COXARTHROSIS – DISEASE OF MULTIFACTORIAL ETIOLOGY.
METHODS OF PREVENTION AND TREATMENT. THE ROLE OF KINESITHERAPY IN COXARTHROSIS

Luana Macovei¹ Isabella Brujbu² R.V. Murariu³
University of Medicine and Pharmacy “Grigore T. Popa” - Iași
Faculty of Medicine
1. Discipline of Reumatology-Balneophysotherapy
2. Discipline of Family Medicine
3. Directorate of Community Assistance Iași, Department of School Health

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METHODS OF PREVENTION AND TREATMENT. THE ROLE OF KINESITHERAPY IN COXARTHROSIS (Abstract): Coxarthrosis is a disorder of the physiological balance between the strength of the articular cartilage and articular bone, and between the pressures exerted on the joint. It is a disease with a slow progressive and long course. Its insidious onset and progression, marked by variable periods of stagnation lasting months or even years make it difficult to establish the time of onset. **Material and Methods**: The study was conducted between January 2012 and December 2012, on a series of 27 coxarthrosis patients, diagnosed at the Rheumatology Clinic of the Iasi Rehabilitation Hospital. **Results and Discussion**: Of the 27 patients, 11 (40.74%) had primary bilateral coxarthrosis, 8 (29.63%) early coxarthrosis, right, 6 (22.22%) coxarthrosis, left, secondary to aseptic femoral head osteonecrosis, and 2 (7.41%) patients had bilateral coxarthrosis secondary to acetabular insufficiency. Kinesitherapy proved to be highly effective in the rehabilitation of coxarthrosis patients by alleviating pain, mechanical protection of the hip joint, walking rehabilitation in total hip arthroplasty, and social and professional integration of the patients. The massage besides its analgesic effect also acted as a muscle relaxant. Once the objectives have been met, the kinesiology program becomes global and functional rather than analytical, as it aims at reintegrating the coxofemoral joint into normal movement patterns. **Conclusions**: Kinesitherapy has been shown to be a physical treatment that can not be replaced by other rehabilitation methods and is crucial in the recovery of lost functions. **Keywords**: COXARTHROSIS, KINESIOThERAPY, REHABILITATION.

One of the main characteristics of living matter is movement. Throughout its long evolution, movement has continuously improved. It has gradually evolved from the simplest movement of unicellular organisms to the movement performed by a specialized apparatus, namely the locomotor system in animals (1).

The coxofemoral joint (Fig. 1) can be compared with a mechanical system that from an anatomical point of view displays three degrees of freedom of motion: flexion-extension (along the sagittal plane), adduction and abduction (the lower limb moves away respectively toward the other limb, in the frontal plane of the body,
around the anteroposterior axis); *internal and external rotation* (performed horizontally around a vertical axis) (Fig. 2).

The coxofemoral joint is of great importance for the static position (in unipodal and bipodal support that distributes weight from the pelvis to the lower limbs) and for the locomotion (it provides the swing of the lower limb during the swing phase) (2). Hip stability is due to bone factors, providing vertical stability, ligament factors, providing anterior stability, and muscle factors, particularly influencing anterior stability (3, 4).

Typical to the physiology of joint movement is a quite low friction coefficient (between 0.005 and 0.01). The pressure regime also varies and the movement is sometimes made under the high pressure of body weight and sometimes just under the lower pressure of muscle contraction (4). Such a small friction coefficient is due to the extremely low roughness of joint surfaces, and the viscosity of the synovial fluid varies inversely with the speed of joint movement (5). The type of synovial lubrication changes depending on the exerted pressure and the speed with which the movement is made.

The biomechanical approach of the locomotor system allows a deeper understanding of how the premature joint wear occurs and develops and, in case of the hip, how coxarthrosis evolves (5, 6).

Just like any other joint, the hip is always under the influence of the permanent static pressure generated by the contraction of different muscle groups. In addition, there is an intermittent dynamic pressure caused by body weight during standing and walking. The circumstances under which the hip joint acts in the unipodal stance justify why a force four times one’s body weight is exerted on the articular surface. In order to maintain the equilibrium of the basin towards the femoral head, the action of body weight must be counterbalanced by muscle strength. As the muscle force lever arm is three times lower than that of body weight, a resultant force with a value about four times that of body weight measured above the hip is exerted on the hip. This
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force is evenly distributed over the entire articular surface (6).

This congenital or acquired deficiency, more or less pronounced, that affects the supportive joint tissues, can lead to an imbalance (secondary coxarthrosis) (7). An abnormal increase in articular pressures caused by the decrease in the contact area between the articular surfaces leads to the disruption of the normal balance (primary coxarthrosis).

If the pressure exerted on the joints exceeds the resilience of supportive tissue, a series of pathological changes occur that induce major changes in joint configuration during the development of coxarthrosis.

Genes that are involved in most topographical variations of arthritis are most probably those coding vitamin D receptors. They influence bone mass, the proximity of loci for type II collagen, a major component of hyaline cartilage, the insulin-like growth factors 1, the cartilage oligomeric proteins, and the human leukocyte antigen (HLA) system (8). It has been suggested that the disease loci could be placed on chromosome 2q and/or 11q. There is evidence that the different locations of arthritis are genetically encoded in distinct loci.

In the early stages, the number and activity of chondrocytes increases, followed by their progressive decrease. The synthesis of proteoglycan (PG) in chondrocytes decreases and the amount of lytic enzymes and matrix metallo-proteinases (MMP) increases (9). Their production is stimulated by pro-inflammatory cytokines (IL-1, IL-6, TNF-α) and by mechanical factors. Moreover, plasminogen activates latent MMPs. Tissue inhibitors of metallo-proteinases (TIMPs) and plasminogen activator inhibitor-1 (PAI-1) has an inhibitory effect on MMPs and plasminogen, respectively.

The arthritic damage progresses under the influence of proinflammatory and proteolytic biological systems, of which the most important are IL-1 (active mediator of inflammation, with a major role in tissue destruction), PG, nitric oxide (NO) (the latter stimulates the production of proinflammatory cytokines - especially IL-1 and TNF-α - and induces vasodilatation and increased permeability) and MMPs.

**Diagnosis and clinical management.**
The diagnosis of coxarthrosis is facilitated by history taking that may reveal the onset of the disease, its location, the rhythm and radiation of pain. Coxarthrosis has two fundamental aspects: increased mechanical stress on joints (excessive loading, congenital or acquired defects of body architecture) and alteration of cartilaginous tissue, leading to the development of osteoarthritis. The secondary cartilage changes are due to metabolic, infectious or inflammatory factors. The disease manifests itself by the gradual and progressive occurrence of pain in the hip, a mechanical type of pain that occurs in motion and relieves itself or disappears at rest.

In most cases, pain occurs in the groin and radiates to the anterior side of the thigh and further to the knee. In other cases, pain occurs in the buttock area. At the disease onset, pain is triggered by position changes and in the more advanced forms of disease pain becomes permanent. Pain arises from small efforts, is more difficult to alleviate and requires a longer resting period. Later, pain occurs at the first steps, but it disappears when the joint warms up and it reappears if the effort is prolonged (10). Pain becomes more frequent over time and it is associated with limitation of joint mobility. As pain worsens and the limitation of joint
mobility occurs, lameness becomes permanent and pronounced, progressively reducing the functionality of coxarthrosis patient. Bone crepitus reported by patients and revealed by the clinical examination indicates the severity of the bone lesion.

Diagnosis should be made at an early stage of the disease so that treatment to be as effective as possible. Short term joint stiffness (<30 min) occurs as a result of the thickening of the synovial membrane and articular capsule (11). The limitation of joint mobility is a consequence of the retraction of the articular capsule, of the osteophytes and of the incongruence of the articular surfaces. Joint instability occurs as a result of weakening periarticular muscle strength and deformities of the bone ends that make up the joint.

The radiologic examination is the preferred method for diagnosing coxarthrosis and assessing the femoral head shape, the appearance of the joint space, the presence of osteophytes and changes in femoral head structure.

A new type of radiographic procedure, a technical version called micro focal radiography, with high spatial resolution, can detect early changes invisible to standard techniques.

Scintigraphy with methylene or hydroxymethylene diphosphonate shows details about blood flow in the bone and soft tissue and bone turnover. Ultrasound can assess the arthritic process and the degenerative changes. Lesions that remain invisible on radiographs are identified by the high sensitivity and specificity of nuclear magnetic resonance imaging.

**Therapeutic guidelines.** Coxarthrosis treatment aims at decreasing pain intensity and increasing stability, mobility, coordination and balance during walking.

Currently, the therapeutic regimen for patients with coxarthrosis is a long term process that takes place in two stages: a medical conservative stage that combines a program of joint hygiene, with drug therapy (analgesics and chondroprotective agents) and kinetic physical therapy, which is a maintenance therapy or a functional rehabilitation (12) and a surgical stage.

Treatment aims to reduce pain and the functional discomfort of the patient and at the same time to stop the development of joint damage. Conservative treatment is effective in less advanced forms. Pain disappears, joint mobility improves, but the conservative treatment may not always stop the development of the disease. Of particular importance are hygienic measures aimed at fully unloading the hip joint and avoiding any strain. Working conditions should change, sport activities that involve stress on the hip joint should be stopped and, just in case, a walking cane should be used (13). A walking cane carried in the hand opposite the affected hip and on which the patient rests associated with the arthritic hip support release approximately two-thirds of the pressure exerted on the articular surface. Fighting obesity and overweight is also important in order to avoid hip joint overload. This hygienic treatment should be associated with anti-inflammatory and analgesic medication.

Kinesitherapy aims at maintaining a good joint and general mobility and tonic muscles, prerequisites for a successful rehabilitation. Kinesitherapy is associated with periodical balneophysical therapy (14).

Modern surgery offers multiple ways to stop the development of osteoarthritis. Conservative and functional surgical procedures (osteotomies and changing relationships between the articular surfaces)
give the possibility of changing the way the mechanical factors act upon the hip (15). They manage to increase the contact area between the two joint ends and thereby to lessen to a large extent the pressure exerted on this surface. As a result of the biological effect of improving local circulation, osteotomies relieve pain.

Conservative surgery (osteotomy, arthroscopic debridement, arthrodese, partial arthroplasty) or total hip replacement surgery must be associated with a prolonged conservative and rehabilitative treatment.

MATERIAL AND METHODS

The study was conducted between January 2012 and December 2012, on a series of 27 coxarthrosis patients diagnosed at the Rheumatology Clinic of the Iasi Rehabilitation Hospital. The patients were admitted for 10-15 days and were recruited based on the type of joint damage, age, degree of patient compliance, and other factors observed at individual assessments.

RESULTS AND DISCUSSION

Of the 27 patients, 11 (40.74%) had primary bilateral coxarthrosis with pain and functional decompensation. Muscle testing, the testing of the muscles that stabilize the coxofemoral joint, showed a value of 4. In these patients, pain diminished or alleviated at rest and they were walking with a limp. The degrees of coxofemoral joint mobility were affected by the arthritic process, especially in internal and external rotation movements, and they were associated with contracture of adductor and pelvirochanteric muscles (Fig. 3).

Kinesitherapy and massage were effective in relaxing the coxofemoral joint and correcting or preventing the incorrect body position. Medical gymnastics resulted in restored mobility of the lower limb and the progressive increase in muscle strength was due to practicing passive mobilization, self-mobilization, active mobilization and movements for toning the lower limb muscles. A cane was used when walking, the cane being held in the hand corresponding to the healthy hip.

Analgesics and anti-inflammatory drugs, vasodilator agents and anti-contraction medication were used in fighting pain, controlling muscle contracture, and preventing vascular disorders.

Of the 27 coxarthrosis patients, 8
(29.63%) had early coxarthrosis, right hip, presenting mild or moderate pain and instability in motion. Testing of the muscles that stabilize the coxofemoral joint showed a value of 5, with a mild contracture of adductor and pelvi-trochanteric muscles that limits the mobility of the hip. Without cane, they were walking with a limp when tired or on longer distances. The treatment methods used were kinesitherapy, passive mobilization, self-mobilization and active mobilization by progressive resistance exercises, toning the lower limb muscles if hypotonic, toning the hamstring and gluteal muscles through isometric or isotonic exercises. The stage objectives were to adapt to effort and to resume walking. Physiotherapy, thermotherapy, hydrotherapy and, if possible, hydro-kinesitherapy have also been recommended.

Six (22.22%) of the 27 patients had coxarthrosis, left, secondary to aseptic femoral head osteonecrosis with incorrect position of the lower limb and sometimes with pain in the lumbosacral area. Often the patients were forced to use walking cane. Muscle testing showed lower values in extensor abductor and internal rotator muscles. This accounted for the altered stance in flexion and adduction.

Of the 27 coxarthrosis patients, 2 (7.41%) presented bilateral coxarthrosis secondary to acetabular insufficiency. Patients reported mixed arthralgia in the coxofemoral joints, often associated with back pain or knee pain. Isometric contractions for the quadriceps muscle, correcting the trunk and pelvis position by means of exercises for paravertebral and abdominal muscles, hydro-kinesitherapy, active and passive mobilization, massage, toning muscles aimed to control pain, maintain mobility and muscle strength. Patients had a good outcome and regained stability, mobility and muscle strength in both lower limbs.

The kinesitherapy program conducted during our study was individualized and aimed to relieve pain (through hydrotherapy, electrotherapy and thermo-therapy) by achieving a good stability of the hip joint, providing functional mobility angles, and avoiding incorrect body position.

The analysis of the data on the achieved joint and muscle balance showed an improvement in joint mobility, normal muscle strength values, and a good social and professional integration of the patients.

**CONCLUSIONS**

Researchers have shown that early use of kinesitherapy had good results in coxarthrosis patients for the functional recovery of the affected area due to the individualization of the kinesitherapy procedures according to patient's response to treatment.

The proper assessment of joint function impairment, pain, radiological injury quantification, patient compliance has allowed an accurate decision making on therapy and long-term rehabilitation methods.

The complex therapeutic, educational, and physical kinetic and drug regimen associated with close doctor-patient cooperation has been shown to manage this disease from its onset.

**REFERENCES**

A CLINICAL AND HISTOLOGICAL REPORT OF A TOOTH WITH AN OPEN APEX TREATED WITH REGENERATIVE ENDOdontICS USING PLATELET-RICH PLASMA

Regenerative endodontic procedures are biologically procedures which aim to regenerate the damaged pulp-dentin complex, resorbed root, cervical or apical dentin by stimulating of the proliferation of remaining vital tissues under favorable conditions. The conventional method consisted of inducing bleeding into the pulp canal by mechanically irritating the periapical tissues. The created blood clot operated as a matrix for the growth of new tissues into the pulp canal. However, this procedure implied discomfort for the patient because of the irritation of the periapical tissues. Understanding of the physiological roles of platelets in wound healing has led to the idea of using platelets as a scaffold for regenerative endodontic therapy. Platelet-Rich Plasma (PRP) consists of a limited volume of plasma enriched with platelets, obtained from the patient. The purpose of this case report was to present the clinical, radiographic, and histological findings of a regenerative procedure using platelet-rich plasma (PRP) 14 months after the procedure. A 12-year-old boy whose maxillary second premolar tooth had been treated with regenerative endodontics was seen with a chief complaint of pain and sensitivity to cold. After clinical and radiographic examinations, a pulpal diagnosis of reversible pulpitis and normal periapical tissues was made for this tooth. Because of the patient's complaint and his guardian's insistence on either a root canal treatment or an extraction, a root canal treatment was performed in this tooth. After entry into the root canal, the soft tissue present in the canal was removed with the aid of a large barbed broach and examined histologically. Examination of the tissue removed from the root canal of this tooth revealed the presence of a vital pulp-like vital connective tissue. There was no evidence of bone in the specimen. Very few inflammatory cells were noted in the periphery of the specimen. Based on these findings, the authors concluded that pulp-like tissue could be generated in human teeth with the use of PRP as a scaffold in regenerative endodontic procedures (Torabinejad M, Faras H. A clinical and histological report of a tooth with an open apex treated with regenerative endodontics using platelet-rich plasma J Endod 2012; 38(6); 864-8).

Gianina Iovan