Commentary
Volume 8:6, 2022

Oral Health Case Reports

ISSN: 2471-8726 Open Access

Human Dental Pulp Cell Nucleoli Extruded

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Introduction

Dental pulp stem cells proliferate rapidly and can differentiate into a variety of cell types, including endothelial cells. The purpose of this study was to assess the ultrastructural properties of human dental pulp cells from permanent frontal teeth. Prior to prosthetic treatments for aesthetic purposes, human adult bioptic dental pulp was collected from n = 10 healthy frontal teeth of five adult patients. Transmission electron microscopy was used to examine the tissues. We discovered cells with an unusual feature: giant nucleoli that resembled intranuclear endoplasmic reticulum and mimicked extrusion into the cytoplasm. These were either partially embedded within the nuclei, with the adnuclear side coated by marginal heterochromatin and the abnuclear side coated by a thin rim of ribosomes, or appeared to be isolated from the nuclei while still covered by ribosomes.

Due to its accessibility and differentiation potential, the dental pulp entrapped within the "sealed niche" of the pulp chamber is particularly interesting in regenerative medicine. The DP is divided into zones, each with its own cellular repertoire and role. The DP outer odontoblast layer ensures dentin matrix production and subsequent calcification. Weil's cell-free zone is followed by a cell-rich zone and then the pulp core. The core is home to a variety of connective cell populations, including DP stem cells, which are derived from neural ectomesenchyme and have a high proliferative profile and immunosuppressive activity. Dental pulp cells, in addition to having multilineage potential, may release proangiogenic factors under hypoxic stress. DP stem cells, however, can promote adult vasculogenesis by differentiating into endothelial-like cells because hematopoietic progenitors are not identifiable within the right microenvironment [1].

Description

Transmission electron microscopy was rarely used to characterise the human DP. Because frontal prosthetic treatments may necessitate endodontic treatment, we decided to examine the ultrastructure of healthy DP harvested from frontal teeth using TEM.Thus, we aimed to assess the ultrastructural characteristics of human dental pulp, focusing on DP cells with mitotic or unusual characteristics. After discovering the specific nucleolar features of some of the DP cells we encountered, we decided to report this in the current study, taking into account a feature that could represent a trait of some intermediate cells, such as transit-amplifying DP cells.

Prior to prosthetic treatments for aesthetic reasons, human adult biopsy material (dental pulp) was collected from n=10 healthy frontal teeth of 5 adult patients. The patients provided informed consent for the use of biopsy material for research purposes. The study was carried out in accordance with the Declaration of Helsinki guidelines and was approved by the Ethics Committee. Tissue samples were prepared for TEM as previously described. For 4 hours at 4°C, small tissue fragments were fixed in fresh ice-cold 4% glutaraldehyde in sodium cacodylate buffer (pH 7.4). The tissues were washed six times with 0.05 M sodium cacodylate buffer (pH 7.4) at 4°C after fixation, and then postfixed in 2% osmium tetroxide in 0.1 M sodium cacodylate at room temperature for 2.5 hours [2-5].

Conclusion

Pericytes, which are widely regarded as key players in the perivascular stem niche, are involved in bidirectional transdifferentiation: on the one hand, in the adluminal flow from mesenchymal to endothelial cells, and on the other, in the abluminal flow from endothelial to mesenchymal or stem cells. In this regard, transit-amplifying cells in niches will exhibit enough phenotypic versatility to make precise cell type identification difficult. We believe that these unusual nucleoli are from transit-amplifying cells, but more research is needed to determine the functional value of the extruded nucleoli in the dental niche, as well as whether such substructures are unique to this niche. Extruded nucleoli in plants have been reported to be a response to hypoxia or metal exposure.

Acknowledgement

None.

Conflict of Interest

There are no conflicts of interest by author.

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Received: 02 November, 2022, Manuscript No. OHCR-23-86875; **Editor Assigned:** 05 November, 2022, PreQC No. P-86875; **Reviewed:** 16 November, 2022, QC No.Q-86875; **Revised:** 22 November, 2022, Manuscript No. R-86875; **Published:** 28 November, 2022, DOI: 10.37421/2471-8726.2022.8.68

How to cite this article: Hostiuc, Sorin. "Human Dental Pulp Cell Nucleoli Extruded." *Oral health case Rep* 8 (2022): 68.