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Editorial

Wharton Jelly-Derived Mesenchymal Stem Cells

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Editorial

The term "prenatal" refers to the periodnear the birth, but technically it takes about 20 weeks from pregnancy to the first 28 days after birth [1]. It is proven that the umbilical cord and pre-natal tissues that are assumed as discarded tissues are rich in stem cells [2].

In fact, the stem cells used in the regenerative medicine should be easily obtained, access to it should be non-invasive, high in number and securely transplanted to the host. Since achieving bone marrow mesenchymal stem cell is dangerous because of viral contamination, scientists are focused on a replacing source such as fat, synovial fluid, fetus liver; deciduous dentition, Cord blood, and especially Wharton jelly are considered as an alternative source of mesenchymal stem cells [3].

This alternative source of mesenchymal stem cells was possible with report of the cultivation of Wharton Jelly Cultures, and isolation of human umbilical cord itself was first reported by Thomas Wharton in 1656 [4].

The umbilical cord which causes the relationship between mother and fetus during pregnancy. Umbilical cord's weight is about 40 grams in a human being, reaches 60-65 cm in length, and the diameter of umbilical cord reaches 1.5 cm at the time of delivery. The umbilical cord is covered by a single layer ofamnionitic membrane-derived squamous epithelial cells called umbilical epithelium. These epithelial cells exhibit ultrastructural and functional properties similar to keratinocytes. Previously, it has been shown that they have the characteristics of stem cells.The internal tissue structure consists of two arteries and one vein surrounded by a mucoid connective tissue called Wharton Jelly. Wharton jelly is consists of a glycoprotein andcollagenous microfibrils. The mentioned networks act as a soft skeleton and consist of small and wave-like bundles of collagenous fibrilsthat surround umbilical vessels. Most of the constituents of glycosaminoglycans are consist of hyaluronic acids in umbilical cord [5].

In fact, the main role of this hydrated jelly material around the fibroblasts and collagenous fibrils is to prevent the pressure, swelling and bending of the umbilical arteries, which creates a two way flow of blood between the mother and the mother. Wharton Jelly has an adventitious-like function that the umbilical veins do not have. Stromal cells of Wharton Jelly seem to be involved in regulating the cord blood flow. At least in some cases, the decline in fetal growth is due to a reduction in stromaleads to hypoplasia of the umbilical veins [6].

First, scientists were seeking for a possible cause and structural changes in the case of preeclampsia or hypertension.The second reason was the identification of cord blood stromal cells that were similar to mesenchymal fibroblasts. Also, these cells were similar to smooth muscle cells and were considered as myofibroblasts. According to reports and based on accurate cellular testing and extracellular matrix components, the human umbilical cord shows a different tissue partitions. At least 6 distinct areas have been identified based on structural and functional studies from outside to inside: Surface epithelium includes the following parts: amniotic epithelium or epithelium of the umbilical cord, subamnioticstroma, gaps, intervascularstroma called Wharton jelly, perivascular stroma and blood vessels. Structural, immune histochemical and functional studies have shown that there is a significant difference in the number and nature of subamniotic, intervascular, and perivascular cells, which leads to the hypothesis that these distinct areas originated from different areas. For example, vascular steroid myofibroblast cells of intervascularstromaoriginated from smooth muscle cells or fibroblasts of vessels [7].

The human umbilical cord contains of different types of stem cells which have several benefits:They are available in large quantities. Approximately, 6.5×10^6 cells per cm from the umbilical cord can be isolated andcan be doubled for more than 80 times without aging. Their easy and safe accessibility do not hurt the mother and the fetus and their aspiration process are not accompanied with pain. In compared with embryonic stem cells, they are not accompanying with moral considerations [8]. Have a more proliferative activity than bone marrow mesenchymal stem cells.Since these inactive stromal mesenchymal cells lack MHC II and other stimulant molecules at their surface, they do not create immune responses to the host tissue [9]. Transcriptome analysis of umbilical cord-derived mesenchymal stem cells represents an increase in the expression of genesassociated with the immune systemincluding IL6, VEGF (which are important in the immune suppressive properties of mesenchymal cells) And 200 CD (which prevents rejection of the fetus during pregnancy and is involved in immunological tolerance of the allogeneic skin and cardiac transplantation). In addition, studies have shown the high expression of Human Leukocyte G Antigens (HLA-G) belonging to HLA-1, which playan important role in immunological tolerance during implantation and pregnancy [10]. And colleagues showed for the first time that the immunesuppressor effects of umbilical mesenchymal stem cell depend on the Prostaglandin E2 (PGE2)

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mechanisms whose biosynthesis is completely blocked by the immunosuppressive activity of these cells, which probably inhibits T cell proliferation [11]. Human Wharton jelly-derived mesenchymal stem cells have a low level of typical molecular markers for a potent embryonic stem cell phenotype including OCT4, Nanog, Sox2, and Lin28. The reason that these cells do not have teratoma [5]. These cells have the ability to stick to plastics in standard culture conditions, have the capacity fordifferentiation intomesodermal lineage bone, fat and cartilage, express CD37, CD90 and CD105, but do not express hematopoetic markers such as CD14, CD11b, CD34, CD45, CD19, and CD79 [12-14].

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