ABSTRACT

Isolation methods of Wharton's Jelly Mesenchymal Stem Cells and their differentiation potency in osteogenic media

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Supported by: Fabio Triolo, DdR, MPhil, PhD, Department of Pediatric Surgery; The University of Texas at Houston Medical School – Office of the Dean
Key Words: Wharton's Jelly, Stem Cells, Oseteogenic differentiation

Introduction: Wharton's jelly-derived mesenchymal stem cells (WJMSC) are considered to be a promising new source for regenerative medicine. They are derived from wharton's jelly, which is a gelatinous tissue located in the umbilical cord. It combines the benefits of adult stem cells and embryonic stem cells while avoiding the ethical and physical limitations of both. Specifically, WJMSCs have anti-tumoral properties and are immunosuppressant. Addtionally, WJMSC come with it's own natural tissue construct, the wharton's jelly itself which is loaded with rich extra-cellular matrices and proteins that aid in the growth and development of WJMSCs in vivo and in vitro. Collectively, these properties are exciting for regenerative medicine and warrant investigation in order to further explore potential clinical applications of WJMSCs. Specifically within the lab of Dr. Triolo, WJMSC are currently being used in pioneering experiments to treat cleft palate in infants. In order to use the mesenchymal stem cells found within the wharton's jelly for the treatment of cleft palate , the wharton's jelly must first be isolated from the umbilical cord and the osteogenic differentiation potential of the WJMSC muse then be evaluated.
Methods: The wharton's jelly was isolated through a set protocol in which the umbilical cord is cleaned and divided into pieces of roughly 5-8 cm in length. The pieces were cleaned and opened, then the three vessels innate to the umbilical cord were removed. The wharton's jelly was then scraped off the epithelial tissue and placed in phosphate buffer solution. The isolated Wharton's jelly was then placed in both an osteogenic media and a control media and observed for mineralization after fourteen days using alizarin red staining.
Results: The isolation method for wharton's jelly from the umbilical cord was proven effective by the results of the wharton's jelly in culture. After fourteen days, the plates containing wharton's jelly within osteogenic media showed significant mineralization as indicated by the alizarin red staining. This was further verified by comparing the mineralization of the WJMSC in the osteogenic media with the WJMSC in the control media which showed no mineralization.
Conclusions: The results of this experiment reinforced the promising nature of WJMSC in clinical applications. The WJMSC showed strong differentiation potency in situ when placed in osteogenic media, showing clear signs of differentiation by its mineral deposits just after fourteen days. These results reinforce the ability of WJMSC to differentiate osteogenically and be used in clinical applications such as the treatment of cleft palate.