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# Light-Microscopic Research of the Satellite Cells in the Trigeminal Ganglia in People with Abrasion of the Occlusal Surface of the Teeth

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**Abstract:** ***Human trigeminal ganglia have been used as material for the present morphological study. After removing the whole brain, ganglia were then placed in a solution of 4% neutral formalin and after 5 days fixation the procedure continued with dehydration of the tissue pieces in an ascending series of alcohols, followed by clearing in cedar oil. The samples were embedded in paraffin and then serial cross-sections of 20 µm each were cut. After they were mounted on slides some of the serial cross-sections were stained by the Nissl method. At we make research 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. Materials & Methods: Materials of trigeminal ganglia were prepared by a standard protocol for the Medical University of Sofia for*** *light-microscopic.* ***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 affecting the teeth damage, joints and cytological changes occurring in TG. This is the beginning of a new research.***

**Keywords:** abrasion of teeth, pseudo unipolar neurons, light-microscopic study, satellite cells, temporomandibular joint, peripheral nervous system.

## 1. 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 [11, 12, 13, 14, 22, 23, 24, 25].

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

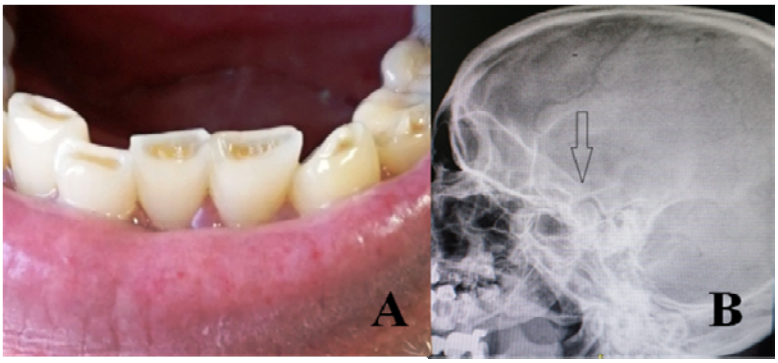


**Figure 1**: A. You can see the different stages of the teeth abrasion; B. Rö presentation of the temporomandibular joint in patients with abrasion of teeth.

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, 7, 8, 13, 14, 18, 19, 20]. 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 [16, 17,18, 19, 20, 21, 23].

## 2. 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 light-microscopy. Findings were photographed and presented in section results.

## 3. Results and Discussion

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 2 and 3). 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 (Figres 2 and 3).

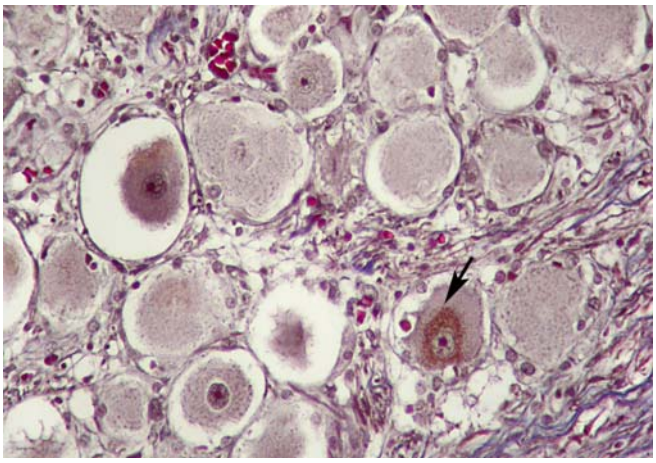

**Figure 2:** Light microscopic image of satellite cell with oval nucleus arranged around dark a neuron. Human material. HE x 150.

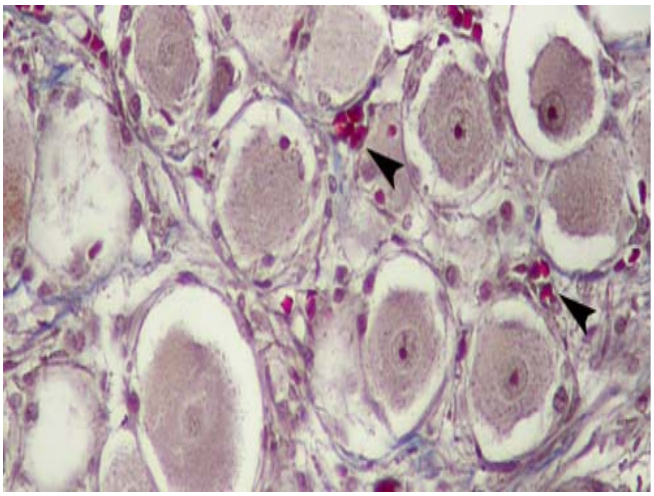

**Figure 3:** Medium sized neuron with mesh nucleolus. To the neurolema is observed the elongated nuclei of the surrounding satellites. Human material. HE x 150.

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], methods rarely used for pseudounipolar neurons, and those used with the rest of brain structures – Golgi [1, 2, 7] 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. 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. 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 2 and 3). More Cajal (1903), describes the shape of these cells polymorph: flattened, elongated, ovoid, polygonal, and located close to each other (Figure 3).

## 4. 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 light-microscopic images and presented the results. 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 2, and 3).

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## Author Profile

**Dimo Krastev** graduated in 1994 Faculty of Medicine of the Medical University of Sofia and then graduated in 1999 Faculty of Dental Medicine of the Medical University of Sofia. Dr. Krastev wrote his PhD thesis at the Department of Anatomy and Histology at the Medical University of Sofia and received his doctoral degree. His research interests are related to anatomiy, histology, maxillofacial surgery and orofacial pain. He is currently a member of the Bulgarian Medical Association, Bulgarian Dental Association, Bulgarian Anatomical Society and Anatomische Gesellshaft-Germany.