

Research article

Internal changes of TMJ at young people with different somatotypes

OKSANA VOLOVAR^{1*}, DMYTRO TOPCHII², IRYNA LOGVYNENKO³, TETIANA DOBRYI-VECHIR⁴, MYKOLA OBLAP⁵

^{1,2,3,4,5}Department of Oral and Maxillo-Facial Surgery, Bogomolets National Medical University, Kyiv, Ukraine

*Corresponding Author

Email ID: scienceandsciencepool@gmail.com

Received: 02.04.20, Revised: 02.05.20, Accepted: 02.06.20

ABSTRACT

Objective: The aim of the current research is to study the somatotype, the state of connective tissue and the appearance of infra-articular changes of temporomandibular joint case at the young patients.

Methodology: The current study presents the results of studies of 270 patients with temporomandibular joint case (average age is 26,3±8,0 years old). The attachment to the specific somatotype was established at all patients on the basis of the designation of growth and height indicator. There were made: 270 roentgenograms, 150 computerized tomographies of temporomandibular joint case, 250 magnetic resonance imaging of patients with temporomandibular joint case with arthrosis, temporomandibular joint case arthropathias and dysplasias and the comparative estimate of their diagnostic consideration was determined. Radiological and computerized tomographies symptoms, that are definitive for the specific groups of patients with temporomandibular joint case pathology, were determined. The data of 149 magnetic resonance imaging revealed the infra-articular changes of temporomandibular joint case.

Results: The results obtained indicate the presence of a clinic relation and radiological, computerized tomographies and magnetic resonance imaging of temporomandibular joint case semiotics depending on the age and patients bodybuild. People with the asthenic bodybuild were more susceptible to most temporomandibular joint case diseases. Temporomandibular joint case pathology was distributed as follows: patients with arthrosis (58.8%), deforming arthrosis (12.5%), arthropathy (25.0%), temporomandibular joint case dysplasia (3.8%).

Conclusions: There is a need for an magnetic resonance imaging study of temporomandibular joint case at young people with unformed connective tissue, which is associated with predisposition to the appearance of pathological intra-articular changes without clinical manifestations of the disease.

Keywords: temporomandibular joint, arthritis, infra-articular changes, dysplasia, connective tissue, interarticular disk

INTRODUCTION

Arthritis as pathologies of the whole present time is widely discussing in modern scientific society [1-3] and the problem of temporomandibular joint case (TMJ) is also among the circle of medical scientist' society [4-10]. Until now, some occlusal disorders (tooth loss, irrational dental prosthetics, pathological lowering of occlusal vertical dimension or joint injury) are wrongly considered as the main reason of the occurrence of joint pathology of temporomandibular joint (TMJ) [11-15].

At the same time, a great diversity of TMJ clinical manifestations of young people against the background of acceleration is not sufficiently studied. There are no sufficient studies on how the somatotype of a young person influences on his/her formation of musculoskeletal system and its role in the appearance of pathological changes of TMJ [16-20].

Fundamental scientific works of E. Kretschmer [21] and W.H. Sheldon [28] are dedicated to the studying of interconnection of person's somatotype with the formatoin at him specific set of psychodynamic qualities [21, 28].

The degree of maturity of derivative mesenchyme tissues is very important in the formation of specific set of morphological characters which serve as the foundation for the basis of somatotype emphasizing. The differences between the tempo of bone maturation and the uneven bone and joint aging at the people of different age and somatotype are proved [26, 28].

The acceleration of young people shows as the growth increase in comparison with the width and mass of body on account of its muscle component that leads to the disproportion and disharmony of body. Somatotype at early developers changes to the side of asthenia that leads to the

"rejuvenescence" of a number of diseases, connected with the insufficient degree of maturity of connective tissue. The detection of these states is possible with the help of the application of radiology modern methods [26-28].

Joint disorders are common diseases that, according to some researches, affect about 30% and more of population. The most common cause of joint diseases is infra-articular pathological changes, which the majority of researches determine them as abnormal disk position as related to the head of mandible [16, 17, 20].

The formation of TMJ defect appearance includes genetic, anatomic and hormonal factors, bad habits, psychosocial components, occlusion, traumatic injuries [4, 6, 10]. However, the etiology of joint disorders is still the subject for discussions.

The goal of research is to study the somatotype, the state of connective tissue and the appearance of infra-articular changes of TMJ at the young patients.

MATERIALS AND METHODS

A physical examination of 270 patients with complains of TMJ was conducted. Among the examined patients there were 53 men and 217 women with the average age $26,3 \pm 8,0$ years old. Patients complained about the feeling of morning stiffness in one or two TMJ; about morning chewing of solid food; about crepitation, crack in TMJ.

There were examined the body structure, chest, spine; the joint hypermobility was found; there were determined iris and sclera colors, the degree of stroma of iris connective tissue density.

After the clinical implications, the X-ray methods of diagnosis were made to all examined: X-ray study of TMJ by Parm with open mouth, computerized diagnostics (CT) and magnetic resonance imaging (MRI) of TMJ [13, 21].

X-ray inspection of TMJ with open mouth (Parm view) was made on "Planmeca Intra" dental panoramic tomograph (Finland) with the standard permission and exposition.

TMJ CT was made on the spiral single detector CT scanner "ASTEION TOSHIBA". Received data were processed in graphic dental computer program SimPlant (Materialise Software), which provided the simultaneous viewing of in different planes – axial, frontal and saggital sections and panoramic section with 1 mm step and there were made 3D reconstructions of TMJ.

TMJ MRI was made on the low floor apparatus Magnetom open (Siemens). The research protocol included the imaging of T2-WI or Pd-weighted image in coronal plane, T1-WI in axial projection

and slanting saggital projection in 3D_mFFE mode for getting T1-WI in the position of habitual occlusion and with the maximally open mouth. The marking of the slanting saggital sections is made on the axial sections at the level of articular heads with by blokes of sections, perpendicular to the long frontal axis of articular head and it is corrected on the coronal sections in parallel to the rami of mandible.

RESULTS AND DISCUSSION

The majority of patients (71%) denoted crack and crepitation in joints. 32% of patients complained about the dull ache in TMJ, which occurred more often after chewing of solid food, long conversation; the restriction to open mouth had 25% of patients. Patients that were included into investigation had orthognatic occlusion, and they had no dentition defects. Patients were divided into particular groups, considering their clinics and TMJ radiology: 1) crepitation, crack in TMJ when moving mandible, painless restriction of mouth opening, without changes of soft, bone tissues (21% of patients); 2) the presence of crepitation or crack in TMJ, recurring restriction of mandible moving, presence of motion block in joint, insignificant pain and intermittent headache; misalignment of joint disk forward (laterally or medially) – 27% of patients; 3) intermittent joint pain and th appearance of restriction of mandible moving; disk misalignment with deformation or alteration of its structure; insignificant bone changes (68%); 4) constant restriction of mandible moving, deformation of front or/and back of joint disk, solution of disk continuity; bone deformations of mandible head and glenoid fossa with osteophytes (11%); 5) stable restriction of mouth opening and mandible moving, difficult mastication of solid food; changes in joint disk (deformation, perforation, thinning), muscular tissue and TMJ bones (4%).

During the clinical examination, 73% of patients had asthenic bodybuild, the hypermobility of joints of hand on the background of relaxation of ligaments, the deformation of chest, scoliosis and cervical vertebral osteochondrosis, bright (blue) color of iris, blue sclerae, IV-VI degrees of stroma of iris connective tissue density, indicating undifferentiated connective tissue dysplasia [16,18]. The mentioned changes can be the reason of connective tissue metabolic imbalance, fibrillogenesis, the decay of collagen structures of conective tissue ground substance and the development of chronic hyperplastic inflammation in the tissues of capsular ligamentous apparatus of TMJ [26, 28].

The following changes were determined at 87% of patients during the X-ray inspection of joints

with open mouth (setup by Parm): 1) end-plates thickening of condylar head, glenoid fossa and articular tuber (unilateral and ambilateral), 2) appearance of osteoporosis, osteosclerosis or the presence of osteophyte along the edges of mandible head and glenoid fossa, 3) the decrease of linear dimensions of one of mandible heads, its deformation or applanation, 4) narrowing or irregular width of X-ray joint gap.

Patients were set diagnoses, considering their clinical manifestations and TMJ X-ray examination: arthrosis (58,8%), deforming arthrosis (12,5), arthropathia (internal infraction) (25%), TMJ dysplasia (3,7%).

Patients, who have TMJ arthrosis, (63%) had narrowing of X-ray joint gap, 39% had osteophyte on the glenoid fossae and articular tubers, 47% had end-plates thickening of the glenoid fossae and articular tubers. A specific symptom was the asymmetry of linear dimensions of mandible head, which was found at 53% of patients. Wherein, the structure of mandible head bone tissue was changed at 47% of patients and 36% had the radiographic signs of osteosclerosis.

The changes of mandible head structure were determined at the patients of this group during TMJ CT: deformation at 94,4%; osteophyte at 88,9%; osteoporosis at 50%. The end-plates thickening of glenoid fossa and articular tuber on CT was found at 66,7% of patients.

For TMJ deforming arthrosis there was defined the presence of osteophyte along the edges of mandible heads and glenoid fossae, which were found at 41% of patients. In this group of patients, mandible heads at 38% of patients had bubbly structure of bone tissue with osteoporosis characteristics.

Among TMJ diseases, the first place took so called "internal derangement", which accounts from 70% to 82% out of all TMJ pathologies [9, 12]. Internal derangements lead to the secondary osteoarthritis, which develops without infra-articular disorders treatment [7, 14, 18]. There was made TMJ MRI at 250 patients at the age from 26 to 32 years old for the intelligence of TMJ infra-articular disorders over the period of 2006-2018. There were found TMJ infra-articular disorders, which included misalignments, defects, and deformations of articular disk, sprains and fibrous bands rupture, abnormal changes of joint capsule.

TMJ infra-articular disorders were found at 87% of patients. These disorders resonated with the arthroses of different intensity in 45% of cases.

TMJ infra-articular disorders were found at 73% of patients with frontal misalignment of articular disk. The misalignments of TMJ disk were set and/or unset.

23% of patients with frontal misalignment of articular disk, who had appropriate clinical symptomatology in the clinic groups (1, 2, 3), were set of a diagnosis of TMJ arthrosis.

MRI indication of disk fragmentation was found at 4% of patients with unset frontal misalignments of articular disk.

3% of patients with painless restriction of mouth opening and mandible misalignment to the pathological side were set a diagnosis of bone tissue newgrowth, osteoma of mandible right head, and 3 patients – TMJ chondromatosis.

The deformation of ruptured disk at 34% of observation more often presents the thickening of back pole and densification of frontal and central part that led to the formation of double convex or rounded disk.

The variants of abnormal disk form were: rounded, flattened or crumpled. Ruptured disk, tears of its post-disk area were found at 3,3% of examinations. The tear was in the upper fibres of post-disk layer of bilaminar area of back pole of articular disk, which looked like outstretched.

During the analysis of TMJ MRI and the comparison of different somatotypes, the various variants were found in terms of disk position when a mouth was opened and closed. Frontal misalignment of TMJ articular disk was found at the majority of patients, 87% of asthenic bodybuild. At the same time, the majority of hypersthenic patients (95%) and the half of sthenic patients (55,6%) had the right position of the articular disk when a mouth was opened and closed.

57% of patients showed signs of synovitis with frank exudative component at TMJ MRI.

The presence of big amount of synovial proliferation was accompanied by pain, disk misalignment and bone osteoarthritic changes on TMJ x-rays and CT. In 49% of cases there was observed large accumulation of fluid with the picture of "arthrographic effect".

Intra-articular disc misalignment is one of the most common TMJ disorders and is considered the main mechanism in the pathogenesis of articular disorders.

The pathogenesis of the development of TMJ intra-articular changes successively leading to osteoarthritis remains not fully studied. We have confirmed that intra-articular changes in most cases concerned pathological dislocation of the articular disc. Much less frequently, there was a disk change: deformation, perforation, thinning; ruptures of the posterior disc layers and ligaments of the joint were noted; 57% of patients had signs of synovitis with frank exudative component.

Young people with undifferentiated connective tissue dysplasia are at risk for predisposing to the

development of TMJ pathology [26, 28].

In our opinion, it is necessary to conduct an early TMJ MRI of young people before the appearance of clinical manifestations of joint disease.

Frontal misalignment of articular disk was detected in 63% of patients examined for TMJ MRI. Its role in the further pathogenesis of the disease is considered controversial. So, some studies have determined it in a third of asymptomatic volunteers and consider it physiologically normal within 30 years old [20, 24, 25].

We found the minimum frequency of observations of articular disc misalignment at patients with hypersthenic (1.4%) and normosthenic (5.4%) bodybuild.

Other changes in the articular disc such as: alteration, perforation of the middle part of the disk and ruptures of the retrodiscal layers of the disk; some authors devote the main role in the development of the disease [12, 19, 24, 25], in our study, met quite rarely (2.3%) and is connected with trauma. Deformation of dislocated disk and the contraction of volume of frontal and central part in 23% of cases, in our opinion, can be a reversible process and does not necessarily lead to osteoarthritis over time.

The adverse dynamics of the development of the disease in most cases is confirmed by the results of radiography, CT, MRI of the TMJ. Wherein, the disease was characterized by the joint effusion and the appearance of inflammatory edema of the bone marrow of the mandible head with the gradual formation of secondary osteoarthritic changes: joint space narrowing, subchondral sclerosis, the contour deformation of mandible head, more often flattened form and mandible head osteophytes.

CONCLUSION

The results obtained indicate the presence of a clinic relation and radiological, CT and MRI of TMJ semiotics depending on the age and patients bodybuild. People with the asthenic bodybuild were more susceptible to most TMJ diseases. Among them, the TMJ pathology was distributed as follows: patients with arthrosis (58.8%), deforming arthrosis (12.5%), arthropathy (25.0%), TMJ dysplasia (3.8%).

Intra-articular disc misalignment is one of the most common TMJ disorders and is considered the main mechanism in the pathogenesis of articular pathology.

TMJ Intra-articular changes at MRI in 63% of patients in the majority of cases, 68% related to pathological dislocation of the articular disc (frontal misalignment). It was found that the smaller the degree of the disk misalignment, the

less frank other intra-articular changes (ruptures, disk dissection, intracapsular effusion and connected with it the degenerative changes of articular processes).

The need for an MRI study of TMJ at young people with unformed connective tissue is associated with their predisposition to the appearance of pathological intra-articular changes without clinical manifestations of the disease.

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