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MORPHOMETRIC CHARACTERISTICS OF THE MANDIBULAR CONDYLAR PROCESSES

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ABSTRACT

Aim: to study the morphometric characteristics of the mandibular condylar processes to identify patterns and their classification.

Materials and Methods: a study of 49 skeletonized and certified mandibular preparations was performed using a caliper and a depth gauge. During the study of the material, the forms and the main morphometric parameters of the condylar processes were determined and analyzed. Statistical data processing was carried out using the Microsoft Excel program.

Results: The study of certified biological material yielded the main morphometric and morphofunctional parameters of the mandibular condylar processes. We revealed characteristic differences in the anatomical structures of the studied preparations. The main variants and types of combinations of forms of condylar processes were singled out: oval, hook-shaped, diamond-shaped, L-shaped. The lowest asymmetry index is characteristic of a combination of oval and diamond–shaped forms - 2.44%., and the highest asymmetry index is characteristic of diamond–shaped and L-shaped forms of condylar processes - 7.13%.

Conclusion: The presented data can help practitioners to more accurately determine the target point for Gow-Gates anesthesia; to take into account the nature of the influence of structural changes in the joint on other elements of the dental apparatus, thus preventing functional diseases of the temporomandibular joint. The methodology of studying the main morphometric parameters on skeletonized preparations of the lower jaws can be adapted for the examination of living persons using diagnostic radiology.

Keywords: morphometric examination, condylar process, Gow-Gates anesthesia, mandible

INTRODUCTION

The condylar processes of the lower jaw are important links of the dental apparatus. Pathological processes that occur directly in the temporomandibular joint, the surrounding bone and soft tissue structures lead to disruption in the myodynamic balance and serious dysfunction in controlling jaw movements, such as opening the mouth, chewing food and external respiration. The nature of the influence of structural disorders of the condylar processes on other areas of the dental apparatus and its consequences on the features and effectiveness of therapeutic manipulations is not fully understood.

Taking into account the clinical significance and relevance of this issue, morphometric characteristics of the condylar processes of the mandible were studied in order to identify patterns and their classification.

Morphological and morphometric features of the temporomandibular joint are formed under the influence of pathological processes in the prenatal and postnatal periods of human development. [12]

In the postnatal period, during its development the lower jaw is exposed to various factors: age-related changes, traumatic injuries, the development of inflammatory processes, changes in the adequate distribution of masticatory pressure, changes in occlusal relationships, disorganization of masticatory muscle groups, etc. These factors cause structural changes in the lower jaw, which affects the nature of muscle attachment.[22]

Individual variability of anatomical and topographic features of the condylar processes of the mandible, arising under the influence of both congenital and acquired factors, is one of the causes of complications after local anesthesia, as well as the cause of pain dysfunction of the TMJ, disorders of myodynamic balance and functions of chewing, breathing and external respiration.

Previously, various authors have tried to classify the shape of the condylar processes of the mandible [5, 7, 13, 15, 21, 25]. Orthopantomographic systematization, which was used by Anisuzzaman M. M. et al., can be considered the most successful. (2019) in his work on the study of the morphology of the condylar processes of the mandible, which, according to this classification, can have the shape of an oval, a bird's beak, a rhombus and a curved finger. [2]

The morphology of the condylar process is of great importance for applied medicine and diagnostic radiology as well as for planning surgical interventions, blockades, and providing emergency care in maxillofacial surgery [1, 3, 6, 8, 16, 19, 20].

Awareness of TMJ pathologies of various etiologies (ankylosis, osteoarthritis, osteoarthritis, malignant neoplasms, callus, etc.) that reduce the quality of intraoral dental manipulations (for example, IANB) due to the restriction of mouth opening is also of great practical importance in the clinical activity of a dentist. [9, 13, 24]

Consequently, knowledge of the morphometric characteristics of the condylar process helps avoiding the development of dental complications, such as: mechanical damage to the pterygoid muscle and contracture of the mandible, injury to the inferior alveolar nerve and vessels with the formation of a hematoma, the ingress of anesthetic into the bloodstream, etc. [10, 11, 17, 23].

MATERIALS AND METHODS

A study of the lower jaws from 49 corpses (male – 32, female – 17) was conducted. The age of the species was in the range of 72.67±11.47 years. The study was conducted at the Department of Operative Surgery and Topographic Anatomy, Sklifosovsky Institute of Clinical Medicine and I.M. Sechenov First Moscow State Medical University (The Sechenov University). This study was approved by the Ethics Committee of The Sechenov University (Protocol no.: 02-23 of 01/26/2023). Preparations of the mandible with the presence of congenital defects and deformities, as well as with a violation of the safety of the preparations, i.e. the anatomical integrity of the condylar processes, branches and the body of the mandible, were excluded from the study.

During the study of the material, the forms and the main morphometric parameters of the condylar processes were determined and analyzed.

Statistical data processing was carried out using the Microsoft Excel program. The sample size is determined by calculating the formula:

$$n = (Z2pq/e2)/(1+((Z2pq/e2)-1)/e2N),$$

Where n is the volume of the sample population; N is the size of the general population; Z is the normalized deviation determined based on the selected confidence level; p is the variation found for the sample; q=1–p; e is the marginal sampling error (for the proportion of the trait, the confidence interval ("error" ± %).

For the general population of 49 skeletonized and certified lower jaw preparations with a confidence level of 95% and a maximum permissible error of 5%, the volume of the sample population was 44.