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Application of clinical grade hUC-MSCs in the treatment of uterine scars in rats

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Full thickness injuries of the uterus may trigger uterine scar formation after cesarean section, ultimately leading to a variety of obstetrical complications or infertility. The main mechanisms of uterine scar formation involved in acute or chronic inflammatory response, collagen deposition and muscle fiber regeneration. Now-a-days, few methods have adequately solved these problems. Human umbilical cord derived mesenchymal stem cells (hUC-MSCs) have excellent function in immune regulation, tissue regeneration and functional reconstruction and have shown great promise in clinical applications. The objective of this study was to investigate the effect of hUC-MSCs construct on inflammation regulation, collagen degradation and functional regeneration in rat uterine scars following full thickness excision of uterine walls. In our research, the clinical grade hUC-MSCs would be prepared strictly following the international standards of the International Society for Stem Cell Research (ISSCR). In order to establish a rat model of uterine scars, a 2.0 cm in length, full thickness incision of uterine walls was performed around 0.5 cm from each uterine horn. A total of 100 rats were randomly assigned to five groups, including a normal group (n = 20), eutocia group (n = 20), cesarean group (n = 20), control group (saline n = 20) and hUC-MSCs group (n = 20) to investigate the effect of clinical grade hUC-MSCs treatments on the structure and function of uterine scars. Saline or hUC-MSCs were injected surrounding each uterine scar, respectively. At days 15, 30, 60 and 90 post-transplantation, the superparamagnetic iron oxide nanoparticles (SPIONs) labeled hUC-MSCs were detected and traced in vitro by MRI. The planting, distribution and migration of hUC-MSCs in uterine scar were dynamically detected by MRI and fluorescence tracing of the living image of a small animal. Haematoxylin eosin staining, Masson's trichrome staining, immunofluorescence staining, western blot and real-time PCR for collagen, matrix metallo proteinases, inflammatory factors, chemokine, bFGF, PDGF-BB and VEGF were performed. We would like to find out the value of hUC-MSCs according to the research mechanism.



Figure 1: Effect of hUC-MSCs on inflammation regulation, collagen degradation and functional regeneration in rat uterine scars.

Recent Publications

1. Fan D, Xia Q, Wu S, Ye S, Liu L, Wang W, *et al.*, (2018) Mesenchymal stem cells in the treatment of Cesarean section skin scars: study protocol for a randomized, controlled trial. *Trials* 19(1):155.
2. Fan D, Wu S, Ye S, Wang W, Wang L, Fu Y, *et al.*, (2018) Random placenta margin incision for control hemorrhage during cesarean delivery complicated by complete placenta previa: a prospective cohort study. *Journal of Maternal-Fetal & Neonatal Medicine* DOI: 10.1080/14767058.2018.1457638.
3. Liu Y, Fan D, Fu Y, Wu S, Wang W, Ye S, *et al.*, (2018) Diagnostic accuracy of cystoscopy and ultrasonography in the prenatal diagnosis of abnormally invasive placenta. *Medicine (Baltimore)* 97(15):e0438.
4. Fan D, Wu S, Wang R, Huang Y, Fu Y, Ai W, *et al.*, (2017) Successfully treated congenital cystic adenomatoid malformation by open fetal surgery: A care-compliant case report of a 5-year follow-up and review of the literature. *Medicine (Baltimore)* 96(2):e5865.

Biography

Shuzhen Wu is currently an obstetrician in Southern Medical University Affiliated Maternal & Child Health Hospital of Foshan. She graduated with her Master's degree in Obstetric (2009-2011), and her undergraduate degree in Medicine (2004-2009) from Shantou University Medical College, China. Her academic and research interests lie in high-risk obstetric, placenta previa, fetal in utero treatment, and regenerative medicine and stem cell clinical therapy.

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