

Peculiarities of clinical course of osteoarthritis combined with type 2 diabetes mellitus, obesity and hypertension

Y. I. Serdulets

Bukovinian State Medical University, Chernivtsi, Ukraine

Key words: osteoarthritis, algofunctional index, obesity, hypertension, type 2 diabetes mellitus

Osteoarthritis (OA) is the most common disease of the joints and the leading cause of disability among the adult population. The main manifestations of OA are: progressive loss of articular cartilage, cartilage calcification, formation of osteophytes, violation of remodeling of subchondral bone and inflammation of the synovial membrane [4, 13]. Its development is characterized by cellular stress and degradation of the extracellular matrix arising from micro- and macro-degradation, which activate abnormal (pathological) adaptive rehabilitation responses, including proinflammatory pathways of the immune system [4]. The disease begins with disorders at the molecular level (abnormal metabolism in the tissues of the joints) with subsequent anatomical and physiological disorders that lead to the development of a clinically significant disease [12]. OA not only affects quality of life and reduces the functionally active period, but also increases mortality due to the progression of concomitant diseases such as depression and cardiovascular events [4, 9]. More often, the joint is considered not as a combination of bone articular surfaces, cartilage structures, synovial fluid, articular capsule and periarticular apparatus, but as the only organ with its inherent components, namely, inflammatory, neurotrophic, immune, metabolic and functional [3]. OA is considered as an organ disease, and in view of the defeat of various articular groups — as a multiple organ [10]. Therefore, the combination of OA with type 2 diabetes, arterial hypertension, abdominal obesity is relevant. After all, these diseases have a number of general mechanisms of progression. These include chronic systemic generalized immunological inflammation (including in adipose tissue), insulin resistance, dyslipidemia, endothelial dysfunction, genetic changes

in the regulation of both general processes and local changes (especially in obesity), and the like.

Therefore, the aim of research was to study the clinical parameters of articular syndrome in patients with OA, combined with type 2 diabetes, obesity and arterial hypertension.

Material and methods of research. To solve the problems posed in the work, 116 patients were examined at the inpatient stage of treatment at the rheumatologic department of Chernivtsi Regional Clinical Hospital during 2015-2017. The work was based on generally accepted world and national normative and legal policy documents: the main GCP standards (Good Clinical Practice, Good Clinical Practice, 1996) [14]; The Council of Europe Convention on Human Rights and Biomedicine (of 04.04.1997) [16]; Appropriate Principles of the Geneva Declaration on Biometric Proofreading (1974), adapted at XXXXI of the International Assembly in Hong Kong (1989), in which a person raises the object, as well as "Ethical Principles of Medical Scholarly Acquisitions with the Involvement of Human Subjects", adopted by the 52nd Symbol of the Medical Association (2000) [7, 15]; the orders of the Ministry of Health of Ukraine No. 218 of November 1, 2000, No. 66 dated February 13, 2006 and No. 690 dated by September 23, 2009. The research card and the form of informed consent of the patient were approved by the Biomedical Ethics Commission of the Academy of Sciences of Ukraine "Bukovinian State Medical University" Ministry of Health of Ukraine (Chernivtsi city).

Diagnosis of OA was established on the basis of complaints, anamnesis, results of clinical and laboratory and instrumental research in accordance with the diagnostic criteria of the Order of the Ministry of Health of Ukraine dated October 12, 2006, No.676 "Clinical protocol for the provision of medical care to patients with osteoarthritis" and American College of Rheumatology (ACR, 1991)

The estimation of anthropometric indices was the determination of: height, body mass, waist circumference (OT), hip circumference (OS), body mass index (BMI) determination by mass to height (m), elevation to square, and OT / OS ratio.

In accordance with the generally accepted criteria for the determination of OT > 94 cm in men and > 80 cm in women, abdominal obesity is stated. According to the Kettle index, the diagnosis of "obesity" was established in patients with BMI ≥ 30 kg / m².

In order to detect and evaluate the occurrence of an outpatient pathology of the cardiovascular system, in particular arterial hypertension, the patient was given an intratracheal examination — an electrocardiogram (performed according to the generally accepted method), ophthalmocopy, blood pressure measure (AT).

The diagnosis of hypertension was verified according to the order of the Ministry of Health of Ukraine No. 384 dated May 24, 2012 and the recommendations of the Ukrainian Association of Cardiologists, 2012 [1]; ESC, ESH, 2013 [1].

Diagnosis of diabetes mellitus was stated in accordance with the order of the Ministry of Health of Ukraine dated 21.12.2012 # 1118. The verification of the diagnosis of "type 2 diabetes mellitus" was carried out on the basis of the "Unified clinical protocol of specialized medical care: type 2 diabetes" (2012).

In order to evaluate the pain syndrome and the general patient response, the following methods were used: the alko-functional index of Lekene [2, 5]; The WOMAC index (Western Ontario and McMaster University) is a self-assessment questionnaire for patient's degree of pain (at rest and at walking — 5 questions), stiffness (duration and severity — 2 questions), functional inadequacy in day-to-day activities (17 questions). The score was YES in millimeters. This scale has the form of a ruler with markings of 0 to 100 mm, where 0 means no pain (stiffness or difficulty), and 100 is the maximum pain (stiffness or difficulty).

For patients with OA, an X-ray examination of the affected joints with the determination of the X-ray of the OA for J. H. Kellgren I. Lawrence was performed.

Statistical processing was performed using MS® Excel™ 2010 applications, Primer of Biostatistics® 6.05 and Statistica™ 7.0 (Statsoft® Inc). The computer registry (database) of the obtained indicators was created in the

system Microsoft Excel. The reliability of the data was calculated using the two-sample (for independent samples), or the pair (for dependent) t-criterion Student when the distribution is close to normal. Statistically probable differences were considered at $p < 0.05$.

Results of research and discussion. Taking into account complaints, anamnesis, objective status, data of general-clinical and instrumental methods of examination, the following clinical groups of dynamic observation were selected: I group — 37 patients with osteoarthritis; II group — 21 patients with OA in combination with arterial hypertension; III group — 41 patients with OA with concomitant arterial hypertension and abdominal obesity; IV group — 17 patients with OA in combination with arterial hypertension, abdominal obesity and type 2 diabetes; V group — 25 practically healthy persons. The average age of patients was $58,03 \pm 14,91$ years, and the duration of the disease was in the range from 5 to 32 years ($18,5 \pm 8,83$ years). Among the examined patients, 78.45% (91) women and 21.55% (25) men, the ratio of "women: men" was 3.6: 1, which is not different from the average population. According to the degree of functional failure of the joints and the groups of joints, the patients were distributed this way (Table 1).

Table 1

Distribution patients with osteoarthritis depending on the group of affected joints and the degree of functional disorders of the joints

Groups of patients	FS of joints, n=116 (%)			Groups of affected joints, n=74 (%)				
	I ступінь, n=76 (%)	II ступінь, n=37 (%)	III ступінь, n=3 (%)	Gonarthrosis, n=76 (%)	Coxarthrosis, n=3 (%)	Gonarthrosis + Coxarthrosis, n=18 (%)	Gonarthrosis + small joints, n=12 (%)	Small joints, n=7 (%)
I group OA, n=37	35 (94,6%)	2 (5,4%)	0 (0%)	33 (89%)	0(0%)	0 (0%)	0 (0%)	4 (11%)
II group, OA+AH, n=21	16 (76,2%)	5 (23,8%)	0 (0%)	16 (76,2%)	0 (0%)	0 (0%)	4 (19%)	1 (4,8%)
III group OA+AH+AO, n=41	21 (51,2%)	20 (48,8%)	0 (0%)	26 (63,4%)	1 (2,4%)	7 (17,2)	6 (14,6%)	1 (2,4%)
IV group OA+AG+AO+D	4 (23,5%)	10 (58,8%)	3 (17,7%)	1 (5,9%)	2 (11,7)	11 (64,8%)	2 (11,7)	1 (5,9%)

M2, n=17))))
----------	---	---	---	--	--	--	---

It was established that in patients with isolated course of OA the limb of the knee joints (89%) and I degree of FNS predominated, joining the AH caused the growth of the groups of affected joints with the prevalence of gonarthrosis. On the background of AO and type 2 diabetes, the number of affected joints has increased, which has also affected the increase of functional failure of patients. In patients with III group patients with obesity I degree and arterial hypertension of 1 degree prevailed, the presence of concomitant type 2 diabetes predetermined the prevalence of patients with obesity II (17.6%) and III (82.4%) degrees with corresponding increase of arterial pressure (Table 2).

Table 2

Distribution patients with osteoarthritis, taking into account body mass, arterial hypertension, diabetes mellitus

Groups of patients	Body mass, n=116 (%)				Degrees of increased blood pressure, n=116 (%)			DM type 2, n=17 (%)
	Normal BM, n=37 (%)	Excessive BM, n=27 (%)	Obesity stage I, n=24 (%)	Obesity stages II and III, n=28 (%)	Normal blood pressure, n=37 (%)	Blood pressure level 1, n=34 (%)	Blood pressure level 2, n=45 (%)	
I group OA, n=37	37 (100%)	0	0	0	37 (100%)	0	0	0
II group, OA+AH, n=21	0	21 (100%)	0	0	0	18 (85,7%)	3 (14,3%)	0
III группа OA+AH+AO, n=41	0	6 (14,6%)	21 (51,2%)	14 (34,2%)	0	16 (39%)	25 (61%)	0
IV группа OA+AH+AO+DM2, n=17	0	0	3 (17,6%)	14 (82,4)	0	0	17 (100%)	17 (100%)

The analysis of the results of the evaluation of the functional state of the joints according to the Lekene index is presented in the table (Table 3).

Table 3

Distribution of patients according to the Lekene index in patients with OA, which combines with AH, OA and DM type 2

Lekene index in scores	Groups of patients examined			
	I group OA, n=37	II group, OA+AH, n=21	III group OA+AH+AO, n=41	IV group OA+AH+AO+DM2, n=17

Mild OA (1-4)	-	-	-	-
Moderate OA (5-7)	25 (67,6%)	10 (47,6%)	5 (12,2%)	-
Severe OA (8-10)	9 (24,3%)	7 (33,3%)	18 (43,9%)	4 (23,5%)
Very severe OA (11-13)	4 (7,8%)	4 (19,1%)	10 (24,4%)	3 (17,6%)
Extremely severe OA (14 i >)	-	-	8 (19,5%)	10 (58,9%)

It was found that in group I, patients with moderate osteoarthritis prevailed, joining of arterial hypertension led to an increase in the percentage of patients with severe OA in group II. However, an extremely severe course of osteoarthritis was found in patients with IV group (58.9%). With the increase in body weight, there was an increase in the proportion of patients with very severe and extremely severe OA. It has been established that obesity often increases the risk of progression of X-ray changes in knee joints, which is consistent with those of other researchers [11]. So, according to the meta-analysis conducted by Jiang L. et al. an increase in the body mass index (BMI) for every 5 units leads to an increase in the risk of developing OA of the knee joints by 35% [11].

It has been studied that the presence of hyperglycemia leads to the activation of the polyol route of glucose metabolism and non-enzymatic protein glycosylation, which causes damage to the muscles and periacicular tissues. Hyperglycemia and OA interact both locally and systemically; local effects of oxidative stress and glycosylation of end products increase the damage of cartilage tissue, and the accumulation of toxic glycolysis products can contribute to the progression of OA [8].

The analysis of the results showed that all the patients examined complained of pain associated with exercise, motility and daily activities, which significantly increased with an increase in the stage of OA and the addition of comorbid pathology. For patients with OA, hypertension, abdominal obesity with the addition of type 2 diabetes was characterized by an increase in the intensity of arthralgic pain, in particular, it was characterized by night pain, motor impairment with a significant violation of daily activities (Table 4).

Table 4

Results of the evaluation of the functional state of the joints according to the WOMAC index in patients with OA, combined with AH, OA and DM type 2

2

Indices, units, mm	Groups of patients examined			
	I group OA, n=37	II group, OA+AH, n=21	III group OA+AH+AO, n=41	IV group OA+AH+AO+DM2, n=17
WOMAC, pain, mm	205,1±18,1	226,5±19,9	249,5±26,3	283,5±11,3*
WOMAC, stiffness, mm	50,5±5,3	59,8±3,67	87,7±4,2*/**	107,4±5,9*/**
WOMAC, functional failure, mm	754,2±26,8	814,4±25,9	906,9±22,7*/**	1091,6±12,3*/**/**

Notes: * — reliable in relation to the indices of group I ($p<0,05$); ** — reliable in relation to the indices of group II ($p<0,05$); *** — reliable in relation to the indices of group III ($p<0,05$).

Conclusion. The combined course of OA, AH, obesity and DM type 2 is accompanied by an increase in the intensity of joint pain, motor function impairment, and the daily activities of patients.

References:

1. Артеріальна гіпертензія. Оновлена та адаптована клінічна настанова, заснована на доказах (2012 рік) : практичні рекомендації; проект / Робоча група з артеріальної гіпертензії Укр. асоц. Кардіологів // Артеріальна гіпертензія. — 2012. — №1. — С. 96–152.
2. Борткевич О. П. Сучасні принципи оцінки артрологічного статусу хворих на остеоартроз / О. П. Борткевич // Здоров'я України. — 2010. — №2. — С. 8.
3. Головач І. Ю. Остеоартрит: современные фундаментальные и прикладные аспекты патогенеза заболевания / И. Ю. Головач // Боль. Суставы. Позвоночник. — 2014. — №3 (15). — С. 54–58.
4. Головач І. Ю. Хворобомодифікуюча терапія в чинних рекомендаціях: уроки минулого та можливості майбутнього / І. Ю. Головач // Травма. — 2017. — №18 (3). — С. 11–21.
5. Коваленко В. М. Національний підручник з ревматології / В. М. Коваленко, Н. М. Шуба. — К. : Моріон, 2013. — 672 с.

6. 2013 ESH/ESC Guidelines for the management of arterial hypertension: the Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC) / G. Mancia, R. Fagard, K. Narkiewicz [et al.] // *Journal of Hypertension*. — 2013. — Vol. 31, No 7. — P. 1281–1357.
7. Abbing H. D. Developments in International/European Health Law / H. D. Abbing // *European Journal Health Law*. — 2009. — Vol. 16, No 1. — P. 81–88.
8. Accumulation of metabolic risk factors such as overweight, hypertension, dyslipidaemia, and impaired glucose tolerance raises the risk of occurrence and progression of knee osteoarthritis : a 3 — year follow-up of the ROAD study / N. Yoshimura, S. Muraki, H. Oka [et al.] // *Osteoarthritis Cartilage*. — 2012. — Vol. 20, No 11. — P. 1217–1226.
9. All cause and disease specific mortality in patients with knee or hip osteoarthritis : population based cohort study / E. Nuesch, P. Dieppe, S. Reichenbach [et al.] // *BMJ*. — 2011. — Vol. 342. — P. d1165.
10. Bijlsma J. W. Osteoarthritis: an update with relevance for clinical practice / J. W. Bijlsma, F. Berenbaum, F. P. Lafeber // *Lancet*. — 2011. — Vol. 377. — P. 2115–2126.
11. Body mass index and susceptibility to knee osteoarthritis : a systematic review and meta-analysis / L. Jiang, W. Tian, Y. Wang [et al.] // *Joint Bone Spine*. — 2012. — Vol. 79, No 3. — P. 291–297.
12. Call for Standardized Definitions of Osteoarthritis and Risk Stratification for Clinical Trials and Clinical Use / V. B. Kraus, F. J. Blanco, M. Englund [et al.] // *Osteoarthritis Cartilage*. — 2015. — Vol. 23, No 8. — P. 1238–1241.
13. Elder B. D. Systematic assessment of growth factor treatment on biochemical and biomechanical properties of engineered articular cartilage constructs / B. D. Elder, K. A. Athanasiou // *Osteoarthritis Cartilage*. — 2009. — Vol. 17, No 1. — P. 114–123.

14. Otte A. Good clinical practice: historical background and key aspects / A. Otte, H. Maier-Lenz, R. A. Dierckx // Nuclear Medicine Communication. — 2005. — Vol. 26, No 7. — P. 563–574.
15. Portaluppi F. Ethical and methodological standards for laboratory and medical biological rhythm research / F. Portaluppi, Y. Touitou, M. Smolensky [et al.] // Chronobiol. International. — 2008. — Vol. 25, No 6. — P. 999–1016.
16. Schoukens P. The right to access health care: health care according to European social security law instruments / P. Schoukens // Medical Law. — 2008. — Vol. 27, No 3. — P. 501–533.

Peculiarities of clinical course of osteoarthritis combined with type 2 diabetes mellitus, obesity and hypertension

Y. I. Serdulets

Bukovinian State Medical University, Chernivtsi, Ukraine

Key words: osteoarthritis, algofunctional index, obesity, hypertension, type 2 diabetes mellitus

The aim of paper is to study the clinical indices of articular syndrome in patients with osteoarthritis combined with type 2 diabetes mellitus, obesity and hypertension. It has been found out that the combined course of osteoarthritis, abdominal obesity and type 2 diabetes mellitus is accompanied by the intensified pain syndrome in the joints, a disruption of the motor function as well as the daily activities of patients.