Annals of Academy of Romanian Scientists
Online edition Series: Medical Sciences
ISSN 2285-4150 Volume 3, Number 1/2012

PLACE OF THE INTERTROCHANTERIC OBLIQUE MEDIALIZATION OSTEOTOMY IN COMPLEX TREATMENT OF HIP OSTEOARTHRITIS

Nicolae GORUN[1], Emil MAREŞ[2]

Abstract. *Surgical treatment of hip arthrosis must restore the balance between the joint mechanical stress and joint structures' strength. This can be achieved by reducing pressure (mechanical factor), by increasing resistance of osteocartilaginous tissue (biological factor) or both.*

Increasing tissue resistance (biological factor) can be less modified than mechanical factor which can be modified more effectively by appropriate surgery that can decrease the joint stress, reducing workload and increasing the bearing surface.

Among these interventions, tenotomies (Voss completed by Cordier's surgery) and trochanteric osteotomies are included.

Among osteotomies, the most important and more widely used is the medialization oblique intertrochanteric osteotomy, allowing significant improvements for a relatively long period of time, after which a total arthroplasty is indicated, surgery more difficult due to metallic material and internal translation of the shaft.

There are presented a series of cases of hip arthrosis that have taken advantage of McMurray osteotomy for a variable period of time, even 25 years, and eventually needed a total arthroplasty.

Keywords: *intertrochanteric osteotomy, medialization, hip osteoarthritis.*

Rezumat. *Tratamentul chirurgical al coxartrozelor trebuie să restabilească echilibrul dintre solicitările mecanice articulare şi rezistenţa structurilor sale. Acest scop poate fi atins prin reducerea presiunii exercitate (factorul mecanic), prin creşterea rezistenţei ţesuturilor osteocartilaginoase (factorul biologic) sau pe ambele căi. Dacă creşterea rezistenţei ţesuturilor (factorul biologic) poate fi mai puţin influenţat, factorul mecanic poate fi influenţat mult mai eficient, printr-o intervenţie chirurgicală adecvată articulară, prin reducerea încărcării şi mărirea suprafeţei portante.*

Între aceste intervenţii se numără tenotomiile (operaţia lui Voss, completată de Cordier) şi osteotomiile trohanteriene.

Dintre osteotomii, cea mai importantă şi cea mai larg utilizată este osteotomia intertrohanteriană oblică de medializare, care permite ameliorări semnificative şi pentru o relativ lungă perioadă de timp, după care este indicată artroplastia totală, intervenţie mai dificilă, datorită prezenţei materialului metalic şi translaţiei interne a diafizei.

Sunt prezentate o serie de cazuri cu coxartroză, care au beneficiat de osteotomia McMurray, o perioadă variabilă de timp, chiar 25 ani şi care au ajuns în final la artroplastie totală.

Cuvinte-cheie: *osteotomie intertrohanteriană, medializare, osteoartită.*

[1] Professor, „Sfântul Ioan" Clinical Emergency Hospital Bucharest
[2] Orthopedist, „Elias" Clinical Emergency Hospital Bucharest
*Address for correspondence: Professor Nicolae Gorun, „Sfântul Ioan" Clinical Emergency Hospital Bucharest, e-mail adress: nicolaegorun35@yahoo.com

1. General Information

Given the pathogenesis of hip osteoarthritis, its treatment must restore the balance between pressure and resistance supported by joint tissue structures. In this sense, the goal can be achieved by decreasing pressure on joints and increase resistance of osteocartilaginous structures. It is, in other words, the influence of two factors incriminated: biological factor and bio-mechanical factor.

Increased tissue resistance (biological factors) can be influenced very little. Anti-inflammatory and chondroprotective medication, as well as some surgery (various inter-trochanteric osteotomies and tenotomies) may influence the strength of joint tissues. In the early primitive osteoarthritis can be obtained by such means not only a stabilization of the disease, but a joint recovery, conditioned by a lower mechanical stress (29,21,32, 31).

Osteotomy stimulates the regeneration of articular vascularization and thus regeneration, as demonstrated by Lemoine in his experimental research.

In turn, low mechanical joint stress is more valuable, making more bearable suffering. Mechanical factors may be influenced more effectively by appropriate surgery, which can bring high pressure to normal levels. Decrease in stress which acts on the joint can be achieved by reducing load (reduction of pressure forces), by increasing the bearing surface, or both ways (**Figure no. 1, Figure no. 2**) (7, 5, 9, 13, 4).

Figure no. 1:
Primitive bilateral coxarthrosis. Radiological aspects front view. There are all the morphological features (pinched and irregular space, osteophytosis, geodes, bone sclerosis, decalcify)

Figure no. 2:
Bilateral coxarthrosis secondary to congenital dysplasia with coxa valga subluxans. Radiological aspects front view. There are all the characteristic morphological aspects.

Intertrohanteric oblique osteotomy with internal translation of the femoral shaft, type McMurray (1935) is commonly practiced in many countries, replacing centering osteo-tomies. It is a simple and effective inter-vention. As pointed out by Postel (1963), these osteotomies lie before intraarticular interventions (arthrodesis, arthroplasty). In turn, A. Fernandez Sabate et al. (1977) place medialization osteo-tomy between Pauwels osteotomy and total prosthesis,

stating that when an intervention type Pauwels is not justified, awaiting arthroplasty, this osteotomy can be practiced (21 , 22, 19, 17, 18, 8, 15).

2. Surgical Technique

From a technical standpoint, McMurray osteotomy is therefore an intertrochanteric osteotomy oblique from outside to inside from the bottom to up, which interrupts the external cortex of 1-2 cm below the crest of the external vast muscle and internal cortex, at the femoral neck base. An important technique moment is the Merckel spur section, which must be done carefully, because a lower cortical spike detached from the femoral neck, may catch on in the joint capsule, preventing medialization. McMurray's idea was to transform arthritic support in a direct subacetabullary support by maximum medialization of the femoral shaft, without changes in the angle and abduction placement of lower limb. In this way, the body weight would be transmitted directly from the pelvis to the femoral shaft. While Picard and Graglia raises a damping effect, related to the discontinuation of the external obturator muscle, quadratus femoris and iliopsoas, directly sub-cotiloidian support is unbearable, due to excessive restriction in the new joint bearing surface at only 1 cm². Fortunately, the proposed maximum medialization by McMurray can be achieved only rarely (28, 26, 30, 14, 10, 23).

As the Merle d'Aubigné, Ferguson, Rabichong, Doliveux, Robinet, Maquet, Medrea et al., Picard and Graglia and others showed, internal translation should be moderate, which means a maximum of 1.5 cm medialization (1/3 to 1/2 of the thickness of the femoral shaft). A medialization of 2 cm is far too excessive and has the risk of nonunion by restricting the remaining bone surfaces in contact, and difficulty in fixation. In addition, a higher medialization constitutes a formidable obstacle to the implantation of the femoral piece, if subsequent total arthroplasty (**Figure no. 3, Figure no. 4**) (20, 23, 27, 3).

Figure no. 3: *McMurray intertrochanteric medialization oblique osteotomy (scheme)*

Figure no. 4: *Primitive left coxarthrosis. Front view preoperative radiologic appearance (left). Post-operative radiological appearance front view (right): intertrochanteric medialization oblique osteotomy + nail-plate and 5 screws osteosynthesis with compaction.*

3. Discussion

Valentin (1966) argues that the direction of osteotomy plane and internal translation size would not influence the results, which is not true.

As pointed Huchet, Müller and others consolidation is directly related to shape and strength of the metallic material used, its penetration into fragments and achieve efficient compression between fragments.

The strong stabilization of the osteotomy, compression between fragments contributes greatly to patient mobilization and early support of the operated leg, and finally, the considerable shortening of the period of functional recovery. It rejects any plaster immobilization.

Oblique medialization osteotomy effects were controversial and are difficult to explain, but real and lasting.

Improving regional circulatory system, primarily venous drainage (biological effect) is common to any type of osteotomy practiced in this area (horizontal osteotomy without medialization type Nissen, small medialization horizontal osteotomy Putti type, Pauwels type osteotomy etc.) (6, 2, 1).

From the biomechanical point of view, Maquet demonstrated that isolated media-lization, as practiced today, does not change hip stress, because the pelvis, not directly supported on the shaft, its center of rotation is always the center of the femoral head. After the great majority of authors, however, a positive biomechanical effect is related, first,to the permanent reduction of pressure by relaxing adductor and iliopsoas muscles following femoral shaft moving in and up (muscle détente, Rabichong).

In a random and capricious way also can produce a change in the bearing surface. By interfragmentary compression, external cortical of the shaft penetrates more trohanterian spongious block, thereby obtaining an involuntary valgization. If nail-plate angle is greater than the angle that the plan of the osteotomy is made with external diaphyseal cortical, by adapting the plate to shaft, it is also an involuntary valgization and when the first angle is smaller than the second, gives an involuntary varization, which may not always be undone by compression. After Maquet, bearing surface modification confirms the principles formulated by Pauwels (**Figure no. 5, Figure no. 6, Figure no. 7).**

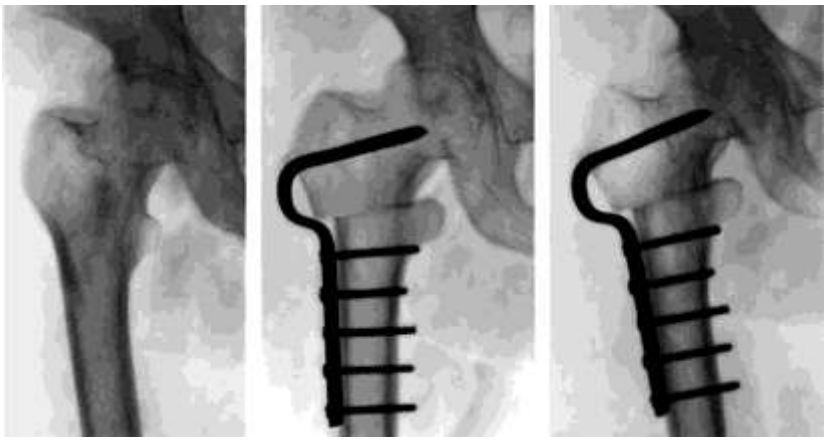

Figure no. 5:
Primitive right coxarthrosis. Front view preoperative radiologic appearance (left). Postoperative radiological appearance front view (middle). Postoperative radiological late aspect intertrochanteric medialization oblique osteotomy + nail-plate and 5 screws osteosynthesis with compaction

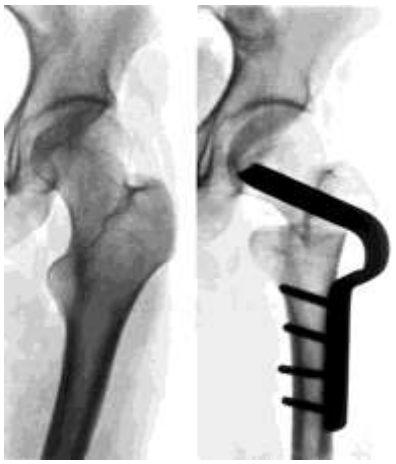

Figure no. 6:
Coxa Valga subluxans. Front view preoperative radiologic appearance (left). Postoperative radiological appearance front view (right): intertrochanteric medialization and varization osteotomy + nail-plate and 4 screws osteosynthesis

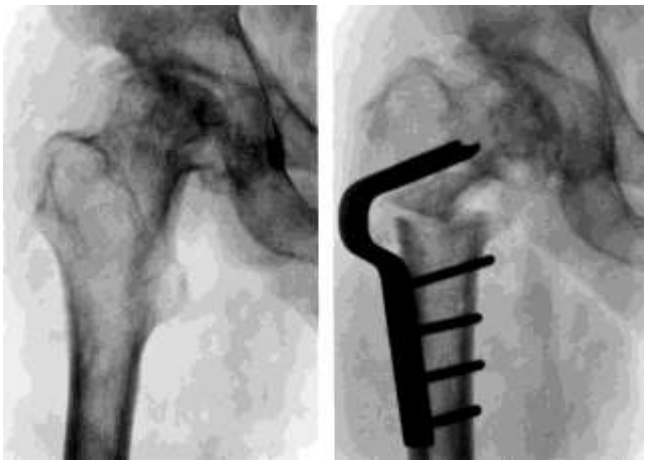

Figure no. 7:
Coxarthrosis secondary to congenital dysplasia with coxa valga subluxans. Front view preoperative radiologic appearance (left). Postoperative radiological appearance front view (right) intertrochanteric medialization and varization osteotomy + nail-plate and 4 screws osteosynthesis

In turn, Marneffe, Duchesne et al said McMurray osteotomy should be, first, a reorientation osteotomy of the femoral head, which can not be accepted, at least theoretically.

McMurray osteotomy is indicated in very painful hip osteoarthritis, with obvious structural changes, where it is kept, however, a flexion of 60° and a 25° abduction. Rigorous fixation is imperative to avoid plaster immobilization. Most authors use one-piece nail-plate type Müller with interfragmentary compaction.

In terms of indications and proper technique, the overall results of the McMurray osteotomy are very good and good in 80% of cases (Hirsch, Ottolenghi). Most haven't pain, but some patients do not feel any improvement.

If pain is the cornerstone of surgical indication, many authors have emphasized
the crucial role of prophylactic medialization osteoarthritis in prearthritis and early arthritis, especially when associated with valgization ("providential complex", as Picard and Graglia) or varization of the epiphyseal block. In other words, as analgesic and stabilized operation, McMurray osteotomy indication is much broader than the indication of centering type Pauwels osteotomy.

The authors conception in last decades, to establish indication McMurray osteotomy type would be needed some pathology circumstances: joint space relatively preserved, unaltered femoral head, articular surface matching, moderate marginal osteophytosis, joint mobility relatively good (at least 60-80° flexion and a minimum of 20-25° abduction) (**Figure no. 8, Figure no. 9**).

Figure no. 8:
Bilateral coxarthrosis secondary to aseptic necrosis of femoral head

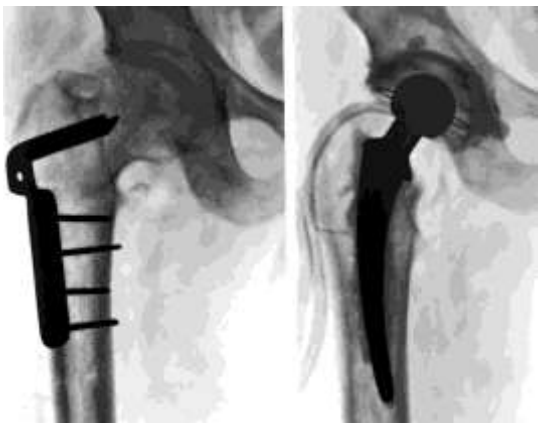

Figure no. 9:
Previous case. Postoperative radiological appearance front view (left), after intertrochanteric medialization osteotomy + nail-plate and 4 screws osteosynthesis, with consolidation. Postoperative front view aspect after total arthroplasty with Charnley-Müller prosthesis

Cedard believes that the best indication of medialization osteotomy is essential osteo-arthritis, with mobility still good, bilateral forms inequal as

development where the status of the other hip requires total arthroplasty, and secondary osteorthritis installed on dysplasia or upper pole cephalic necrosis.

After Kerboull (1972), medialization osteo-tomy would be indicated on a hip worn uniformly, space partially missing, large matching, femoral head osteophytosis important and a sclerogeodic head, and severe coxarthrosis with significant limitation of movements, if arthroplasty is contraindicated . J,Y. de la Caffinière (1972) considers that joint stiffness is not a contraindication, and Picard and Graglia argues that they achieved the best results in osteoarthritis secondary to hip dysplasia or subluxation.

Between contraindications: any vicious hip position, blocked hip, and age over 70 years. Osteoarthritis with significant radiological changes, but well tolerated in functional terms, must not be operated.

4. Results

When properly indicated and executed well, McMurray osteotomy gives overall, very good results and good results in about 85-90% of cases.

To appreciate the results, examine four elements: pain, mobility, gait and radiological appearance.

Pain relief is most evident (83% after Picard and Graglia, 85% after Hirsch and even 94% after Ottolenghi). It noted that the gradual impro-vement in pain can take two years. Patients who evolve unfavorably in the first year after intervention has seldom further improvement. In contrast, those that evolve favorably in the first year, have important and lasting improvements, degradation occurring rarely.

Although there is a slight shortening of the lower limb respectively, after one year of operation, we see and improved mobility (flexion, abduction and adduction), but only in a third of cases, mobility is not changed, a third of cases and one third of the cases have even a reduction in mobility (R. Judet). Inconsistent effect on joint mobility, is also the only criticism that can be done to this intervention (12, 25). Improving gait, occurs more slowly, only after one year after surgery and only 60% of cases (Postel, 1972) (24, 25, 26).

Overall, the pain, mobility and walking, using quotation system proposed by Postel and Merle d'Aubigné, note the very good results 30%, 30% good and 40% fairly good results **(Figure no. 10).**

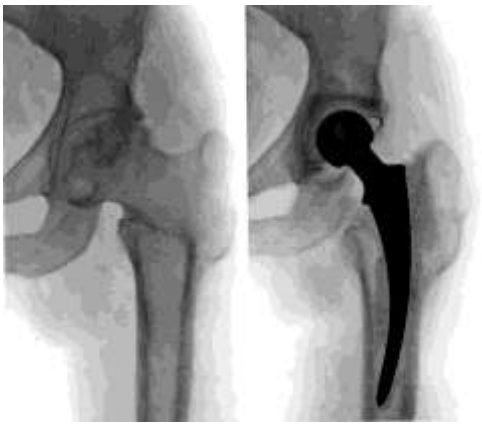

Figure no. 10: *Coxarthrosis primitive surgery. Postoperative radiological appearance front view (left) after after oblique intertrochanteric medialization osteotomy with consolidation. Postoperative radiological appearance front view (right): total arthroplasty with cemented prosthesis Charnley-Müller*

Improve in the appearance of radiological lesions, expression of healing of osteonecrotic lesions, begins to be noticed until after six months of intervention. In the first months after surgery, it is noted, not infrequently, a radiological worsening: joint space deleted, cloudy, vague and osteoporosis. In 65-70% of cases, radiological signs are unchanged or slightly improved after six months, but gradually radiological aspect improves in the first three years. Cases in which the radiological appearance is worsened in the first year after the osteotomy is safe failures. After Kerboull (1972), an early osteoarthritis with limited wear, interline still visible and restricted congruent joint does only 20% radiological improvement. Note that generally clinical improvement precedes radiological improvement, while radiological degradation precedes clinical deterioration.

One peculiarity of the radiologically image, inexplicable to most authors, is the reappearance "of the fog" of the joint space at a rate of 50% of cases, loss of bone geodes and homogenization of the bone structures (R Judet, McFarland). This demonstrates and explains the quality and sustainability of the results obtained by McMurray osteotomy. In 20% of cases, there is notice of no improvement or even worsening of radiological aspect (**Figure no. 11÷14**).

Figure no. 11:
Right fusion hip secondary to unilateral dysplasia after scheletonize and descent under supracondilary extension

Figure no. 12:
Previous case. Radiological aspects front view, after extraction of the clip placed on trilamelary autograft and of the nail.

Figure no. 13:
Previous case. Contralateral coxarthrosis by overdemand. Preoperative radiologic appearance front view (left). Postoperative radiological appearance front view (right): intertrochanteric medialization oblique osteotomy + nail-plate and 4 screws osteosynthesis with compaction

Figure no. 14:
Previous case. Radiological aspects front view 16 years after osteotomy and 12 years after the extraction of the metal (left). Postoperative appearance front view (right) after cemented total arthroplasty Charnley-Müller type

Finally, Picard and Graglia placed in the scale of assessment of results, two extremely useful features: patient satisfaction (present in 80% of cases) and surgeon satisfaction (present in 70% of cases) (23, 3, 5, 26, 8).

In a comprehensive study on the results of oblique medialization osteotomy distance of more than 10 years after surgery, H. Judet et al. concluded that the McMurray osteotomy provides convenient living for an average of eight years. On this occasion, the authors cited are uncertain whether this osteotomy still has indications, given the somewhat limited results, and progress for total hip arthroplasty. After Gorun, who published a remarkable study of a personal series of 100 patients with 107 McMurray osteotomies (76 secondary osteo-arthritis and 24 primary), the number of failures after this type of osteotomy is much smaller than the number of failures after arthroplasty and tenotomy, and improvement period is 12-15 years, or more.

5. Conclusions

a) The results obtained by most authors enable us to assert that the oblique medialization intertrochanteric osteotomy covers a long period of complex treatment of hip arthritis, beginning with an ordinary antineuralgic and ending with a total arthroplasty.

b) It must occupy a central place in the therapeutic plan of hip arthritis, since its results are far superior to all other interventions applied.

c) If this surgery is practiced very early, the results are better and more sustainable.

d) This should really convince rheumatologists, and internists for early referral of the patients to orthopedic specialists.

Another way to effectively reduce joint pressure is to increase the bearing surface. This goal is achieved by type Pauwels centering osteotomy, of valgization and varization, depending on radiological evidence of centering. Expanding the bearing surface by this osteotomies decreases articular pressure, to a greater extent than the reduction of pressure involved efforts.

REFERENCES

[1] Baciu Cl. – *Chirurgia şi protezarea aparatului locomotor*, Ed. Medicală, Bucureşti, 1986, p. 330-332.

[2] Bauer R., Kerschbaumer F., Poisel S. – *Voie d'abord en chirurgie orthopédique et traumatologique* (traduction par Patel A., Féron J.M., Signoret F), Ed.Masson, Paris, 1988, p.106-118.

[3] Casanova G. – *Les protheses de hanche*, Encycl. Méd. Chir. Techniques chirurgicales, Paris, 1980, 44666.

[4] Blaimont P. – *Contribution à l'étude biomécanique du fémur humain*, Acta Orthop. Belg. (Bruxelles), 1968, t. 34, fasc. 5, p. 665-844.

[5] Croitor Gh. – *Anatomia funcţională şi biomecanica şoldului*, Ed. Prometeu, Chişinău, 2006, p. 84-97.

[6] Denischi A., Dinulescu I., Medrea O. – *Coxartroza*, Editura Publistar, Bucureşti, 1997, p. 37-56, p.84-92.

[7] Dubois J.L. – *Repères radiologiques et mensurations de la hanche de l'adulte*, J. Belg. Méd. Phis. Rhum. (Bruxelles), 1961, vol.16, nr. 3, p.89-112.

[8] Gorun N. – *Locul osteotomiei oblice de medializare în tratamentul coxartrozelor,* Revista de Ortopedie şi Traumatologie (Bucureşti), 1991, vol.1, nr.1-2, p.47-59.

[9] Hardinge K. – *The direct lateral approach to the hip*, J. B. Jt. Surg., 1982, vol.64-B, no.1, p.17-23.

[10] Huchet C. – *Contribution a l'étude mécanique de la hanche*, Ed.Maloine, Paris, 1965.

[11] Jocu I. – *Examenul ragiologic al centurii pelviene (bazinului) şi membrului inferior*, p.402-417 (în Lungeanu M. şi colab. – Manual de tehnică radiologică, Editura medicală, Bucureşti, 1988).

[12] Judet H., Judet J., Judet R., M'barek M. – *Résultats de l'ostéotomie de Mac Murray au dela de dix ans*, Rev. Chir. Orthop. (Paris), 1989, vol. 75, suppl.I, p. 573.

[13] Lanflais F. – *Indications chirurgicales dans la hanche dysplasique*, Rev. Prat. (Paris), 1980, vol.30, no.19, p.1989-1994

[14] Lequesne M. – *Coxometrie. Mesure des angles fondamentaux de la hanche radiographique de l'adulte par un raporteur combiné*, Rev. Rhum. (Paris), 1963, vol. 7, nr. 7, p. 479-485.

[15] Maquet P. – *Charge et solicitation de la hanche*, Rev. Méd. Liège, 1969, vol. 24, no.4, p. 146-169.

[16] Maquet P. – *Defférents moyens de réduire les contraintes de compression dans l'articulation de la hanche,* Acta Orthop.Belg. (Bruxelles), 1978, t.44, fasc.1, p. 115-131.

[17] McMurray T.P. – *Osteoarthritis of the hip*, Brit.J.Surg., 1935, vol.22, p.716.

[18] McMurray T.P. – *Osteoarthritis of the hip*, J.Bone Jt. Surg., 1939, vol.21-A, no.1, p.1-12.

[19] Medrea O., Ionescu M., Sgarbură I. – *Osteotomiile în tratamentul coxartrozei,* Chirurgia (Bucureşti), 1971, vol. 20, nr. 10, p. 903-912.

[20] Medrea O., Buga M., Antonescu D., Popescu M., Marin I.Gh., Iliescu N., Constantinescu I. – *Metode de calcul şi cercetări experimentale în analiza stărilor de tensiune din extremitatea superioară a femurului*, p.169-190 (în Denischi A. şi colab. – Biomecanica, Editura Academiei Republicii Socialiste România, Bucureşti, 1989).

[21] Pauwels F. – *Biomechanics of the normal and diseased hip*, Ed.Springer-Verlag, Berlin, 1976.

[22] Pauwels F. – *L'ostéotomie dans le traitement chirurgical de la coxarthrose*, Triangle (Bâle), 1968, vol.8, nr.6, p.196-210.

[23] Picard J.-J., Graglia D. – *Considérations sur l'ostéotomie selon McMurray dans la coxarthrose*, Rev .Chir. Orthop. (Paris), 1966, vol. 52, no. 7, p. 601-609.

[24] Postel M. – *Indication des ostéotomies dans les coxarthroses*, Rhumatologie (Paris), 1963, t.15, no. 6, p.279-281.

[25] Postel M. Lesaux D., Courpied J.P., Deplus F. – *Résultats à 10 ans d'une série d'ostéotomies de translation*, Acta Orthop. Belg. (Bruxelles), 1978, t.44, fasc.1, p.203-210.

[26] Postel M. – *Ostéotomies*, EMC (Appareil moteur-Techniques), fasc. 44635, N, 9, 1972.

[27] Prouveur M. – *Coxométrie et équilibre du bassin*, Lille chir., 1964, vol.19, nr.5, p. 207-211.

[28] Rickewaert A. – *Os et articulations*, 2e édition, Flammarion Médecine, Paris, 1975, p. 215-219.

[29] Sgarbură I., Rovenţa Nicolina – *Explorarea radiografică a articulaţiei coxofemurale. Elemente de coxometrie*, Oncologia şi radiologia (Bucureşti), 1968, vol.7, nr.4, p.325-332.

[30] Tomoaia Gh., Baciu B., Macovei M., Grin M., Harabagiu E., Jula F. – *Artroplastia şoldului în coxartroza după displazia congenitală de şold*, Revista de Ortopedie şi Traumatologie (Bucureşti), 2007, vol. 17, nr. 4, p. 255-263.

[31] Voinea A., Zaharia C. – *Elemente de chirurgie ortopedică*, Editura Militară, Bucureşti, 1985, p. 284.

[32] Zaharia C. – *Elemente de patologie a aparatului locomotor,* Ed.Paideia, Bucureşti, 1994, p. 303-310