On the potential of decidua-derived MSC as therapeutic agents for bone repair

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OBJECTIVE:
Adult mesenchymal stem cells derived from fat or bone marrow represent a promising therapeutic treatment to promote tissue regeneration. However, their availability is limited by the number of donors who are willing to undergo the surgical session that is needed to isolate fat or bone marrow. Placental tissues have been suggested as an alternative source of stem cells, as their availability is practically unlimited, they involve no additional surgery to the donor, and their use does not pose ethical dilemmas. Decidua-derived mesenchymal stem cells (DMSC) have been proved to have a high replicative potential and the ability to differentiate into different lineages.

MATERIALS AND METHODS:
DMSC were isolated from discarded placentas of healthy newborns after informed-consent of the mothers, seeded on ßTCP/HA granules and implanted into full-thick cranial defects in immunocompetent adult rats. Prior to implantation, the cells were labelled with a fluorescent marker in order to later detect them by in vivo fluorescence. Control rats received unseeded (no-cells) ßTCP/HA granules. Implants were non-invasively followed-up by in vivo fluorescence and MRI. After 21 days, animals were euthanized, and their craniums were dissected out, fixed, embedded in paraffin and cut into sections, which were stained to detect new bone formation.

RESULTS:
Fluorescence emission was detected in the cranial region of animals implanted with DMSC-seeded ßTCP/HA-granules for up to 15 days after implantation. MRI and gadolinium injection confirmed vascularization of all implants from the seventh day after surgery. Histological examination and image analysis showed more in vivo bone formation around the DMSC-seeded ßTCP/HA- granules as compared with the no-cells controls.

CONCLUSION:
DMSC promote bone healing in an in vivo model of bone repair.