

Wharton's Jelly-Derived Mesenchymal Stem Cells Modulate Heart Rate Variability and Improve Baroreflex Sensitivity in Septic Rats

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Abstract : Sepsis induces alterations in hemodynamics and autonomic nervous system (ASN). The autonomic activity can be calculated by measuring heart rate variability (HRV) that represents the complex interplay between ASN and cardiac pacemaker cells. Wharton's jelly mesenchymal stem cells (WJ-MSCs) are known to express genes and secreted factors involved in neuroprotective and immunological effects, also to improve the survival in experimental septic animals. We hypothesized, that WJ-MSCs present an important role in the autonomic activity and in the hemodynamic effects in a cecal ligation and puncture (CLP) model of sepsis. Methods: We used flow cytometry to evaluate WJ-MSCs phenotypes. We divided Wistar rats into groups: sham (shamoperated); CLP; and CLP+MSC (106 WJ-MSCs, i.p., 6 h after CLP). At 24 h post-CLP, we recorded the systolic arterial pressure (SAP) and heart rate (HR) over 20 min. The spectral analysis of HR and SAP; also the spontaneous baroreflex sensitivity (measure by bradycardic and tachycardic responses) were evaluated after recording. The one-way ANOVA and the post hoc Student- Newman- Keuls tests ($P < 0.05$) were used to data comparison Results: WJ-MSCs were negative for CD3, CD34, CD45 and HLA-DR, whereas they were positive for CD73, CD90 and CD105. The CLP group showed a reduction in variance of overall variability and in high-frequency power of HR (heart parasympathetic activity); furthermore, there is a low-frequency reduction of SAP (blood vessels sympathetic activity). The treatment with WJ-MSCs improved the autonomic activity by increasing the high and lowfrequency power; and restore the baroreflex sensitive. Conclusions: WJ-MSCs attenuate the impairment of autonomic control of the heart and vessels and might therefore play a protective role in sepsis. (Supported by FAPESP).

Keywords : baroreflex response, heart rate variability, sepsis, wharton's jelly-derived mesenchymal stem cells

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