatment.

The researchers found that patients who received hDPSC treatment had more signs than the control group of healthy root development and thicker dentin, as well as an increase in blood flow. Additionally, the researchers were able to directly examine the tissue of a treated tooth when one of the patients reinjured it and it had to be extracted. They found that the implanted stem cells regenerated different components of the dental pulp, including the cells that produce dentin, connective tissue and blood vessels.

Despite the successful results, the researchers acknowledge that these are just the first steps. While using a patient’s own stem cells reduces the possibility of immune rejection, it’s not possible in adult patients who have lost all of their primary teeth. Shi and his colleagues are beginning to test the use of allogeneic stem cells to regenerate dental tissue in adults. They are also hoping to secure Food and Drug Administration approval to conduct clinical trials using hDPSCs in the U.S.

“We’re really eager to see what we can do in the dental field, and then building on that to open up channels for systemic disease therapy,” said Shi.

The study, titled “Deciduous autologous tooth stem cells regenerate dental pulp after implantation into injured teeth,” was published in Science Translational Medicine on Aug. 22.