

## Recommendations of Polish Society of Physiotherapy, Polish Society of Family Medicine and College of Family Physicians in Poland for hip joint pain in primary health care

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**Summary Background.** The authors share the view that the treatment of degenerative changes concerning the hip is a multidisciplinary activity. In the opinion of the authors, in the physiotherapeutic procedure, the order of developing periarticular structures is important when restoring normal homeostasis (blood supply, oxygenation, tonus, nutrition), in the area of the joint where there is a modified distribution of resting tension of soft tissues. Patient condition improvement, especially in those with less severe symptoms of degenerative disease (yet are without significant structural changes in the joint and without functional limitations), seems to be the most justified at the level of services provided by the primary care physician.

**Objectives.** The objective of this recommendation for hip joint physiotherapy within the basic health care stage is to propose a simple, uncomplicated set of physiotherapeutic actions that would allow, in particular at the first stage of change, the performance of activities decelerating degenerative processes in this joint and, hence, limiting the pain. The publication is a proposal for a new model of patient care in the system of Polish primary health care, and it is intended to form a background for systemic solutions (including the creation of an interdisciplinary cooperation model) that could be implemented.

**Material and methods.** Experts from the Polish Society of Physiotherapy, the Society of Family Medicine and the College of Family Physicians have reviewed published evidence from 2008–2018 regarding the use of physiotherapy in treating degenerative changes of the hip joint that have been placed online in PubMed and Cochrane Collaboration.

**Conclusions.** Maintaining good efficiency in hip joint pain patients is the priority in the treatment proceedings. Achievement of the above mentioned goal is possible through improvement of the accessibility of health services, the introduction of early (basic) therapeutic actions (education and physioprophyllaxis) and actively engaging patients in the rehabilitation process (self-therapy) as conducted by the physiotherapist and the individual patient in cooperation with a primary care physician. Shaping a health-conscious attitude within primary care patients, the slowing down of disease progression and the postponing more advanced treatment forms are all further benefits resulting in reduction of the treatment costs within the healthcare system.

**Key words:** physicians, primary health care, physical therapy specialty, hip joint.

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## Background

Degenerative joint changes (OA – osteoarthritis), including the hip joint (coxarthrosis), are among the musculoskeletal disorders that are a frequent problem of an aging society. OA evidences a growing economic burden as well as a challenge for current medicine and health care. The extension of life span and the increased life quality expectations have become a superior problem in ensuring health, and are now a priority in implementing targeted prophylactic programs all over the world [1].

Hip joints are most frequently exposed to joint degenerative processes due to their anatomic structure, their location, as well as their complex biomechanics [2]. Furthermore, hip joints, similarly to knee joints, are the most exploited supporting joints in the motor organ [3, 4]. Indeed, OA frequency qualifies this disease to membership within the group of social diseases of the motor organ. Herein, progressing pathology brings about incorrect load distribution within the entire kinematic chain of the lower limb, pelvis and spine.

Clinical examination and imaging still play an important role in the diagnosis of degenerative changes. However, in addition



to traditional imaging methods (X-ray), specialist care levels of newer technologies and computer aided methods to support analysis (MRI – magnetic resonance, CT – computer tomography, USG), which provide complete and precise pathological imagery in patients [5].

According to the below-mentioned etiology, pathogenesis and clinical imagery of the hip joint OA, it is recommended (as stated by the authors of this paper) that physiotherapeutic procedures be implemented at the initial period when the joint pain occurs. Herein, an important issue is the sequence in which the periarticular structures are worked out so as to restore correct homeostasis (circulation, oxygenation, tonus and nourishing), near the joint, wherein there is an altered distribution of the soft tissue stationary tension. Therefore, when programming the therapy process, it is initially required to include massage, physiotherapy and then exercises and other activity forms.

From the clinical point of view, it is important at each stage of the disease advancement that the patient starts his or her rehabilitation before any irreversible structural changes occur within the hip joint area. It is thus essential to notice the first symptoms related to decrease of muscular flexibility, including periodical pains and weakening, as well as lower strength in muscles that externally pull and rotate the hip [6]. As noticed by Harris-Hajes et al., proper recognition of the disorder causes at the earliest stages (to differ between muscular and articular causes before starting therapy) may potentially delay development of the structural changes in the muscles which provide dynamic and passive resistance in reaction to any external forces [7]. Correct stabilization influences proper articular connection and axial alignment. Moreover, the same restricts exposure to the risk of damage in the articular labrum, the bag and the ligamentous structures, as well as the development of instability in the joint [8]. Receptor pain (capsular-myofascial) constitutes a less complex problem in the therapy in relation to treatment of the pain of structural origin which accompanies the chronic process. Early start of physiotherapeutic procedures, before any structural changes appear or at their slight advancement, will allow to decelerate the degenerative process, reduce pharmacological treatment cost, improve the patient's awareness of auto-therapy and limit disability, thus will unburden the health care system from excessive costs and the need for prolonged therapy [9].

The 21 recommendations developed by the DELPHI discussion panel (represented by experts in rheumatology, orthopaedics and physiotherapy, as well as by patients themselves) indicated, among other issues, that physical activity and loss of body mass are priority preservative actions in this extent. Moreover, regular physical activity and individual exercise programs (including muscle strengthening, cardiovascular activity and flexibility exercises) bring about real chances to lower the pain, decrease the progress of the joint degenerative disorder and improve performance of daily functions [10].

The rehabilitation process success depends not only on the proposed rehabilitation methods, but also on the patient's knowledge and the availability of health care services. In their publication, Smink et al. indicate that in the Netherlands, the primary medical care physician holds the significant role in the care of patients with degenerative changes. The authors also underline that insufficient attention is given to system-based solutions, to supporting the patients by education, to changing their lifestyle and to encouraging them to follow suitable diets in order to control their BMI [11]. Hofstede et al. also emphasize the significance of the primary care physicians in guiding patients with degenerative changes. Furthermore, they notice that orthopaedists recommend improper (too early) qualification to the endoprosthetics without prior exhaustive use of the preserving treatment methods, including pharmacological, physiotherapeutic, dietetic and that related to the change of lifestyle [12, 13].

The authors of this paper share the view that hip related degenerative change treatment is a multi-disciplinary action (it needs an integrated operation between physician, physiotherapist, dietitian and psychotherapist) [14]. All in all, improving the health status of patients, in particular, those with less advanced degenerative disease symptoms (still without major functional limitations), seems undoubtedly justified at the level of the primary medical care physician.

## Objectives

The objective of this recommendation for physiotherapy for hip joint pain in basic health care is to propose simple, uncomplicated physiotherapeutic actions that would allow, in particular, at the first stage of change occurrence, to perform activities that decelerate degenerative processes in this joint and which limit the pain. Such is particularly important when prompt access to specialized physicians and specialized health centers is restricted.

## Recommendation development method

Experts of Polish Society of Physiotherapy, Polish Society of Family Medicine and College of Family Physicians performed a detailed review of any published evidences from the years 2008–2018 concerning the use of physiotherapy with regard to hip joint degenerative changes as placed in the data bases PubMed and Cochrane Collaboration. The aforementioned were browsed using the keywords: hip osteoarthritis, pain, risk factors, epidemiology, guidelines, therapeutic exercise. The prepared synthesis was further analyzed by the experts with respect to usefulness in the Polish primary health care system and to the system-based solutions (including development of the interdisciplinary collaboration model) that could be implemented in our country. The possibility of implementing the model of proceeding at the basic care level and supported by physiotherapy, in patients with pain in the said joints, is, hence, presented.

## Epidemiology

Data analysis for 1996 indicated that 9.6% of all men and 18% of all women all over the world, at the age of 60 and older, have some joint degenerative issues. The largest patients share was found in developed regions of the world [15]. American-sourced data reveal that OA is the main disability reason in persons after 65. Indeed, in nearly 40% of all persons above 65 and in 85% of all individuals above 75 years some joint degenerative symptoms are evident [15, 16]. Estimated data from Australia indicate that among all age groups, the OA frequency is higher in women than in men (respectively, 2.95 vs 1.75 per 1000 persons) [9].

European researches show that the OA frequency in women is 13% and it is 8% in men at the age of 45–49. Moreover, this frequency increases with age. Among persons 80 years old, this problem applies to 55% of the total population [15]. In Sweden, hip joint degenerative change in persons above 45 is recognized via radiologic testing in 2.3% of all women and 1.9% of all men [9]. It is estimated in the European population, the number of persons with the OA problem will increase from 75 million in 2005, to 135 million in 2050. This means that every third Europe inhabitant will be potentially exposed to degenerative changes, including that in the hip joints [17].

In Poland, according to Central Statistical Office calculation, the number of persons above 65 years will double and exceed 8 million. It must be expected then that such an increase of elder persons in the population will also involve higher numbers of OA cases [17].

The progression of degenerative changes in the hip joint is in particular related to some limitation in everyday functioning, and the aforementioned is the common indication for complete replacement surgery of the hip joint. In the United States, within the last 20 years, the number of patients operated upon due to necessity to replace the joint increased from 286,324 in 1996, to 369,372 in 2006, to 464,452 in 2011 (<http://hcupnet.ahrq.gov>) [18].

## Ethiopathology

The hip joint degenerative disorder pathogenesis process is not completely understood, and researches are still conducted to find the so-far-unknown causes of degenerative disease. At the OARSI (Osteoarthritis Research Society International) Congress in 2017, it was underlined that it is required to include in this quest new technologies found in diverse research fields, including genetics, engineering, nanotechnology and nuclear medicine bioselective indicators – all of which could contribute to the pathophysiological insight [19]. Results from these researches will help, for example, more effectively eliminate the pain (depending on the disease clinical stage and the pain phenotype), and also better identify potential causes of joint function disability [19].

Current opinion prevails on a multi-factor etiopathogenesis with regard to hip joint degenerative disease [20]. The disease causes may be conditioned by metabolic dysfunction or by excessive pathologic load on the joint. Damage of the joint cartilage is a result of a disproportion in activity between degenerative enzymes (from the metalloproteinases group) in relation to those responsible for its regeneration (growth factors (TFG $\beta$ ), insulin-like growth factor (IGF) and tissue inhibitors of metalloproteinases (TIMP)) [4, 20, 21]. Researches performed by Achedi et al. indicate that damage of the joint cartilage in the X-ray image of 2 degree in both genders and of 1 degree (mainly in men) are related to clinical, demographic and structural factors essential for OA. The joint cartilage damage in the hip joint, according to the researchers, may be one of major causes of fast advancement of the disease and the pathophysiology. This opinion, however, requires confirmation in further observations [22].

Among the other reasons for degenerative changes, they mention incorrect biomechanical loads directed on the hip joints during different occupational activities related to lifting, handling, climbing stairs or ladders, with or without weights [23]. The researches performed demonstrate that the most burdened is the ipsilateral hip joint (located at the same body side) during lifting and switching the load side from one to another in a horizontal plane. Herein, research results indicate that excessive loads directed on the hip may result in increased pressure on the joint cartilage, and can provoke degenerative changes [23].

In the investigation of Magnus, it was observed that the chance of hip joint degenerative changes risk doubled (OR 2.0; 95% CI 1.5–2.8), and also the hip joint arthroplasty was 2.5 times more frequent (OR 2.5; 95% CI 1.6–3.7) in former athletes than in a control group [24]. Moreover, the available researches demonstrate that male athletes taking part in elite sports at the national or professional level (football, handball, rugby, athletics or hockey) feature increased risk of the hip joint OA development, while persons participating in long distance runs have no explicitly increased risk [25].

The meta-analysis (credibility of evidences at 2a level), published in the JOSPT issue of 2017, indicate that differences in exposure to the hip or knee degenerative changes depend on the run frequency and intensity. General frequency of the hip and knee joint OA was 13.3% (95% CI: 11.6%, 15.2%) in competitors with high training load, 3.5% (95% CI: 3.4%, 3.6%) in recreational runners and 10.2% (95% CI: 9.9%, 10.6%) in the control group.

The rate of chances for hip and/or knee OA in competitors was higher than in joggers or to results received in the control group (in non-runners or persons of sedentary lifestyle) [26].

Researches by Lefèvre-Colau et al. indicate that the OA risk in a radiological image (more frequent presence of osteophytes, without the features of joint space narrowing) is increased in persons who undertake regular and intensive training. Exposed to the said changes are competitors in team, strength and contact sports. To a lesser extent, this applies to those who train in endurance sports and in running races. However, everyday recreational or sport activities with moderate intensity, regardless of their type, are not a fixed factor of clinical or radiological risk of the knee/hip OA [27]. The rate of clinical advancement and the disease development will depend on the balance between the cartilage synthesis and its degradation. Progressing changes will affect both the joint and the surrounding tissues.

Taking into account all of the above aspects, it must be ascertained whether the mentioned causes are directly related to OA and if they may be modified through physician-directed therapy or conduct [8].

### a) Influence of myalgic origin factors

It is noticed that the disease development is influenced by periarticular muscles atrophy or weakening (that may involve disorder of protective reactions, joint hypermobility and instability), leading to increased risk of microtrauma in the joint cartilage being the cause of degenerative changes. Such muscle weakening, featuring a decrease of their strength or their motor unit activation, may lead to changes in walking and to lower capacity in everyday activities [1]. In other research, it was also found that development of clinical symptoms, regardless of hip joint OA advancement, is related to atrophy, weakening of glutes and restriction of abduction range in this joint. Interpretation of changes in glutes mass, according to the authors, may be a useful tool for clinicians that plan rehabilitation strategies for patients [28]. Moreover, it must be added that peak muscular mass is reached in about the 30<sup>th</sup> year of life. After this period it is reduced at the rate 3–8% per decade, and even greater loss takes place after the 60<sup>th</sup> year of life [16]. In 2002, the results of the National Health Interview Survey (NHIS) in the USA confirmed that the patients with diagnosed OA had lesser levels of physical activity in relation to the general population. Indeed, 37% of the population with this diagnosis were physically inactive [29].

### b) Changes in X-ray image

In the radiological image, the level of degenerative change advancement and progression is assessed based on the IRF (Individual Radiographic Feature) scale. The assessment includes the joint space width, the presence and size of osteophytes or cysts, sclerotisation of the subchondral layer and maintenance of the joint alignment [30]. Of note, since muscles ensure dynamic joint stability during motion, some indications of degenerative changes (such as osteophytes and rim thickening) may hypothetically be the result of trials taken by the organism to increase joint stability in situations of inefficient muscle performance that eventually lead to joint instability in movement [8]. Other symptoms seen via X-ray image include: sclerotisation of the subchondral bone layer, osseous cysts (so-called, degenerative geodes), exostosis cartilaginea, osteophytes, mushroom-deformity of the femoral head, doubling of the bottom of the acetabulum and apparent shortening of the femoral neck [31].

### c) Disturbed blood distribution and joint nourishing

Both correct function and the healing process require appropriate blood distribution. The hip joint area is supplied with

arterial blood both through the branches of the internal iliac artery and the external iliac artery. The neck of femur, together with the head, is supplied by branches coming from the external hip artery, while the acetabulum is supplied from branches coming from the obturator artery and the inferior and superior gluteal artery that are extensions of the internal iliac artery. Blood supply disorder may initiate degenerative disorders around the hip joint. Both in the osseous tissue, as well in the cartilage or the connective tissue that create ligaments, the articular capsule or the circumferential cartilage, the process of replacing its component, mainly collagen fibers, is continued constantly. This is a base for adaptive, regenerative and repair processes within the joint area. In situations wherein the arterial blood supply is restricted and the outflow of the venous blood and the lymph is obstructed, the regenerative processes may be decelerated and degenerative changes may occur. At the same time, such scenarios may favor the occurrence of increased stress and pain in the muscles via restriction of their capacity. An example may be the piriformis muscle or the iliococcygeus muscle. In the event of increased piriformis muscle stress, further disturbances of the artery blood distribution may appear. This is induced by pressure on the superior gluteal artery coming from under the joint (a.o., the artery branching to the acetabulum and to the iliopsoas muscle) and to the inferior gluteal artery (that ensures blood supply, a.o. for the sciatic nerve), whilst the iliopsoas has key importance for the efficiency of the lumbar plexus that comes through it. The same, the blood supply disturbance and increased muscular stress that persists for longer time, may lead to pain and even to the inclusion of neuralgia, and significantly accelerates the creation of degenerative changes within hip joint periarticular tissues. Of note, the use of different forms of thermal treatment without prior normalizing of the piriformis and the iliopsoas may sometimes bring an opposite effect in the form of pain intensification [2].

#### d) Incorrect function of circumferential cartilage

The anatomic element that affect function disorder and pain is the circumferential cartilage. Its correct structure tightens the joint and secures optimal hydrostatic fluid tension in the intra-articular space. This mechanism humidifies the joint and protects it against damage. The circumferential cartilage acts as a girth for the joint during walking and prevents its excessive widening [32]. In addition, the joint unsealing leads to a decrease of its surface consolidation. Recent researches have demonstrated that the circumferential cartilage includes numerous proprioceptors and nociceptors. The biggest cluster of the mentioned receptors is seen in the anterior part – which correlates with more frequent changes in this area [2].

#### e) Incorrect axial load in the joint

A joint load that is considered incorrect in accordance with biomechanical rules generates an accelerated wear condition of the articular cartilage. In researches (Dandacheli et al. 2008) with the use of the TK 3D approach, the authors gave differences in the cover of correct and dysplastically changed femur heads, that were, respectively, 75% vs 51%. Herein, it must be recognized that damage to the articular cartilage results in pain and joint dysfunction [33]. Furthermore, incorrect biomechanical loads accelerate the process of cartilage structure wear, and it was observed in conducted researches that the capsules in women have a greater tendency to ante-version than that in men [34]. In addition, incorrect alignment of the head in the capsule brings about the potential risk of degenerative disease.

### Clinical picture

Joint degenerative disease is one of main causes of pain and disability in the adult population. It is estimated that 27 million

people in the United States and 8.5 million people in the United Kingdom have clinically diagnosed degenerative changes. Herein, OA in at least one joint, is presented in 13.9% of all persons at the age of 25 and older and in 33.6% of all adults at the age of 65 and older [35]. The disease process affects all articular tissues (i.e. cartilage, synovium, membranes, meniscuses and ligaments), as well as the periarticular tissues (tendons, fat tissue and muscles). The aforementioned tissues undergo metabolic, structural and functional changes that contribute to initiation and increase chronicity of pain, hence facilitating the disease progress and leading to disability [36]. The disease process usually starts from changes in the cartilage or in the subchondral layer, however, the patient's clinical picture depends on the rate of affected peripheral and intra-articular structures. As a consequence of disturbed blood pressure and incorrect biomechanical loads on the hip joints, local pain intensifies, capsule-muscle contractures fixate within the joint area, muscle mass loss progresses, and lower limb movability is gradually restricted. This last affects dysfunction in other joints (knee, ankle and lower lumbar spine) and enhances the disturbed balance. Most difficult for the patient is the fact that his or her locomotion is limited, and that efficiency gradually worsens (through gradual increase of stiffness and greater functional limitations) [4, 37].

In patients with degenerative changes of the hip joint, the pain is often an irreversible element of everyday activity. Moreover, its intensity depends on the disease advancement and progress rate, and it initially intensifies during activity, thus discouraging any exercise. Along with tiredness and rigidity, with time, it is more and more difficult to mobilize for motion, and additional activity is inhibited and limited to a necessary minimum. Pain is, thus, the key determinant of the kinesiphobia that leads to sedentary lifestyles and decreased general efficiency, as well as to an increase of the risk of obesity and cardiovascular diseases [10].

A vicious cycle is, thus, created: on the one hand, lack of activity; on the other hand, progress of the disease, resulting in increasing loss of the joint motion extent and the intensifying of pain. In addition, more factors appear that worsen the patient's general condition: becoming overweight or obese, aging, weakening, lacking in energy, experiencing progressive loss of fitness. Further barriers mentioned by the patients in researches that determine activity are lack of motivation and purpose, as well as feelings of boredom, laziness, lack of time and family interaction. Moreover, the examined persons held that recommendations for activity were not compliant with their adopted lifestyle and were in contradiction to their social roles. In addition, some patients demonstrated attitudes of resignation from any effort due to feelings of helplessness and because of the necessity to adapt to a reality related to decreased functional efficiency [38].

Persons with increased pain syndrome, while standing, keep their hip and knee joint slightly bent so as to lower the articular capsule tension. They also balance their lower limbs on their toes, thus avoiding the lowering of their pelvis. Herein, increased pain syndrome is accompanied by increased tension and painfulness of the quadratus plantae muscle and the inferior constrictor muscle of the pharynx (and in consequence, it brings about a possible irritation of the lumbar plexus) and the quadriceps straight head. Additionally, in the sitting position they move body weight to the counter lateral of their hip and restrict their lower limb rotation (intensifying the tension of the piriformis muscle and in consequence generating pressure upon the superior and inferior gluteal artery). What is more, they bend in a characteristic way to avoid excessive extension in their hip joint [39]. Significant problems appear during stair climbing/ /descending or when moving along areas with diverse inclination, and also when getting in and out of vehicles. Prosaic activities like putting on socks, shoes or changing positions when sleeping, become quite a challenge due to stiffness and pain. At changes with lesser intensity, initially disturbed patterns of walking appear (variation in limb positioning in adduction, as

well as external rotation usually caused by intensified tension in muscles and adduction of the hip due to protective hip joint positioning and possible irritation of the obturator nerve within the inferior constrictor of pharynx or obturator externus). The disease progress leads to limping, and then it is necessary to use orthopedic provisions (one or two bullet ulnas).

Palpation assessment is very useful in determining which muscles show increased tension at rest, or show reduced flexibility and lowered strength of note, when pressing on the muscular trailer, it may be assumed that in cases of increased tension at rest, this place will be painful [40, 41].

### Differential diagnostics for the needs of physiotherapy

Physiotherapists may perform differential diagnosis by clinical tests [6] – palpation assessment of the pressure sensitivity in muscles and ligaments is presented in Table 1.

### Physiotherapeutic strategy

#### a) Objectives

The care program for patients with hip joint pain is aimed to reach and maintain functional efficiency and independence so as to ensure good quality of life. As for now, no conclusive guidelines have been developed for the type of exercises, their intensity (load, duration, number of repeats) with regard to hip joint degenerative changes. Proposed forms of activity are different, so it is sometimes difficult to compare their effectiveness against each other [43]. The intention of taken rehabilitation activities is to overcome current, troublesome disease symptoms, i.e. pain or limited functional capacities, so to halt or at least decelerate the progress of the pathology in the joint [4]. The

objective is also to reduce treatment costs in the health care system. The therapy must take into account the patient's needs, as well as his or her preferences, both physical and emotional. A key element of such physiotherapy is possible prompt implementation of targeted physiotherapeutic actions (including rehabilitation, education and physioprophylactics). This may be ensured only by primary health care-givers. Researches concerning the analyses of health behaviors indicate that the investigated persons found no relation between active lifestyle, diet and their influence on the risk of occurrence and progression of the joint degenerative changes [44].

Other researches performed by Veenhof et al. demonstrate that persons with degenerative changes avoid any activity due to pain. In turn, insufficient activity, particularly in the initial period, weakens the muscle strength. This leads to joint instability and is a real risk factor for these changes. The authors indicate that when degenerative changes of the hips and knees occur, physical activity is particularly recommended for persons who are overweight, at older age, not active or show reduced functional efficiency [45]. Patients underline that factors motivating activity were support from medical personnel such as the physiotherapist's professional supervision during exercises (hence, credible qualifications, knowledge, instructions, education, positive relationships with the patient) and the physician's engagement (provision of guidelines, recipes, generation of a positive health experience). Among environmental factors that encourage active lifestyles, they mentioned group exercises (socialization element), as well as support from family and friends [38].

WHO-Europe stresses the importance of education in the therapeutic process, and strongly infers that patient education is a continuous process, being an integral element of health-care. The aforementioned includes awareness, provision of information, learning and psychosocial support. All elements of this process are related to the disease and its treatment [46].

**Table 1. Palpation assessment of muscles and their potential effect on vascular and nerve function within the hip joint [40–42]**

Muscle	Place of palpation assessment	Place of pain	Effect on vessels and nerves
Piriformis and gluteal medius	End trailer on bigger trochanter of femur	Buttock pain	Pressure on superior and exterior hypophysial artery that in consequence may lead to disturbed blood supply in the hip, acetabulum, and disorder of sciatic nerve function
Iliopsoas muscle	Lesser trochanter (difficult access). When the lumbar plexus is irritated by the inferior constrictor muscle of the pharynx, the pain often appears when pressing on the superior surface of the tibia	Pain in the hip and medial knee area, increased tension in hip adducting muscles	Irritation of lumbar plexus, and also obturator nerve, femoral nerve
Obturator externus muscle	End trailer in femur over trochanter pit (difficult access – only when lying on side)	Painfulness when pressing on hip adducting muscles. Pain in knee medial area	Pressure on obturator nerve inferior branch that innervate hip adducting muscles
Head straight quadriceps	Initial trailer on anterior inferior iliac spine	Pain in groin and knee anterior area	Increased tension of this muscle has no significant effect on vessels and nerves
Hip adducting muscles	Median hip area (10 cm above knee joint space)	Pain in medial hip part	Increased tension of hip adducting muscles and possible irritation of obtuator nerve by obturator internus muscle, thorough which runs inferior branch of obtuator nerve, or by inferior constrictor muscle of pharynx, through which runs lumbar plexus, also including obturator n
Gluteus maximus muscle	Gluteal tuberosity of the femur	Pain in buttocks area	
Tensor fasciae latae	Anterior superior iliac spine	Pain in hip lateral surface within the ilio tibial band anterior part	Increased tension on anterior iliac spine may lead to intensified tension of inguinal ligament and pressure on hip lateral sural nerve that runs through this ligament

## b) Selection of treatment methods

Since the causes that trigger hip joint degenerative disease pain, deformation, and in consequence, disability, are complex, the rehabilitation program must go beyond the area of only local action. Therefore, the counter to hip pain consists in applying both pharmacological and non-pharmacological treatment methods in order to slow down degenerative changes [39].

From the patient's health assessment, including palpation [47, 48], the examiner can determine which muscles and fasciae should be worked first to restore the correct function of vessels and nerves in the hip joint area. The aforementioned include:

- the piriformis muscle – responsible for the correct function of the superior and exterior hypophysial artery and the sciatic nerve,
- the iliopsoas muscle – responsible for correct function of the lumbar plexus,
- the obturator externus muscle – responsible for correct function of the obturator nerve inferior branch.

Long-lasting increased tension in the above muscles may lead to functional disorder of the superior and exterior hypophysial artery that play important roles in blood supply to most of the hip girdle, and as well to the acetabulum and the sciatic nerve. Therefore, the physiotherapeutic strategy in the hip joint pain should first focus on normalization of increased muscle tension, and only then on restoring correct trophy within the hip joint and on improving its functions.

### Massage

Massage should be used in basic medical care, both as a short-term activity and as a long term activity. In short term therapy, massage is applied for normalization of muscles tension at rest and to restore correct trophy in the fasciae, muscles, ligaments, tendons and articulate capsulas. In long term therapy it is applied usually as self-massage (performed by the patient alone) to inhibit decline processes in the muscles, tendons, ligaments and fasciae by initiating angiogenesis processes and boosting processes of replacing collagen fibers in the connective tissue that create the above motor system organs.

The main source of blood supply for the hip joint muscles and periarticular tissues is the internal iliac artery, and, more precisely, its branches: the inferior and superior gluteal artery, the obturator artery and the iliofemoral artery (which sometimes comes off the superior gluteal artery) [2]. The muscles that due to long-lasting increased tension may disturb the function of the above arteries include: obturator externus – through which in addition runs the obturator nerve inferior branch that innervates the hip adducting muscles and the piriformis muscle (from under which comes out a.o. the sciatic nerve and the inferior and superior gluteal artery). Any physiotherapeutic action in the area of the hip joint, whether the application of kinesiotherapy and physiotherapeutic procedures, or different forms of massage, should be started from the normalization of the piriformis muscle tension, as well as that of the obturator externus and internus. Due to difficult access to these muscles, the best form of relaxation is the massage, which through normalization of the muscles, fascia and ligaments evokes easier accessibility, being structurally correlated with the piriformis muscle and obturators, and enables the normalization of their tension at rest. As a result of the above, the pressure upon vessels and nerves is relieved and the correct blood supply in the area of the hip joint is restored. Moreover, pain is significantly reduced (pain being an effect of poor blood supply to tissues), as is the neuralgia that is a result of irritating the obturator nerve, the sciatic nerve, and, in extreme cases, also the lumbar plexus. After such relief, the exercises and therapeutic procedures which are integral part of both prophylactic proceedings, as well as the total therapeutic program may be started [14, 55].

## Physiotherapy

Pain is a complex phenomenon that is influenced by a number of biological, psychological and social factors. The cumulation of the aforementioned factors decides on the pain intensity, suffering and disability rate. Pain treatment is most effective when a multi-discipline approach is used. This includes both pharmacological and non-pharmacological approaches. Indeed, the American College of Rheumatology and the American Pain Society recommends aerobic exercises and physiotherapy in persons with rheumatological diseases, including OA [52].

Physical treatment support symptomatic therapy includes relieving pain, blood supply disorders, muscle weakening, edema and inflammation). Herein, physical energy is used to achieve the therapeutic effect. Physiotherapy, the application of which supports healing, includes many forms of therapy such as electrotherapy, thermotherapy (heat, cold), ultrasound and light therapy [56].

The physiotherapy objective with regard to hip joint degenerative changes will consist of inducing an analgesic effect, improving tissue nourishing by better blood supply, hindering muscle losses and preventing or decelerating pathological changes [57]. Types of physical stimuli must be selected individually for each patient, taking into account any contraindications. Preferably, the application should be in one series and include treatments with various stimuli (e.g. electrotherapy, thermotherapy, light-therapy). Physical procedures may also constitute preparation for other therapeutic impact, e.g. massage or kinesiotherapy, hence, the sequence of treatments will be very important, depending on the therapeutic target set and the abilities of the physiotherapeutic laboratory. Physical procedures recommended for hip joint pains induced by OA include electrotherapy (such as TENS) [3, 57, 60], thermotherapy (local warmth and cold) [57, 58] and ultrasounds [57, 59].

### Kinesthetic rehabilitation

Our present knowledge level does not allow our therapeutic practices to effectively hinder structural change progression. According to the European League Against Rheumatism (EULAR) and the American College of Rheumatology (ACR), degenerative disease such as OA is omnidirectional. Herein, treatment includes non-pharmacological therapy and pharmacotherapy, with surgery as a last resort [3].

Treatment and rehabilitation effectiveness very often depends on the change advancement rate, and the success of rehabilitation is contingent on the period elapsed from the first symptoms to the time when rehabilitation was started [61]. Effective treatment is often individually tailored. The guidelines derived in the period of 2008–2014, from various health sources, namely: NICE (The National Institute for Health and Care Excellence), RACGP (The Royal Australian College of General Practitioners), Physical Medicine and Rehabilitation (SOFMER), AAOS (American Academy and Orthopedic Surgeons, ACR, EULAR (European League Against Rheumatism, OARS (Osteoarthritis Research Society International, ESCEO (The European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases) indicate that at the 1b level, non-pharmacological treatment include diverse exercises, education, reduction of body mass and enhancement of change biomechanics [16]. Exercises that contribute to reducing pain, stiffness and disability or improve hip joint function and life quality include: aerobic training, endurance exercises, joint mobilizing exercises, stretching exercises, aerobic exercises with low and medium load, proprioception exercises, isometric exercises, resistance exercises, aquatic exercises, as well as conventional exercises (land-based). The last include: mat exercises, isometric, isokinetic, belt and tubing resistance exercises, stretching, walking training (sideways, forwards, backwards, with rising knee) [16, 18, 43, 51].

Table 2. Physiotherapy in the hip joint pains [16, 43, 49–54]

Muscles/ligaments/ fasciae	Self-massage	Massage	Self-physiotherapy	Physiotherapy	Self-kinesiotherapy	Kinesiotherapy	Orthotic provision
Thoracolumbar fascia: – gluteal medius muscle, – quadratus lumborum muscle, – iliopsoas muscle, – on trochanter minor	Thoracolumbar fascia: – gluteal medius muscle, – greater trochanter area, – iliopsoas muscle, – on trochanter minor	Thoracolumbar fascia: – gluteal medius muscle, – quadratus lumborum muscle, – piriformis muscle, – inferior constrictor muscle of pharynx, – on trochanter minor	Different temp. compresses (warm or cold depending on patient's condition – acute, subacute or chronic, and on individual tolerance of thermal stimuli); – use of analgetic ointments or reams or those of the NLPZ group, after prior heating of application place; – biopton lamp or LED therapy or IR; – TENS currents with small battery powered instru- ments – completed with brine baths with peat extract, and baths with special inserts that make water peral, or even ozoned; – as prophylactic or self- therapeutic element, the use of sauna or bathhouse may be only applied; – many patients have access to a magnetic mattress, which may be used for sleeping or only for treat- ments twice a day	Application of physio- therapeutic treatments upon objective specifica- tion (analgesic, improving trophy, correcting muscular strength) – selected by physiotherapist after elimination of contradic- tions, taking into account available measures (the same goal may be reached via different means); – application may be done directly on the cause or on places to which pain radiates, or a mixed technique may used; – during therapy, pro- cedures from different groups may be com- bined (electrotherapy, light therapy, magnetic field, UD, electromag- netic field), so that the stimuli effect is comple- mentary; – the essential element is positioning during application	– Exercises without load, – active slow exercises, – isometric exercises, – isokinetic exercises, – resistance exercises, – exercises that improve muscle litheness and flexibility, – stretching, – bicycle, – cycle ergometer, – swimming, – nordic walking, – organized activities (yoga, tai chi, pilates), – gymnastics with moder- ate load level suitable for patient's exertional capability)	– Motor control training, e.g. Kinetic Control (as for motion direction and extent), – training for deep stabilization of lumbo-pelvic-hip complex, – MET (muscle energy technique), – strengthening and endurance exercises to improve strength and endurance of hip joint rotator, erector, flexor muscles, – training for deep stabilization of the lumbo-pelvic-hip complex, – proprioception exercises, – active exercises without load, with resistance, – balance exercises, – resistance exercises, – sensorimotoric exercises, – education: in load ergonomics, – exercises that improve joint range of motion	Crutch or cane
Obturator externus muscle		Over the trochanter pit area in the location of the obturator externus attachment			– stretching, – exercises that improve flexibility of joint hip external rotators, – exercises for endurance and strength of selected muscle groups	– improvement of flexibility (e.g. MET – muscle energy technique), – exercises to improve strength and endurance (e.g. isometric, isokinetic, resistance exercises), – motor control training (e.g. Kinetic Control), – training for deep stabilization of lumbo-pelvic-hip complex, – improvement of joint stabilization (sensorimotoric training)	
Head straight quadri- ceps	Quadriceps	Quadriceps and the spina iliaca anterior inferior that is the initial attachment of the straight head			– stretching, – exercises that improve flexibility of joint hip erec- tors and flexors, – exercises for endurance and strength of selected muscle groups	– improvement of flexibility (e.g. MET – muscle energy technique), – exercises to improve strength and endurance (e.g. isometric, isokinetic, resistance exercises), – motor control training (e.g. Kinetic Control), – improvement of joint stabilization (sensorimotoric training)	

Recent research about treating degenerative changes has focused upon non-pharmacological therapy. The objective of such therapy is to educate the patient about his/her condition, especially towards modifying their life-styles with respect to physical activity level and body mass reduction. Such type of care should be realized based on individual needs, taking into account the disease etiology and accompanying co-existing diseases [19, 52, 54, 62, 63].

Therapeutic exercises are especially relevant in conservative strategies for dealing with degenerative changes. Such activities are, in reality, both prophylactic and therapeutic, and are highly recommended. Therapeutic exercises include aerobics, aquatic reinforcing exercises and tai chi. Routine performance of the aforementioned have positive effects on symptoms, i.e. pain, loss of motion, weakness and depression. In the current literature, however, it is not possible to compare the effectiveness of applied exercises in terms of type, intensity, duration and frequency. From the clinical point of view, it seems that a key element for the success of the therapy is to determine before its start such components as optimal dosage, program customization need, patient abilities and preferences, co-existent diseases, and accessibility of rehabilitation [37, 52, 64]. The study of Regnaud et al. published in 2015, in Cochrane Database of Systematic, remarks upon the lack of report of unwanted reactions (injuries, falls while exercising) in patients while undertaking applied therapy of either low or high intensity. The researchers underline the need for further investigations to determine both the minimal intensity of exercise program needed to reach the clinical effect, as well as highest possible load tolerated with regard to the affliction that still guarantees the patient's security [65].

All exercises should be applied gradually, be suitably proportioned and reflect the patient's preferences and predispositions. Of note, in some persons with OA (especially for hips and knees), the results of rehabilitation are poorer than expected. Researchers suspect that this fact is correlated with other diseases, i.e. overpressure, obesity, diabetics type II and heart diseases [37]. Advantages resulting from the realized exercise program include among others: pain stoppage or relief, improved joint move-ability, increased strength of weakened muscle groups, better proprioception and fitness, reduced risk of falls, better control of body weight, increased cardio-vascular efficiency, lack of or no need for immediate surgery [66, 67]. Some activities with moderate load are regarded as beneficial for joints as they improve the circulation of the synovial, and, at the same time, ensure appropriate supply of nutritional substances to the cartilage. Moreover, they strengthen muscles around the joint [27].

The benefits from physical activity were seen in the studies of Hootman et al. Herein, 5283 adult persons were observed, and after 12.8 years, the examination was repeated. The performed analysis indicated that free-time physical activity (walking, running, jogging, bicycling, swimming, racket sport playing) and moderate or intensive pursuits (i.e., stretching exercises, gymnastic-rhythmic exercises, weight training), did not increase the risk of degenerative change in the hip and knee joints, regardless of the type and volume of activity (intensity, duration, frequency and type of deformation) [68].

Recommendations for the use of selected methods are based on analyzing available evidences and clinician consensus so as to ensure treatment advantages and the patient's safety. Australian recommendations for non-pharmacological treatment of degenerative changes indicate that there are advantages that are related with reduction of body mass. Each lowering by ca. 5%, has positive influence on decrease of pain intensity and disability. The guidelines put forth a series of recommendations based on credibility. Herein, recommendation level B (credible proofing of the applied method efficiency) included supervised rehab exercises, while recommendation level C (evidences with lesser credibility) embodied aquatic exercises (especially for overweight or obese persons), multi-model phys-

iotherapy programs (including strengthening exercises, stretching, mobilization, soft tissue work, tai chi, education programs and physical treatment (TENS currents, thermotherapy and acupuncture) [69]. The performed meta-analysis by Fransen et al. (Cochrane Collaboration 2014) demonstrate that scientific evidence confirms the effectiveness of supervised exercises in patients with hip joint degenerative changes. Benefits include pain reduction, improved function and heightened physical fitness. Moreover, these positive effects were maintained 3–6 months after finishing the therapy. Still confirmation of permanency of effect is needed [67].

### Orthopedic provision

In cases of hip joint pain induced by overload or by early degenerative changes of the joint structures, the aim of orthopedic provision is to reduce the joint load. In such situations, the patient should be provided with a cane or crutch or Zimmer frame, to be used periodically or all the time depending on the tissue changes advancement [54, 70–72].

### Conclusions

Maintaining good efficiency in patients with hip joint pain is the priority in all treatment proceedings. Physiotherapy has shown itself to be very effective in this regard. Scientific literature provides evidences for rehabilitation effectiveness, hence reduce concerns about the role of used methods in patient functional rehabilitation. Herein, it is recognized that minimizing the patients bed stay and maximizing early activity brings greater functional benefits than prolonging a passive wait for improvements in the patient's condition. Additionally, the rehabilitation effect in the treatment process is important for restoring lost functions, maintaining employment or social roles and reducing several signs and symptoms of the disease.

A review of evidences for physiotherapy effectiveness, however, indicates some limitations related with the selection of the most effective forms of rehabilitation practices. This situation comes about through the lack of consistent credible research. Indeed, rehabilitation practices are often selected based on tradition and are not always supported by sufficient evidences for their use [49].

The American College of Rheumatology (ACR) strongly recommends in hip joint OA rehabilitation, exercises that stimulate the cardio-vascular system, resistance training, aquatic therapies and participation in organized forms of activity. ACR also recommends the employment of mobility aids (Zimmer frames, canes and walking sticks), the use of thermo-therapy treatments and psycho-social support. Of note, the TEP (Technical Expert Panel) has no guidelines for using balance exercises, or muscle strengthening exercises, tai chi or manual therapy [3].

After the family physician or Primary health care provider (PHC) qualifies hip joint pain patients for physiotherapy, the first activities should include palpation assessment (see Table 1) of the muscles that may be involved in the hip area pain. This should be a base for developing a plan of conduct describing the sequence of using massage, physiotherapy and kinesiotherapy. This will also allow the care-giver to specify simple activities to be performed by the patient alone at home so as to actively and responsibly attend to self-therapy, using skills of self-massage, self-physiotherapy and self-kinesiotherapy. Such an approach to hip-joint pain mediation will permit to intensify physiotherapy in the frames of primary health care, but an additional beneficial effect of active self-engagement in the rehabilitation process is an education element: they learn what relieves pain and what hastens recovery. Furthermore, through self-therapy, patients take charge of their own recovery and improve muscular efficiency by stimulating angiogenesis and regenerative and repair processes. For this purpose, patients should perform daily simple recommended physiotherapeutic activities. These may



be additionally supported by simple instructions in the form of brochures or video clips. In cases wherein joint changes have already occurred, activities at the primary health level are to support patients before they visit specialist clinics (rehabilitation or orthopedic) [53].

Introducing and undertaking education programs at the primary health care level requires systematic solutions and reorganization of present treatment practices. The model of conduct presented above, for patients with initial clinical symptoms of the hip joint degenerative changes, is supported by reports from other publications that indicate that in cases of advanced changes, the effectiveness of proposed non-pharmacological methods based on physiotherapy do not bring fully satisfying therapeutic effects. Hence, scientific evidences are presented as conditional to adopt and to use clinically [73]. However, introducing such programs, is cheaper than the costs of direct treatment (surgery) and its indirect effects (work-place absence, disability, restricted social role performance).

The success of the rehabilitation process depends not only on the proposed rehabilitation methods, but also on the patients' knowledge, their education and engagement level. Fully supervised or partially-supervised interventions may be effective in treating joint degenerative disease, but the patients' preferences for supervision level and the exercises course may

be key prediction factors in observance of exercises and the bettering of treatment results [74].

The attractiveness of the proposed activity is also important, as are skills and readiness to participate in own healing. The study authors, in pursuing solutions to enhancing the effectiveness of physiotherapy, have placed attention upon the factors related to proper levels of blood supply and structure innervating that directly affect the hip joint function. The muscles that move joints do so through respective stimulation of the nervous system, so their efficiency depends on three components. An efficient muscle is a muscle well-nourished, well oxygenated and well-stimulated.

In considering the appropriate rehabilitating procedure, initially the need is to restore, e.g. using massage, suitable blood supply in accordance with the anatomy of vessels located in the hip joint area. Subsequently, it is recommended to apply other treatments appropriate to resolving currently dominating symptoms. The intent is to make better – not to make the condition worse. The authors of this publication agree with the conclusions drawn within other publications that further researches must be performed to specify clinical phenotypes and definitions of early symptoms for OA, to effectively prescribe physiotherapeutic recommended interventions at different stages of the disease advancement and to ascertain their effectiveness in treating patients with hip joint degenerative disease [1, 43, 74].

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