Review Article

Histological Study on the Effect of Human Umbilical Cord Mesenchymal Stem Cells Versus their Microvesicles in the Repairing of Acute Kidney Injury Following Ischemia Reperfusion in Adult Male Albino Rats

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ABSTRACT

Background: Renal ischemia/reperfusion (I/R) injury is the major cause of acute kidney injury (AKI); it is associated with severe morbidity and mortality in both developing and developed countries.

Aim of Work: To compare between the therapeutic potential of human umbilical cord–mesenchymal stem cells (hUC-MSCs) and their microvesicles (MVs) on I/R induced AKI in a rat model.

Materials and Methods: 42 adult male albino rats with an average body weight 180-200 grams were included in the study. The control group included twelve rats they were subjected to sham operation and divided into (subgroups Ia and Ib) six rats each. The remaining thirty rats were exposed to I/R injury via clamping of both renal pedicles for 40 minutes (ten rats were the experimental non- treated group they included subgroup IIa in which the sacrification was done 48 hours after reperfusion and subgroup IIb in which the sacrification was done 2 weeks after reperfusion and ten rats injected after reperfusion once intravenously with Paul Karl Horan (PKH) 26 labelled hUC-MSCs in adose of 1x106 diluted in saline the sacrification was done 48 hours for subgroup IIIa and 2 weeks after reperfusion for subgroup IIIb and ten rats injected after reperfusion once intravenously with PKH 26 labelled MVs derived from hUC- MSCs in adose of100 µg diluted in saline the sacrification was done 48 hours for subgroup IVa and 2 weeks after reperfusion for subgroup IVb). The kidney sections were stained with hematoxylin and eosin, PAS and immunohistochemical staining for proliferating cell nuclear antigen (PCNA) and vascular endothelial growth factor (VEGF). Blood samples, were taken to measure serum urea and Cr on Day 2 and Day 14 following I/R acute kidney injury.

Results: Both hUC- MSCs and their MVs exhibited protection against AKI manifested by the improvement of histological architecture, the reduction of serum urea and Cr and the increase in PCNA expression and VEGF expression in renal tubules.

Conclusion: These results suggest the potential renoprotective capacity of both hUC-MSCs and their MVs which was detected biochemically, histologically and morphometrically. But we prefer using MVs on stem cells. To avoid undesirable effects associated with use of cellular material.

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