

# Management and Treatment of Coxarthrosis in the Orthopedic Outpatient Clinic

ANTON TIBERIU PARALIOV<sup>1,2</sup>, MONICA MIHAELA IACOV-CRAITOIU<sup>3</sup>,  
MARIANA MĂDĂLINA MOGOANTĂ<sup>4</sup>, OCTAVIAN ION PREDESCU<sup>5</sup>,  
LAURENȚIU MOGOANTĂ<sup>6</sup>, ȘTEFANIA CRĂIȚOIU<sup>6</sup>

<sup>1</sup>PhD Student, Department of Histology, University of Medicine and Pharmacy of Craiova, Romania

<sup>2</sup>Department of Orthopedics, Emergency County Hospital of Drobeta Turnu Severin, Mehedinti County, Romania

<sup>3</sup>Department of Prosthetic Dentistry, University of Medicine and Pharmacy of Craiova, Romania

<sup>4</sup>Department of Kynetic Physiotherapy, "Filantropia" Hospital of Craiova, Romania

<sup>5</sup>Department of Nursing, Faculty of Nursing, Târgu Jiu Subsidiary, Titu Maiorescu University, Bucharest, Romania

<sup>6</sup>Department of Histology, University of Medicine and Pharmacy of Craiova, Romania

**ABSTRACT:** Coxarthrosis, or hip osteoarthritis (OA), is one of the main causes of hip pain, which can affect patients of all ages, being one of the most common reasons for patients presenting to the specialized outpatient clinic. The objective of our research was to determine the number of patients with coxarthrosis who presented to the Department of Orthopaedics and Traumatology within the Emergency County Hospital of Drobeta Turnu Severin, between 2017-2019, the sex, age, social environment of the patients. All patients underwent a thorough clinical examination to determine the risk factors, the favouring factors and their correlation with the paraclinical data obtained through imaging investigation (pelvis X-ray, computer tomography and nuclear magnetic resonance). The study included 462 patients, aged between 23 and 89 years old, who were diagnosed with varying degrees of coxarthrosis within the specialized outpatient clinic. The main risk factors were obesity, osteoporosis, chronic smoking, rural environment, female sex, the existence of a hip injury and intense physical exertion. The main purpose of the research was to analyse a series of data, which would bring information on the incidence, distribution by age groups, sex, living environment and professional activity of the population with coxarthrosis, in order to develop a therapeutic management as effective as possible.

**KEYWORDS:** Coxarthrosis, risk factors, obesity, physiotherapy, treatment.

## Introduction

Arthrosis is generally characterized by the loss of an important part of the joint cartilage, which causes local pain and reduced mobility.

Arthrosis primarily affects the joints of the knees and hips, the most used joints in daily activities.

It affects about 9.6% of men and 18% of women over the age of 60 years old [1].

Coxarthrosis or hip osteoarthritis (OA) is one of the most common pathologies for which patients present for a consultation in the polyclinic, in the physiotherapy, orthopaedics and traumatology departments [2,3].

The disease is characterized by progressive biomechanical changes due to the damage of joint structures, destruction of articular cartilage, reduction of joint space and loss of joint mobility [4,5].

Hip osteoarthritis is the most common diagnosis in adults who present with pain, functional impotence and limitation of joint movements of the hip.

Patients with coxarthrosis may also complain of pain in the buttocks, groin, thigh or knee, which are intensified by prolonged orthostatism.

The intensity of the pain can range from a nagging pain to a sharp or fierce pain.

Patients suffering from this pathology will often have problems walking, climbing stairs, carrying objects and dressing, arthrosis being the main contributor to limiting daily activities [6,7].

Among adults over the age of 45 years old, the incidence rates for incipient coxarthrosis is about 37%, and for those with severe impairment, about 13%.

The overall incidence is estimated at 2.9 in 1000 individuals [8].

Studies showed that women are more commonly affected by coxarthrosis than men, with the incidence increasing with age (especially over 75 years old) and that African-Americans are at a lower risk than Caucasians [8,9].

Risk factors that can be modifiable for coxarthrosis include heavy manual work, high

body mass index (BMI), low education and socioeconomic status [10].

The risk factors that can not be changed for hip arthrosis are age, female sex, genetic predisposition and previous lesions of the hip joint.

Also smoking, alcohol consumption and intense sports activities can influence the onset of coxarthrosis [3,11,12].

For the management of coxarthrosis, a number of conservative and surgical treatment options are available.

Conservative measures include physiotherapy exercises, to strengthen local muscles, complex exercises at the gym for weight loss, wearing shoes that absorb shocks caused by walking or running on rough terrain, and oral analgesics such as paracetamol and nonsteroidal anti-inflammatories (NSAIDs).

Intra-articular injections (with corticosteroids or hyaluronic acid), arthroscopy and arthroplasty are the available invasive (surgical) options, highly used at present [13].

Arthroplasty is the last treatment solution when the rest of the conservative methods fail.

It consists in the total replacement of the hip with synthetic materials, a surgery that revolutionized the treatment of elderly patients with coxarthrosis, restoring the quality of life with very good long-term results [14].

The management of coxarthrosis is responsible for the substantial costs brought to the health system and society, both through treatment and by reducing work productivity and early retirement [15].

Proper diagnosis and clinical management of coxarthrosis in the early stages is very important because proper treatment (drug, physiotherapist) can avoid hip replacement surgery.

## Aim

This study aimed at evaluating patients with coxarthrosis who required specialized consultation and who presented to the Department of Orthopaedics and Traumatology within the Emergency County Hospital of Drobeta Turnu Severin, between 2017-2019, to identify risk factors and their influence on the onset, development and progression of this pathology, as well as the response to treatment.

## Material and Method

The study included a number of 462 patients, aged between 23 and 89 years old, who presented with symptoms of coxarthrosis in the outpatient clinic of Orthopaedics and

Traumatology within the Emergency County Hospital of Drobeta Turnu Severin, between January 2017 and December 2019.

The patients from the studied group were subjected to a clinical and paraclinical examination, monitoring the following data for every subject: age, gender, area of residence, frequency and nature of symptoms, the presence of pain and its characteristics (time of occurrence (at rest/on exertion), duration intensity, irradiation, means of pain reduction), intensity of daily physical effort, type of coxarthrosis (primary, secondary), the stage of coxarthrosis, associated risk factors [such as osteoporosis, obesity, body weight (BMI-body mass index), smoking], the presence of hip or skeletal trauma in medical history, sedentary lifestyle, the presence of comorbidities.

The inclusion criterion of the patients in the study was the presence of symptoms of coxarthrosis (pain, functional impotence with the limitation of joint movements of the hip) also confirmed by paraclinical investigations, namely classical x-ray images, magnetic resonance imaging (MRI) or computer-tomography (CT) when the classical x-ray examination did not provide sufficient imaging data.

The paraclinical examinations were completed by serological tests for the detection of a local or general inflammatory condition, as well as for the demonstration of some comorbidities that would contraindicate certain therapeutic procedures.

The staging of coxarthrosis for every patient was performed on the basis of the clinical examination, but also with the contribution of the simple pelvis X-ray that highlighted the morphological changes of the joint as well as their severity.

For staging the severity of local lesions and applying a treatment as appropriate as possible to each patient, we used the most well-known coxarthrosis classification system: the Kellgren and Lawrence system.

This classification proposes 4 stages of hip coxarthrosis:

- stage I (incipient coxarthrosis), possible medial narrowing of the joint space;
- stage II (mild coxarthrosis), permanent narrowing of the lower joint space, mild sclerosis;
- stage III (moderate coxarthrosis), marked narrowing of the joint space, mild osteophytes, sclerosis, femoral head and acetabulum deformity;

- stage IV (severe coxarthrosis), large osteophytes, complete loss of joint space with sclerosis and cysts, marked femoral head and acetabulum deformity.

The study was approved by the Ethics Committee of University of Medicine and Pharmacy of Craiova, and a written informed consent of the patients was obtained before enrolling them in this study.

The information obtained with the help of physical, clinical examination and imaging investigations, respectively, was stored in Microsoft Excel documents.

The data of the study were statistically processed to obtain the correlation between the physical, clinical and paraclinical examination of the patients included in the study through several commands of the Pivot Tables, Chart, but also with the functions in the Data Analysis menu of Microsoft Excel.

## Results

### Analysis of clinical data of the patient group

#### Analysis of the patient group by age

The 462 patients in the studied group were aged between 23 and 89 years old, with the average age of 64 years old.

The subjects of the statistical study were divided into 7 age groups, according to Figure 1.

The results of the distribution of the number of patients by age group highlighted the following aspects:

- the age group of 21-30 years old included only 2 patients (0.43%) with secondary coxarthrosis, in stage IV.

The development of an advanced coxarthrosis at this age was explained by the presence of congenital hip dysplasia not treated during childhood.

- between 31 and 40 years old, 10 patients were recorded (representing 2.16% of the total group);

- in the age group of 41-50 years old, we found 32 patients, representing about 6.93% of the total group;

- in the age group of 51-60 years old, there was recorded a number of 116 patients, representing 25.10% of the total group;

- in the age group 61-70 years old, there was recorded a number of 168 patients, representing 36.37% of the total group;

- in the age group of 71-80 years old, 104 patients were recorded, representing 22.52% of the total group;

- there were recorded 30 patients over the age of 80 years old included in the study group, representing 6.49% of the total group.

The distribution of the patient group by age shows that hip osteoarthritis can be found even in young adults under 30 years old.

As it results from our data, the incidence of the disease increases with age, most of the patients with coxarthrosis being diagnosed between 51 and 80 years old (about 84% of the total group).

The decrease in incidence in people over 80 years old is due to the lower prevalence of people of the third age in the structure of society, many people dying after 80 years old, due to other comorbidities (Figures 1,2).

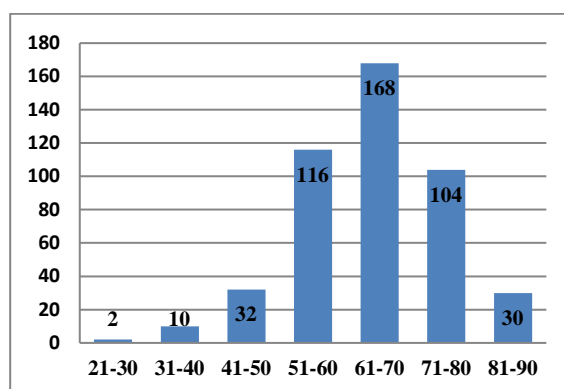


Figure 1. Distribution of the patient's group by age.

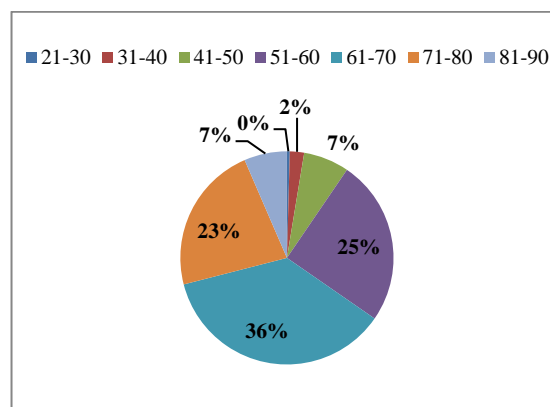


Figure 2. Percentage distribution of patients by age groups.

#### Group distribution of patients by gender

Regarding the gender of patients affected by coxarthrosis, our study found that out of the 462 patients, 257 people, representing 55.63% of the studied group, were females, and 205 patients, representing 44.37%, were males (Figure 3).

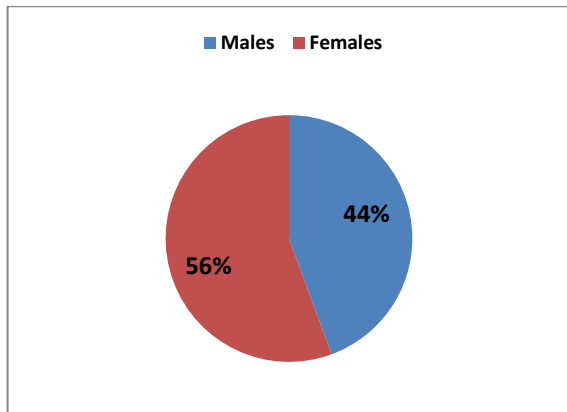


Figure 3. Distribution of patients by gender.

**Group analysis according to the rural/urban living environment**

The living environment of the patients is very important to analyze in order to highlight the environmental factors, physical effort, nutrition as risk factors in the onset of coxarthrosis.

In our study, the statistical analysis of the patient group showed that out of the 462 patients, 244 (52.81%) came from rural areas, and 218 (47.19%) of the subjects came from urban areas (Figure 4).

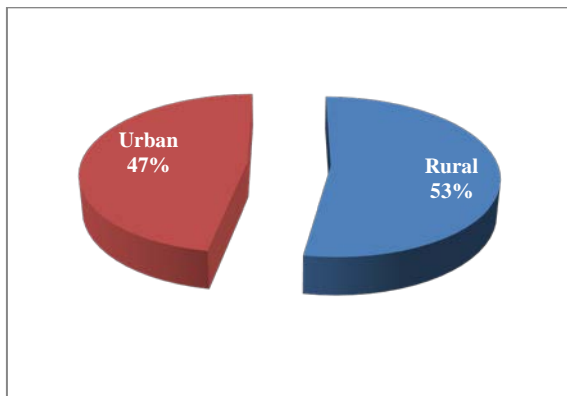


Figure 4. Distribution of patients according to the living environment.

Analyzing the connection between the patient living environment and their gender, it was found that the most affected by coxarthrosis were women in rural areas with 137 cases (29.65%), followed by women in urban areas with 120 cases (25.97%).

The male gender was less affected, with 107 patients in rural areas (23.17%) and 98 (21.21%) in urban areas (Figure 5).

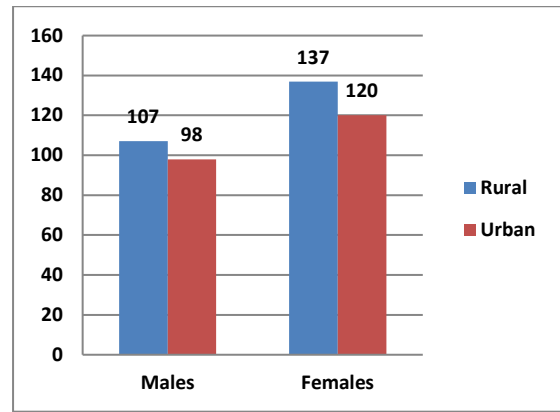


Figure 5. Distribution by gender and living environment.

**Analysis of the progression stage of coxarthrosis**

Following the clinical examination for every patient and the analysis of the images of the pelvic X-rays, the stage of coxarthrosis was established using the Kellgren and Lawrence classification (Figure 6).

Thus, we observed that, out of the group of 462 patients, 276 subjects (59.74%) had stage IV coxarthrosis, 148 patients (32.03%) had stage III coxarthrosis, and 38 patients (8.23%) were diagnosed with stage II coxarthrosis.

Most patients diagnosed with stage IV coxarthrosis were over 61 years old, which confirms that coxarthrosis is a chronic, degenerative condition where age is one of the risk factors.

Furthermore, we also noted that many patients with coxarthrosis neglected the condition or underwent incorrect treatment.

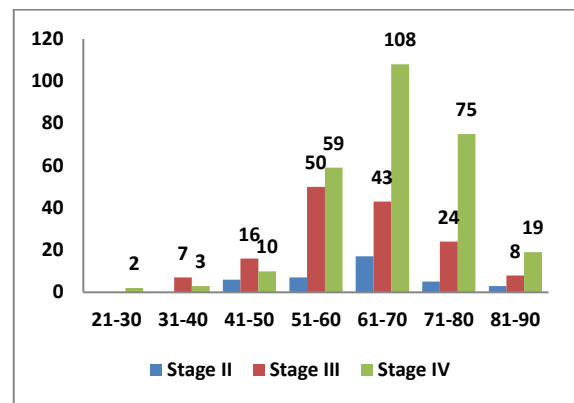


Figure 6. Coxarthrosis, correlation between the age and stage of the condition.

**Correlation of coxarthrosis with body mass index.**

One of the risk factors commonly involved in the etiopathogenesis of coxarthrosis is obesity.

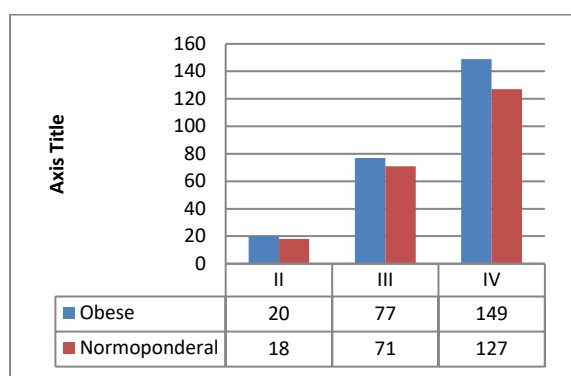
To assess the implications of body weight (obesity) in the onset of coxarthrosis in our

patient group, we assessed the body mass index (BMI) of all patients (Figure 7).

A number of 246 patients, representing 53.25% of the patients had a BMI  $\geq 25\text{kg/m}^2$  (overweight or obese patients), and the remaining 216 patients, representing almost 46.75% were normoponderal.

Analyzing the correlation between BMI and the stage of coxarthrosis progression, we found that there was a significant increase in the number of overweight patients in the more advanced stages of the disease.

Thus, we identified a number of 20 patients (4.33%) with obesity in stage II of the disease, 77 (16.67%) in stage III, and 149 patients (32.25%) in stage IV of coxarthrosis progression.



**Figure 7. Correlations of coxarthrosis with obesity.**

### Group analysis depending on the type of treatment

Recommendations for the management of coxarthrosis in the specialized outpatient clinic focused on a combination of pharmacological and non-pharmacological treatments for the early and moderate stages of the disease (stages II and III).

Most non-pharmacological treatments highlighted physical exercise in the physiotherapy and medical recovery wards of hospitals or private physical therapy practices.

The studied group included patients with coxarthrosis in different stages, from II to IV, all benefiting from pharmacological and non-pharmacological treatment.

Physical exercise was adapted to every patient depending on the progression stage of the disease, the general state of the patient and the associated comorbidities.

In the advanced stages of the disease, physical exercises began with passive movements of flexion/extension, abduction/adduction, internal/external rotation

and repetitive circumduction movement of the affected hip joint; these were followed by light active movements such as walking on smooth ground, on an inclined plane and climbing up and down stairs.

All the exercises were aimed at recovering joint movements and toning the hip muscles.

In parallel with physical therapy, some patients benefited from various physiotherapy procedures (electrotherapy, balneotherapy or medical massage).

The patients were advised to reduce physical activity (especially lifting and carrying weights), to reduce caloric intake and weight control, and as a pharmacological treatment for most patients, nonsteroidal anti-inflammatory medication (NSAIDs) (acetylsalicylic acid, diclofenac, indomethacin, ketoprofen, ibuprofen, aminofenazone, phenylbutazone, piroxicam, etc.) and/or other types of analgesics aimed at relieving pain, reducing inflammation and preserving the function of the hip joint.

The surgical treatment, namely total hip arthroplasty, is the treatment recommended in advanced coxarthrosis (stage IV), with an algic and functional decompensation.

In our study, out of the 462 patients, although most were diagnosed with stage IV of the disease (276 subjects, about 60%) only 128 patients (27% of the total group) were treated surgically within the Emergency County Hospital of Drobeta Turnu Severin between 2017 and 2019.

The low percentage of arthroplasties can be explained by the fact that some of the patients refused surgery, or had numerous associated pathologies, which contraindicated arthroplasty.

### Discussion

Osteoarthritis (OA) is the most common joint disease and a leading cause of disability worldwide.

In recent years, OA became increasingly widespread in the elderly and increasingly obese population, placing a substantial burden on health systems through high social costs [16,17].

Some studies showed that more than 300 million people would be affected by osteoarthritis worldwide [18,19].

The risk of developing hip OA increases with age: about 28% of people over 45 years old show x-ray signs of hip osteoarthritis, and 9.7% develop symptomatic OA [20,21].

In our study, from the beginning, we analyzed the distribution of the disease by age groups.

Following the analysis of the group, it was found that OA can occur in all age groups, but an increased frequency was recorded in patients over 50 years old.

Old age is strongly correlated with the onset of OA, which is a predominantly associated risk factor for the disease [22,23].

Specialized studies estimated the prevalence of osteoarthritis at about 5% in those aged between 15-44 years old, 25-30% in those aged between 45-64 years old and 65-90% in people over 65 years old [24].

There is an exponential increase in the onset of coxarthrosis after the age of 50 years old, and the strong association of age with the disease progression was attributed to the biochemical changes occurring in the hip joint.

These changes occur at the level of the bone matrix (consisting mainly of proteoglycans and collagen fibres), at the level of hyaline articular cartilage and joint synovial.

Also, chondrocytes in the elderly are less capable of producing proteoglycans to maintain the constitution of the cartilage matrix, making the joints more susceptible to arthrosis [25,26].

Females had an increased prevalence, being shown that women have a higher risk for developing coxarthrosis compared to men.

Several studies showed the presence of a smaller articular surface and a more pronounced narrowing of the joint space in women compared to males [27,28].

This suggests that, in women, the cartilage loss can be an age-related phenomenon as well as to hormonal changes occurring with aging.

Oestrogen appears to have a beneficial effect on cartilage, which is demonstrated by postmenopausal oestrogen replacement therapy that protects older women against hip arthrosis [29].

Most of the patients in the study group came from rural areas (244 patients), with a link between the development of coxarthrosis and the increased physical requirements of rural occupations.

In general, studies showed high risks in the association of coxarthrosis with heavy manual labour and/or employment in agriculture or the construction industry.

It was suggested that increased levels of high-impact physical activity, through occupational exposure or long-term participation in physical activity, may predispose to the development of hip arthrosis.

Epidemiological evidence suggested that occupations involving hard work have an increased risk of developing coxarthrosis.

The basic mechanism may be similar to that of obesity, by increasing the joint load that causes the biomechanical stress [30,31].

An extensive meta-analysis found that there is a relationship between body mass index (BMI) and the risk of developing hip osteoarthritis, with every five-unit increase in BMI being associated with an increased 11% risk for developing coxarthrosis.

This association was also found in our studied group, where 53% of the patients had  $BMI \geq 25 \text{ kg/m}^2$  presenting advanced stages of the disease, with major functional impotence and important x-ray changes [32].

Two mechanisms show the link between coxarthrosis and increased BMI.

Firstly, the increase in body weight increases the biomechanical load at the level of the hip joint, thus leading to high joint tensions, especially in the presence of other risk factors, and secondly, obesity, by which the associated systemic pro-inflammatory factors act on all systems and organs, including over the joint structures, increasing the risk of hip OA [33,34].

The objectives of OA hip treatment in the patients of the studied group, focused on reducing pain, restoring mobility and muscle strength of the hip region.

The management of incipient and moderate coxarthrosis (stages II, III) consisted of lifestyle changes, such as smoking cessation, weight loss, limitation or avoidance of intense physical exercise, accompanied by pharmacological treatment and physio-kinotherapy [35].

The pharmacological treatment was carried out by local, oral and or injectable administration (intramuscularly or intravenously) of analgesics, muscle relaxants, glucosamine, chondroitin, steroidal and non-steroidal anti-inflammatories.

Diclofenac and etorcoxib were the most common NSAIDs recommended for hip pain relief, having a moderate effect in patients with early stages of OA (stages I, II and III).

The treatments we recommend are similar to those used in other similar studies [36].

Glucosamine and chondroitin were taken orally, these supplements providing joints with cartilage support, with benefits of relieving pain and slowing the progression of the disease [37].

Thermotherapy, electrotherapy, physical therapy and massage were the physical methods

used in the treatment of pain symptoms and in the reduction of relapses.

Physio - kinesiotherapy is widely recommended in clinical guidelines for OA management, with evidence that exercise offers small to moderate benefits in reducing pain and improving function in hip arthrosis, which is also found in the studied group [38-40].

Intra-articular injections of corticosteroids or hyaluronic acid were used in a small number of patients (only 12 patients accepted the treatment procedure), but had a clinical result similar to that reported by other specialized studies, significantly relieving pain in the first week after the injection, followed by moderate reduction of symptoms after 8 weeks [41].

Total hip arthroplasty is an effective management approach for patients with coxarthrosis who exhausted the other non-surgical options, but this procedure requires substantial expenses for the health system [42].

## Conclusions

Hip osteoarthritis (coxarthrosis) is one of the main causes of limiting daily activities and reducing the quality of life in the elderly, putting a lot of pressure on the medical system and causing economic and social problems, but also on the individual, family and community.

In this study, we observed the presence of coxarthrosis mainly in patients over 50 years old, with a higher incidence in women and patients from rural areas.

The main risk factors detected in patients in the study group were obesity, intense physical activity and the presence of other comorbidities.

The correct management of coxarthrosis has major benefits in relieving the symptoms by reducing the functional, social and economic impact of this pathology.

The GP, the orthopaedist and the medical recovery doctor play an important role in the early diagnosis and treatment of coxarthrosis, as well as for the prevention of the disease, stopping the disease progression and controlling the risk factors.

## Conflict of interests

None to declare.

## References

1. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organ*, 2003, 81(9):646-656.
2. Howell DS, Sapolsky AI, Pita JC, Woessner JF. The pathogenesis of osteoarthritis. *Semin Arthritis Rheum*, 1976, 4(4):365-383.
3. Marques EA, Elbejjani M, Gudnason V, Sigurdsson G, Lang T, Sigurdsson S, Aspelund T, Siggeirsdottir K, Launer L, Eiriksdottir G, Harris TB. Cigarette smoking and hip volumetric bone mineral density and cortical volume loss in older adults: The AGES-Reykjavik study. *Bone*, 2018, 108:186-192.
4. Dutton M. Imaging studies in ortopaedics. In: Dutton M (Ed): *Dutton's Orthopaedic Examination, Evaluation, and Intervention*. 4th Edition, McGraw-Hill Education, 2016, New York, USA, 344-368.
5. Palazzo C, Nguyen C, Lefevre-Colau MM, Rannou F, Poiraudou S. Risk factors and burden of osteoarthritis. *Ann Phys Rehabil Med*, 2016, 59(3):134-138.
6. Palazzo C, Ravaud JF, Papelard A, Ravaud P, Poiraudou S. The burden of musculoskeletal conditions. *PLoS One*, 2014, 9(3):e90633.
7. Wilson JJ, Furukawa M. Evaluation of the patient with hip pain. *Am Fam Physician*, 2014, 89(1):27-34.
8. Moss AS, Murphy LB, Helmick CG, Schwartz TA, Barbour KE, Renner JB, Kalsbeek W, Jordan JM. Annual incidence rates of hip symptoms and three hip OA outcomes from a U.S. population-based cohort study: the Johnston County Osteoarthritis Project. *Osteoarthritis Cartilage*, 2016, 24(9):1518-1527.
9. Kiadaliri AA, Lohmander LS, Moradi-Lakeh M, Petersson IF, Englund M. High and rising burden of hip and knee osteoarthritis in the Nordic region, 1990-2015. *Acta Orthop*, 2018, 89(2):177-183.
10. Reyes C, Leyland KM, Peat G, Cooper C, Arden NK, Prieto-Alhambra D. Association Between Overweight and Obesity and Risk of Clinically Diagnosed Knee, Hip, and Hand Osteoarthritis: A Population-Based Cohort Study. *Arthritis Rheumatol*, 2016, 68(8):1869-1875.
11. Chaganti RK, Lane NE. Risk factors for incident osteoarthritis of the hip and knee. *Curr Rev Musculoskelet Med*, 2011, 4(3):99-104.
12. Juhakoski R, Heliövaara M, Impivaara O, Kröger H, Knekt P, Lauren H, Arokoski JP. Risk factors for the development of hip osteoarthritis: a population-based prospective study. *Rheumatology (Oxford)*, 2009, 48(1):83-87.
13. Aweid O, Haider Z, Saed A, Kalairajah Y. Treatment modalities for hip and knee osteoarthritis: A systematic review of safety. *J Orthop Surg (Hong Kong)*, 2018, 26(3):2309499018808669.
14. Learmonth ID, Young C, Rorabeck C. The operation of the century: total hip replacement. *Lancet*. 2007, 370(9597):1508-1519.
15. Bannuru RR, Osani MC, Vaysbrot EE, Arden NK, Bennell K, Bierma-Zeinstra SMA, Kraus VB, Lohmander LS, Abbott JH, Bhandari M, Blanco FJ, Espinosa R, Haugen IK, Lin J, Mandl LA, Moilanen E, Nakamura N, Snyder-Mackler L, Trojian T, Underwood M, McAlindon TE. OARSI guidelines for the non-surgical management of knee, hip, and polyarticular osteoarthritis. *Osteoarthritis Cartilage*. 2019, 27(11):1578-1589.
16. Katz JN, Arant KR, Loeser RF. Diagnosis and Treatment of Hip and Knee Osteoarthritis: A Review. *JAMA*, 2021, 325(6):568-578.
17. Hunter DJ, Bierma-Zeinstra S. Osteoarthritis. *Lancet*, 2019, 393(10182):1745-1759.

18. Safiri S, Kolahi AA, Smith E, Hill C, Bettampadi D, Mansournia MA, Hoy D, Ashrafi-Asgarabad A, Sepidarkish M, Almasi-Hashiani A, Collins G, Kaufman J, Qorbani M, Moradi-Lakeh M, Woolf AD, Guillemin F, March L, Cross M. Global, regional and national burden of osteoarthritis 1990-2017: a systematic analysis of the Global Burden of Disease Study 2017. *Ann Rheum Dis*, 2020, 79(6):819-828.
19. Sabha M, Hochberg MC. Non-surgical management of hip and knee osteoarthritis; comparison of ACR/AF and OARSI 2019 and VA/DoD 2020 guidelines. *Osteoarthr Cartil Open*, 2021, 4(1):100232.
20. Bijlsma JW, Knahr K. Strategies for the prevention and management of osteoarthritis of the hip and knee. *Best Pract Res Clin Rheumatol*, 2007, 21(1):59-76.
21. Jordan JM, Helmick CG, Renner JB, Luta G, Dragomir AD, Woodard J, Fang F, Schwartz TA, Nelson AE, Abbate LM, Callahan LF, Kalsbeek WD, Hochberg MC. Prevalence of hip symptoms and radiographic and symptomatic hip osteoarthritis in African Americans and Caucasians: the Johnston County Osteoarthritis Project. *J Rheumatol*, 2009, 36(4):809-815.
22. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Kremers HM, Wolfe F; National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum*, 2008, 58(1):26-35.
23. Hunter DJ, McDougall JJ, Keefe FJ. The symptoms of osteoarthritis and the genesis of pain. *Med Clin North Am*, 2009, 93(1):83-100
24. Buckwalter JA, Martin JA. Osteoarthritis. *Adv Drug Deliv Rev*, 2006, 58(2):150-167.
25. Buchanan WW, Kean WF, Kean R. History and current status of osteoarthritis in the population. *Inflammopharmacology*, 2003, 11(4):301-316.
26. Adatia A, Rainsford KD, Kean WF. Osteoarthritis of the knee and hip. Part I: aetiology and pathogenesis as a basis for pharmacotherapy. *J Pharm Pharmacol*, 2012, 64(5):617-625.
27. Prieto-Alhambra D, Judge A, Javaid MK, Cooper C, Diez-Perez A, Arden NK. Incidence and risk factors for clinically diagnosed knee, hip and hand osteoarthritis: influences of age, gender and osteoarthritis affecting other joints. *Ann Rheum Dis*, 2014, 73(9):1659-1664.
28. Lanyon P, Muir K, Doherty S, Doherty M. Age and sex differences in hip joint space among asymptomatic subjects without structural change: implications for epidemiologic studies. *Arthritis Rheum*, 2003, 48(4):1041-1046.
29. Nevitt MC, Cummings SR, Lane NE, Hochberg MC, Scott JC, Pressman AR, Genant HK, Cauley JA. Association of estrogen replacement therapy with the risk of osteoarthritis of the hip in elderly white women. Study of Osteoporotic Fractures Research Group. *Arch Intern Med*, 1996, 156(18):2073-2080.
30. Harris EC, Coggon D. HIP osteoarthritis and work. *Best Pract Res Clin Rheumatol*, 2015, 29(3):462-482.
31. Sulsky SI, Carlton L, Bochmann F, Ellegast R, Glitsch U, Hartmann B, Pallapies D, Seidel D, Sun Y. Epidemiological evidence for work load as a risk factor for osteoarthritis of the hip: a systematic review. *PLoS One*, 2012, 7(2):e31521.
32. Jiang L, Rong J, Wang Y, Hu F, Bao C, Li X, Zhao Y. The relationship between body mass index and hip osteoarthritis: a systematic review and meta-analysis. *Joint Bone Spine*, 2011, 78(2):150-155.
33. Vuolteenaho K, Koskinen A, Kukkonen M, Nieminen R, Päivärinta U, Moilanen T, Moilanen E. Leptin enhances synthesis of proinflammatory mediators in human osteoarthritic cartilage-mediator role of NO in leptin-induced PGE2, IL-6, and IL-8 production. *Mediators Inflamm*, 2009, 009:345838.
34. Murphy NJ, Eyles JP, Hunter DJ. Hip Osteoarthritis: Etiopathogenesis and Implications for Management. *Adv Ther*. 2016, 33(11):1921-1946.
35. Nguyen C, Lefèvre-Colau MM, Poiradeau S, Rannou F. Rehabilitation (exercise and strength training) and osteoarthritis: A critical narrative review. *Ann Phys Rehabil Med*, 2016, 59(3):190-195.
36. da Costa BR, Reichenbach S, Keller N, Nartey L, Wandel S, Jüni P, Trelle S. Effectiveness of non-steroidal anti-inflammatory drugs for the treatment of pain in knee and hip osteoarthritis: a network meta-analysis. *Lancet*, 2017 390(10090):e21-e33.
37. Liow Y, Wang W, Loh VW. Outpatient management of knee osteoarthritis. *Singapore Med J*, 2017, 58(10):580-584.
38. Bennell K. Physiotherapy management of hip osteoarthritis. *J Physiother*, 2013, 59(3):145-157.
39. Bennell KL, Buchbinder R, Hinman RS. Physical therapies in the management of osteoarthritis: current state of the evidence. *Curr Opin Rheumatol*, 2015, 27(3):304-311.
40. Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S. Exercise for osteoarthritis of the hip. *Cochrane Database Syst Rev*, 2014, (4):CD007912.
41. McCabe PS, Maricar N, Parkes MJ, Felson DT, O'Neill TW. The efficacy of intra-articular steroids in hip osteoarthritis: a systematic review. *Osteoarthritis Cartilage*, 2016, 24(9):1509-1517.
42. Daigle ME, Weinstein AM, Katz JN, Losina E. The cost-effectiveness of total joint arthroplasty: a systematic review of published literature. *Best Pract Res Clin Rheumatol*, 2012, 26(5):649-658.

---

*Corresponding Author: Monica Mihaela Iacov-Craioiu, Department of Prosthetic Dentistry, University of Medicine and Pharmacy of Craiova, e-mail: monica.craioiu@umfscv.ro*