ELECTRON-MICROSCOPICAL RESEARCH OF THE SATELLITE CELLS IN THE TRIGEMINAL GANGLIA IN PEOPLE WITH ABRASION OF THE OCCLUSAL SURFACE OF THE TEETH

DIMO S. KRASTEV

Associate Professor, Department of Anatomy, College of Medicine, Medical University - Sofia, EU-Bulgaria

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Abstract: It is clearly visible on histological samples that perikarya of pseudounipolar neurons are tightly wrapped by small satellite cells with intimately connected neurolemmas. Satellite cells were named by Cajal (1899) and described as cells with flat shapes. According to Kerr research initial glomerular part of the human axon is not covered by myelin for the first 100 micrometers of glomerular apparatus, and is covered only by satellite cells. Materials & Methods: Materials of trigeminal ganglia were prepared by a standard protocol for the Medical University of Sofia for electron microscopy. Ultrathin sections were observed with an electron microscope, type Hitachi U-11A, Hitachi-500 and Tesla BS 613. Findings were photographed and presented in rend results. Results: In our study, we found that the abrasion of teeth affects temporomandibular joint and changes occur in the peripheral nervous system. The changes affect satellite cells located around medium and small neurons of the trigeminal ganglia. They are expressed in the reduction of satellite cells and change their structural features. Conclusions: Up to now no research has been conducted affectng the teeth damage, joints and cytological changes occurring in TG. This is the beginning of a new research.

Keywords: Abrasion of Teeth, Pseudounipolar Neurons, Satellite Cells, Temporomandibular Joint, Peripheral Nervous System.
INTRODUCTION

Temporomandibular disorders (TMD) are part of the functional pathology of the masticatory system and represent a heterogeneous group of disorders affecting the temporomandibular joints, facial and jaw muscles, teeth, periodontal and neuromuscular system.

By Rö it was established that the bodies human cadaveric with abrasion of the occlusal surface of the teeth have a temporomandibular joint (TMJ) disorder Figure 1 and Figure 2 [11, 12, 13, 14].

Studies on patients with a combination of abrasion and breach of the TMJ were made by some authors [8, 9, 10, 15, 16, 17].

![Figure 1](image1.png) Rö presentation of the temporomandibular joint in patients with abrasion of teeth

![Figure 2](image2.png) A and B. Presented are a different stages of the teeth abrasion

According to scientific reports over the last decade has seen a steady trend of increasing frequency of TMD. Studies have found that 20 to 75 percent of the total population show signs and symptoms of functional disturbances of the masticatory system [6, 13, 14]. TMD is characterized by some basic symptoms such as pain and sounds in the temporomandibular joints (TMJ) pain in the masticatory muscles, difficulty or limited jaw movements. Often, together with the main symptoms has attendant symptoms such as pain or noise in the ear,
neck pain, headache, neuralgia, and dental pain, which can divert the attention of the clinician of the main symptoms of the TMD \cite{16, 17}.

**MATERIALS AND METHODS**

For this study we used human cadaveric material from the Department of Pathological Anatomy. To achieve the objective we selected five bodies with abrasion of the occlusal surface of the tooth, and five controls without changes. Results were compared and described. The age of the used materials in this study were between 60-65 years. Materials of trigeminal ganglia were prepared by a standard protocol for the Medical University of Sofia for electron microscopy. Ultrathin sections were observed with an electron microscope, type Hitachi U-11A, Hitachi-500 and Tesla BS 613. Findings were photographed and presented in Rend results.

**RESULTS**

It was found that in experimental or traumatic peripheral nerve damage, in addition to the changes that accompany the perikaryon of pseudounipolar neurons are changed and satellite cells, such that the most demonstrative results in their contacts, i.e., increase in their number due to the need for greater strength. In medium and small neurons, they are usually located at a certain distance and the ring form, looks loose and incomplete (Figures 3 and 4). In our studies we found and neurons present at the beginning of the trunk of the first and second branch of the trigeminal nerve located between nerve fibers (Figures 4 and 5).

![Figure 3 Elecron microscopic image of satellite cell with oval nucleus. Human material. x 15000.](image)
Figure 4. Medium sized neuron with mesh nucleolus, large and bright core (2) and the presence of pigment in the cytoplasm. To the neurolemma is observed the elongated nuclei of the surrounding satellites (1) and axonal outgrowth. Human material. x 12500.

Figure 5 Satellite cells with triangular and elongated shape of the body and the core. Human material. x 18000.
DISCUSSION

Masticatory system is extremely complex functional complex and its normal functioning is due to existing functional and homeostatic balance between the various structural components - teeth, periodontium, masticatory muscles, muscles of neck, mandibular joint, and the psyche of each individual. This harmony in the masticatory system may be disrupted by a number of factors, acting separately or in combination. The literature describes various events and circumstances that can lead to the normal function of the masticatory system. This changed or impaired function of the masticatory system is defined as a functional disorder.

Discovering of cytoarchitectonic picture of trigeminal ganglion is in direct dependence on methods applied. Despite of many investigations with Nissl method \[1, 3, 4, 19\], methods rarely used for pseudounipolar neurons, and those used with the rest of brain structures – Golgi \[1, 2, 7, 19\] there are still omissions in cytological aspect. Contemporary research on the base of modern technologies considerably add, and in some cases shed a new light on detailed learning of morphological ganglion structure, and its physiological importance, role, connections and communications with periphery.

Generally speaking results of our investigation are in accord with results of many authors, working with different kinds of animals, and human samples as well.

These neurons are mostly medium and large size of the cell body. In these satellite cells are very small and are a great distance from each other (Figures 3 and 5). More Cajal (1903), describes the shape of these cells polymorph: flattened, elongated, ovoid, polygonal, and located close to each other (Figures 3, 4 and 5). Functionally they show similarities to Schwann cells in the PNS. In the cytoplasm are presented all cellular organelles, but poor quantity. In some of the satellite cells, we found the presence of glycogen granules scattered around the nucleus. The core is small, eccentrically arranged, with presence of a bright halo around it (Figures 3, 4 and 5). In some of the satellite cells were observed in two cores arranged adjacent. There are nuclei as circular and elliptical shape (Figure 5.). Kariolemata smooth and only a few of satellites observed the presence of small invaginations (Figures 3 and 4). The chromatin is evenly dispersed and gives homogeneous appearance of the nucleus. Nucleolus is tightly clearly visible and eccentrically located (Figures 4 and 5). Granular endoplasmic reticulum is represented by short tanks, stick with ribosomes. Throughout the cytoplasm and found free ribosomes. Mitochondria are small in size and usually scattered around the nucleus, but some cells are tightly assembled as rosettes. Golgi apparatus is represented by elongated smooth-tanks, which are most often communicate from one side to the outer sheet of kariolemata and the other with the inner sheet of tsitolemata. Immunohistochemical study confirmed the presence of peroxisomes in satellite cells, speaking for their active participation in the destruction of substances and processing of amino acid transmitters.
CONCLUSION

During the study We found changes affecting both neurons and the satellite cells located around them.

According, the objective of this work We executed electron microscopic images and presented the results. Morphological characterization of intracellular organelles satellite cell is expressed in the fact that they are located in the perinuclear region as close to the cell surface only skeletoobrazuvashli microtubules and microfilaments and less frequent presence of mitochondria. The location of the satellite cell in the vicinity of certain parts is extremely dense and in other respects the order of 20 nm (Figures 3, 4 and 5). We found that among some of these contacts are formed on the type of gap junctions.

REFERENCES:


