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Comparison of Clinical and Radiological Parameters at Knee Osteoarthritis

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ABSTRACT

Introduction: Osteoarthritis (OA) or arthrosis represents an inflammatory disease of joints that develops as a result of interaction of mechanical and biological parameters. With disease development, degenerative changes on joint cartilage can be noticeable that affect and cause pathological changes on other parts of a joint resulting in pain and dysfunction of a joint. A. E. Garrod in 1907 described osteoarthritis as a special clinical entity and separated it from a rheumatoid arthritis. OA is characterized with loss of a joint cartilage, development of new bone tissue under affected cartilage (subchondral bone) and development of osteophytes on joint edge. First sign of a disease is pain after period of relaxation that slowly intensifies. **Material and Methods:** In this paper, 40 patients have been analyzed with clinical and radiological signs of OA of the knee joint. Radiological classification was done by Ahlback's classification. **Results:** In our study female gender was more affected with average age of 63 years. On Ahlback classification, grade II was represented the most. Comparison between clinical and radiological signs showed that there was no significant difference between established grade of OA. Wide spectrum of visible radiological osteoarthritis changes on joints is in correlation with the age of examinees.

Keywords: knee osteoarthritis, clinical parameters, radiological signs.

1. INTRODUCTION

Osteoarthritis is a chronic degenerative disease that affects all structures of a joint. Primary or secondary osteoarthritis represents a major problem in elderly. The weakening of the metabolic balance between the synthesis and degradation of cartilage and subchondral bone overcome catabolic over anabolic processes which causes progressive destruction of joint tissue (1, 2). OA is characterized by focal loss of articular cartilage, new bone formation in the area beneath the damaged cartilage resulting as a subchondral bone and developments of bone spurs called osteophytes. OA is in developed countries the leading cause of physical disability in the elderly, but also the fastest growing problem of health and disability.

OA is seen as a disease that affects the entire joint (bone, cartilage and associated structures) not only cartilage (3, 4). The diagnosis of OA is essentially set up by clinical examination and confirmation by radiological changes. In the conventional X-rays first changes are seen as a smaller or greater narrowing of the joint space, more medially as a sign of deterioration of cartilage with bone sclerosis on certain parts of the joint. The severity of radiographic changes may not correspond with the severity of clinical symptoms (4, 5). First sign of a disease is usually pain after relaxation or sleep, which is dull and gradually formed. Clinical examination shows painful joint on palpation, crepitus phenomenon in movements, decreased range of motion, deformation of a joint, disorder of a joint axis, swelling, effusion and

weakness of muscles (6, 7). Risk factors for the development of OA are older age, obesity, previous joint injuries, and genetic and anatomical factors, such as the shape and the hinge axis. Additional factors are: gender, race and factors as deficiency of vitamin D. The final stage of disease is a deformation of the joint. For radiological analysis CAT scan and MRI are significant because they show the degree of damage of a cartilage and other para-articular joint structures (8, 9).

The degree of degeneration of cartilage can be divided into four stages:

1. Unaffected;
2. Early degenerative joint changes;
3. Advanced degenerative joint changes;
4. Final degenerative joint changes (10, 11).

Grade I	Joint space is reduced to 1/2. Cartilage tibial condyle is partially damaged, but there is a reduction height
Grade II	Total loss of cartilage on the femoral and tibial condyle. Exposed tibial condyle
Grade III	0,5 cm of destructed bone of tibial and femoral condyle

Picture 1. Radiological classification of knee osteoarthritis by Ahlback (1968) (4)

2. OBJECTIVE

Aim of the study is to determine possible discrepancy between clinical and radiological signs of knee osteoarthritis.

3. MATERIAL AND METHODS

The study was conducted as a retrospective study at the Clinic for Orthopedics and Traumatology of the University Clinical Center Sarajevo during 2015th. The study included 40 patients with clinical (painful knee, loss of mobility, occasional knee swelling) signs of a knee OA. On the conventional X-rays in two projections noticeable changes are determined by Ahlback classification. All patients underwent physical therapy with pain killers and steroid antirheumatics for a period of one year. All patients underwent analysis of the intensity of pain at rest, walking and exercise.

4. RESULTS

The results are presented in tables through the number of patients, percentage, arithmetic mean with standard deviation and range of values. The comparison is performed using the chi-square test, Pearson correlation coefficient and analysis of variance results of all tests.

Tests are considered significant with reliability of 95% or $p < 0.05$. The entire analysis was performed using SPSS Statistics v23.0.

Sex	Male	11 (27.5%)
	Female	29 (72.5%)
Age	Average	63.8±6.3 years
	Age span	46-74 years
Knee	Left	18 (45.0%)
	Right	22 (55.0%)
Pain at	Load bearing	17 (42.5%)
	Walking	11 (27.5%)
	Resting, walking and under load	12 (30.0%)
Ahlback	I	11 (27.5%)
	II	18 (45.0%)
	III	11 (27.5%)

Table 1. General sample

An analysis of the total sample (N = 40) indicated that women were more represented with 29 or 72.5% of cases compared to men who were in our sample represented with 11 or 27.5% cases. The average age of examinees was 63.8 ± 6.3 years, with the youngest examine aged 46 and the oldest aged 74 years.

The pain is present in the right knee in 22 patients or 55% compared to the left knee that was affected in 18 patients or 45%. In relation to clinical findings pain was most often occurred during load on the knee – 17 patients or 42.5%, then at rest, walking and load – 12 patients or 30%, and walking and load – 11 patients or 27.5%.

Compared to Ahlback classification grade one was noticeable in 11 patients or 27.5%, grade II in 18 patients or 45% and grade III in 11 patients or 27.5% of respondents.

		Pain during...			Total
		Load bearing	Walking	Resting, walking and load bearing	
Ahlback	I	N 6	5	0	11
		% 35.3	45.5	0.0	27.5
	II	N 8	3	7	18
		% 47.1	27.3	58.3	45.0
	III	N 3	3	5	11
		% 17.6	27.3	41.7	27..
Total	N	17	11	12	40
	%	100.0	100.0	100.0	100.0

Table 2. Pain during resting, walking and load bearing (by Ahlback classification). $\chi^2=7.699$; $p=0.103$. $\rho=0.320$; $p=0.044$

Comparison of radiographic and clinical findings show that between same samples there is no statistically significant difference ($\chi^2=7.699$; $p=0.103$; $p<0.05$) and that there is a statistically significant correlation between these two findings ($\rho=0.320$; $p=0.044$; $p<0.05$). This suggests that there is a adequacy between clinical and radiographic findings.

Clinically, patients usually had pain that occurred only with load on a knee–Ahlback grade II (47.1%), walking and load on a knee–Ahlback grade I and during the rest–Ahlback grade II or III.

		Pain during...			Total
		Load bearing	Walking	Resting, walking and load bearing	
Sex	Male	N	1	5	11
		%	5.9	45.5	27.5
	Female	N	16	6	29
		%	94.1	54.5	72.5
Total	N	17	11	12	40
	%	100.0	100.0	100.0	100.0

Table 3. Pain during load bearing, walking and resting by sex (N0=40). $\chi^2=6.971$; $p=0.031$

Analysis of clinical findings by gender shows statistically significant difference ($p < 0.05$), and thus pain with the load on a knee was more prevalent in women whereas this was not noticeable in two other clinical findings.

			Ahlback			Total
			I	II	III	
Sex	Male	N	1	8	2	11
		%	9.1	44.4	18.2	27.5
	Female	N	10	10	9	29
		%	90.9	55.6	81.8	72.5
Total	N	11	18	11	40	
	%	100.0	100.0	100.0	100.0	

Table 4. Osteoarthritis: male to female ratio (by Ahlback classification). $\chi^2=4.941$; $p=0.085$

In the case of comparison of radiographic findings by gender significant difference was not found ($p > 0.05$), although it can be noted that the female: male ratio was significantly higher in grade I and III.

		Pain during...			Total	
		Load bearing	Walking	Resting, walking and load bearing		
Knee	Left	N	9	4	5	18
		%	52.9	36.4	41.7	45.0
	Right	N	8	7	7	22
		%	47.1	63.6	58.3	55.0
Total	N	17	11	12	40	
	%	100.0	100.0	100.0	100.0	

Table 5. Pain of right/left knee during load bearing, walking and resting (N0=40). $\chi^2=0.819$; $p=0.664$

Comparison of the knee showed significant difference ($p > 0.05$) compared to the side and the pain with the load on a knee that was a little bit more prevalent on the left knee while in the other two clinical findings on the right knee.

		Ahlback			Total	
		I	II	III		
Knee	Left	N	5	8	5	18
		%	45.5	44.4	45.5	45.0
	Right	N	6	10	6	22
		%	54.5	55.6	54.5	55.0
Total	N	11	18	11	40	
	%	100.0	100.0	100.0	100.0	

Table 6. Involvement of OA:right/left knee (by Ahlback classification). $\chi^2=0.004$; $p=0.998$

All three levels of Ahlback classification were somewhat more frequent on the right knee without significant difference ($p > 0.05$).

	N	Mean	Std. Deviation	Std. Error	Min.	Max.
Load bearing	17	62.82	7.93	1.92	46.00	71.00
Walking	11	64.36	4.82	1.45	57.00	74.00
Resting, walking and load bearing	12	64.75	4.90	1.41	57.00	72.00
Total	40	63.83	6.27	0.99	46.00	74.00

Table 7. Age of patients. $F=0.375$; $p=0.690$

Comparison of the average age according to clinical findings do not show a significant difference ($p > 0.05$) in different clinical findings.

Age						
	N	Mean	Std. De- viation	Std. Error	Min.	Max.
I	11	66.82	4.26	1.29	60.00	74.00
II	18	60.89	6.94	1.64	46.00	69.00
III	11	65.64	4.92	1.48	57.00	72.00
Total	40	63.83	6.27	0.99	46.00	74.00

Table 8. Age and Ahlback classification. $F=4.310$; $p=0.021$

Compared to Ahlback classification, significant difference was noted with respect to age ($p < 0.05$).

5. DISCUSSION

In our study, greater representation of women at all stages of disease is evident which is in correlation with known higher incidence of OA in women according to literature (1, 4). Analyzing classic radiographic of the knee joint it is possible to indirectly estimate the thinning and changes of articular cartilage as well as reduction of interosseus distance within the joint. Reduction of interosseus distance very often is not found in early stages of disease and sometimes even in later stages of OA of the knee. In these situations, conventional radiography has less value in assessing the damage to the articular cartilage and the degree of OA of the knee. Newer opinions suggest that the efficacy in the treatment of knee OA is directly linked to the early diagnosis of disease using other radiological tests (CAT, MRI), while anatomically joint is still not irreversibly changed and while there is sufficient cartilage tissue that can respond to therapy (5, 12).

Comparison of radiographic and clinical findings show that there is no significant difference between them ($\chi^2=7.699$; $p=0.103$; $p > 0.05$) and that there was statistically significant correlation between these two findings ($\rho=0.320$; $p=0.044$; $p < 0.05$). There is an overlap between the clinical findings and radiographic findings. Epidemiological studies on the OA of the knee are often based on X ray definition of changes of the knee with first proposed radiological classification done by Kellgren and Lawrence (1957), which is characterized by knee OA divided into four grades [(0) normal to (4) severe]. However, the lack of definition of OA just based on radiographic changes is not enough for a proper examination (4, 12). For example, researchers have shown that joint pain in OA is enhanced in comorbid diseases, depends of muscle strength, mental state and disability.

For this reason, radiological approach can not accurately reflect the clinical picture of the knee OA. For example, the clinical finding that the pain occurs only when the knee is burdened with load, patients usually had Ahlback grade II (47.1%), for finding that the pain occurs when walking and load Ahlback I and the finding that the pain occurs at rest suits Ahlback II or III (4, 5).

A wide range of radiological changes seen in OA is in accordance with age. Narrowing of the intraarticular space, with creation of osteophytes and other changes in the anatomy of the joint can be a normal part of the aging process. With aging, a reduction in the number of chondrocytes in OA leads to further loss of cells, but it remains unclear how this process is really extensive. Recent studies using MRI have shown the important role of the meniscus in the OA knee. The prevalence of meniscus damage found on MRI was 19% in women aged 50-59 years and 56% in men aged 70-90 years, while the prevalence of meniscus damage in symptomatic patients with at least moderate radiographic changes in terms of OA 63%. Our results correlate with results in the literature, in all patients, as well as excluding parameters, which were Whaaler Rose, Rheumatoid factor analysis which excludes the existence of arthritis (8, 9). It is known that the biochemical parameters, especially parameters that indicate inflammation joint disease in the normal range (8, 10). Analysis of knee osteoarthritis conventional radiography is associated with many technical limitations and all are replaced by quality assessment using magnetic resonance imaging (MRI) or ultrasound, both in routine clinical and scientific research (7, 11). The real cause of knee pain in patients with OA remains enigmatic, because hyalin cartilage does not contain pain fibers and, as such, cannot be the direct cause of pain in OA. Nerve fibers are present in other structures in the knee, such as joint capsule, periosteum, ligaments, muscles, the outer third of the meniscus (12, 13).

6. CONCLUSION

The results do not differ significantly from previous well-known clinical and radiological data on knee osteoarthritis. In conclusion, there is a discrete correlation between radiological and clinical parameters of OA knee. Further studies are needed to determine optimal methods in diagnosing the OA knee apparatus for use of additional diagnostic methods. The shortcomings of standard radiographs are a superposition of structures, poor visibility of soft tissue and radiation. Radiological findings in patients with OA of the knee are not always associated with functional capacity. A thorough clinical examination of osteoarthritis is necessary because currently there are no specific laboratory tests in the diagnosis of osteoarthritis.

• Conflict of interest: none declared.

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