

ANALYSIS OF THE RESULTS OF IMPLANTATION OF TOTAL HIP ENDOPROTHESIS IN SEVERE DYSPLASTIC COXARTHROSIS

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Abstract

Background: The aim of this study is to affirm the importance of operative treatment of severe dysplastic coxarthrosis through analysis of the results of implantation of total cementless endoprosthesis in patients with DDH Crowe types III and IV.

Patients and methods: This retrospective study involved 28 patients (30 hips) with dysplastic coxarthrosis, in whom an implantation of cementless total hip endoprosthesis was performed at the University Clinic for Orthopaedic Surgery in Skopje. In 26 of the patients the involvement was unilateral and in two patients it was bilateral. The inclusion criterion was radiographically proved severe hip dysplasia Crowe types III and IV. Twenty-one of the patients were female and 7 male, and age distribution was in an interval from 30 to 65 years. The ingrowth of the implant was evaluated using the clinical method, native radiographs and radioisotopic examination with Tc99m. The follow-up period lasted 5 years, and the results were evaluated using the Harris hip score system.

Results: 19 of the patients presented an excellent result of the operative treatment, there were 8 good results with persistent local pain 6 months postoperatively, in one case a surgical revision and reimplantation of the acetabular cup was performed, while one patient underwent a surgical revision and reimplantation of the femoral stem and in another patient there was nonunion at the place of the subtrochanteric osteotomy. Full weight-bearing without the use of crutches was achieved 3 months postoperatively, and no serious early postoperative complications were registered in our patients.

Discussion and conclusions: In the majority of cases in whom a total hip replacement with cementless endoprosthesis is performed because of dysplastic coxarthrosis, a sufficient primary fixation both of the acetabular and the femoral component is achieved, unless one-third of the acetabular cup is left uncovered with bone stock. The problems of decreased muscle strength and limping are usually solved by means of physical therapy in a time period of 45 months.

Key words: Developmental Dysplasia of the Hip, Crowe Classification, Cementless Total Hip Replacement, Harris Hip Score.

Introduction

Developmental dysplasia of the hip is a congenital disease that is characterized by inadequate development of the hip with impaired ossification of the lateral acetabular epiphysis accompanied with displacement of the femoral head from its central position in the acetabulum [1]. The patients have a limp from the child-

hood and intermittent aches in the groin or thigh area. The pain starts to become more severe in the third and fourth decade of life [2]. In that period the patient becomes determined that they need to undergo a surgical procedure.

The surgical treatment of dysplastic coxarthrosis by the use of cementless endoprosthetic replacement of the hip requires a smart so-

lution in order to overcome the enormous number of anatomical and functional disorders imposed by the basic disease. Among the problems that should be bridged with this type of operative intervention we refer to the following:

- Anterior and lateral dysplasia of the acetabulum

- Deformity in the proximal femur

- Muscle imbalance

- Leg length discrepancy

There are numerous possible solutions regarding the problem of dysplastic coxarthrosis in the orthopaedic surgery. Among the many rational solutions there are several that impose as appropriate:

- Solution for the acetabular dysplasia or the neoacetabular coxarthrosis with the use of cementless endoprosthesis without the use of supraacetabular reconstruction such as the Harris procedure or metal augmentation.

- Use of a small and perforated acetabular cup, placed in the true acetabulum.

- A dysplastic polyethylene liner that would cover 2/3 of the dysplastic acetabulum.

- At the same time, achievement of a good press fit fixation.

By using the mentioned solutions we achieved:

- Correction of the anteversion of the acetabulum and the antetorsion in the proximal femur.

- Correction of the leg length discrepancy.

- Correction of the imbalance of the soft tissue around the hip.

In cases with severe congenital dislocation, known as neoacetabular coxarthrosis (Crowe types III and IV) the orthopaedic surgeon faces a great challenge. Placement of the acetabular component in the true acetabulum can lead to significant lengthening of the leg, which can result in nerve injury. This problem is solved with subtrochanteric shortening osteotomy of the femur, which requires a thorough knowledge of the anatomy, as well as total mastery of the operative technique [3]. Enormous attention should be paid to a correct reconstruction of the soft tissues around the hip. If the operation is performed properly, it leads to lasting and functional hip replacement.

Material and methods

This retrospective study was conducted on 28 patients with dysplastic coxarthrosis, of whom 26 had unilateral involvement, and two patients had bilateral developmental dysplasia of the hip. All of them were treated with cementless total replacement of the hip at the University Orthopaedic Surgery Clinic in Skopje. 21 of the patients were female and 7 were male, age distribution from 30 to 65 years.

Inclusion criteria

We included patients whose radiographic findings displayed severe dislocation of the hip according to Crowe types III and IV (Table 1). Eighteen of the hips were classified as Crowe type III, while the remaining 12 were classified as Crowe type IV.

Table 1

Classification of adult developmental dysplasia of the hip according to Crowe

Section 1 – The patient answers the following eight questions with one of the answers given:			
I. Pain	II. Support	III. Distance walked	IV. Limp
None, or ignores it	None	Unlimited	None
Slight, occasional, no compromise in activity	Cane/Walking stick for long walks	Six blocks (30 minutes)	Slight
Mild pain, no effect on average activities, rarely moderate pain with unusual activity, may take aspirin	Cane/Walking stick most of the time	Two or three blocks (10–15 minutes)	Moderate
Moderate pain, tolerable but makes concessions to pain. Some limitations of ordinary activity or work. May require occasional pain medication stronger than aspirin	One crutch	Indoors only	Severe or unable to walk
Marked pain, serious limitation of activities	Two Canes/Walking sticks	Bed and chair only	
Totally disabled, crippled, pain in bed, bedridden	Two crutches or not able to walk		

V. Activities – shoes, socks	VI. Stairs	VII. Public transportation	VIII. Sitting
With ease	Normally without using a railing	Able to use transportation (bus)	Comfortably, ordinary chair for one hour
With difficulty	Normally using a railing	Unable to use public transportation (bus)	On a high chair for 30 minutes
Unable to fit or tie	In any manner		Unable to sit comfortably on any chair
	Unable to climb stairs		

Materials

The types of endoprosthetic replacement material that we used in the operative treatment of the dysplastic coxarthrosis were those used in standard procedures – Zimmer and Jonhson & Jonhson.

Surgical technique

All the patients had undergone preoperative clinical examination, measurement of the leg length was performed, radiographs and determination of the Harris Hip Score. The preoperative radiographs were used to template the endoprosthetic components, as well as to determine the position, dimension, depth and angle of anteversion of the false and true acetabulum, the bone stock that is at disposal in the true acetabulum, and the shape of the femur, as well as the need to shorten it. Only standard endoprosthetic material was available. All the operations were performed by the same team of surgeons.

All the patients were operated under spinal anaesthesia. We used an antero-lateral approach. With careful preparation of the periarticular structures we approached the joint itself. After the femoral neck appeared it was resected with a power saw and removed. Then the true acetabulum was identified. Acetabular preparation implies removal of the pulvinar and reaming of the reestablished true acetabulum in physiological anteversion of 10 degrees and abduction of 45 degrees. Placement of the acetabular component was completed with screw fixation. After careful manual dragging of the proximal part of the femur distally, paying attention at the same time not to injure the sciatic nerve, we asessed the need of additional femoral resection. Because of elongation greater than 3 to 4 cm in the leg length, in 7 of the patients we needed to perform shortening of the femur. The next step was reaming of the femoral part as well as definite implantation of the femoral component, which was also used as an intramedullary osteosynthetic material if femoral resection was performed. Following

these steps, we proceeded towards reduction of the hip and checking the possibility of dislocation of the components. After placement of the drainage and soft tissue reconstruction, the patient left the operating room when the closure of the wound was complete.

Postoperative treatment and evaluation of the results

Our team proceeded towards walking exercises the day following the operation. Antibiotic prophylaxis was conveyed in all the patients. Patients started gradually with weight bearing when walking, leading to complete weight-bearing and walking without crutches 6 months after the operative interventions in all the patients.

The incorporation of the total hip endoprosthesis was evaluated by the use of the clinical method, roentgenogram analysis and body scan with Tc99m. The patents' follow-up lasted 5 years.

The results were evaluated with the Harris Hip Score (Table 2) [4]. A successful result meant a postoperative increase in the Harris Hip Score of more than 20 points accompanied by a radiographically stable implant (Figure 1) with no additional femoral reconstruction.

Table 2

Harris Hip Score Grading. HHS < 70 Poor result, 70–79 Fair, 80–89 Good, 90–100 Excellent

Section 2 – To score this section all four must be 'yes', then get 4 points
Less than 30 degrees of fixed flexion
Less than 10 degrees of fixed int rotation in extension
Less than 10 degrees of fixed adduction
Limb length discrepancy less than 3.2 cm (1.5 inches)
Section 3 – Motion
Total degrees of flexion
Total degrees of abduction
Total degrees of external rotation
Total degrees of adduction

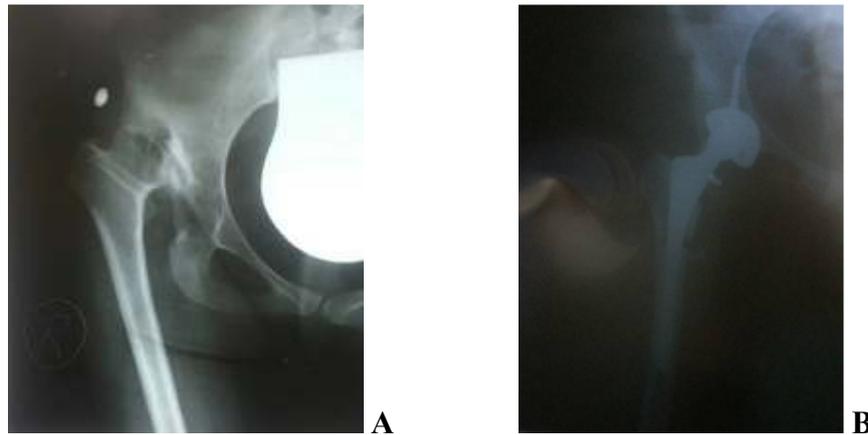


Figure 1 – Roentgenograms of hip of 55-year-old woman that represent: A. Preoperative anteroposterior Roentgenogram with dislocation of the hip Crowe type IV. B. Postoperative, placement of the acetabular cup in the true acetabulum as well as subtrochanteric shortening of the femur

Results

In the process of clinical evaluation, the analysis of the radiographs and the Tc99m scans two orthopaedic surgeons, a specialist in radiology and a specialist in nuclear medicine were involved. Anamnestically and clinically with the use of the Harris Hip Score (HHS) we reached the following results: preoperative mean value of the HHS was 41 (9–57), immediately after the operation 72, after one year's follow-up 8; reaching 85 points (70–97) in the fifth year after the operation (Diagram 1).

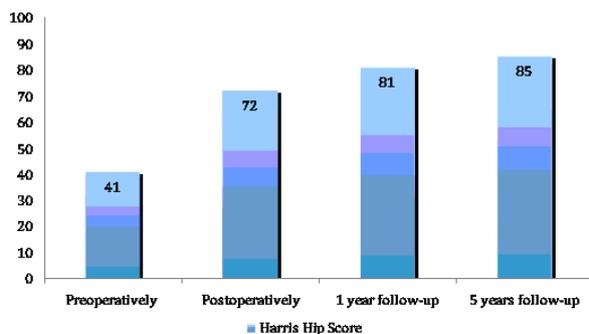


Diagram 1 – Harris Hip Scores in preoperative and different postoperative phases of follow up

In the preoperative clinical examination all the patients except one had a positive Trendelenburg sign; and in the postoperative examination the Trendelenburg sign was absent in all the patients. Leg length discrepancy was improved by a mean value of 9 mm postoperatively, bearing in mind the preoperative discrepancy of a mean 2.2 centimetres value. In all the patients postoperative roentgenograms were performed in different phases of the follow-up. Loosening of the stem was noticed in one patient, and a radiolucent line around the acetabular component appeared in another patient.

In one patient there was nonunion at the place of the subtrochanteric osteotomy.

Two patients had to undergo a bone scan with Tc99m in order to enlighten the case (pain persistence without clinical and radiological changes). 19 of the operated hips had excellent results, 8 had a good result, but with persistent pain 6 months after the intervention, one case was revised and reimplantation of the acetabular component was done, there was also nonunion at the site of the subtrochanteric osteotomy 8 months after the operative intervention (Diagram 2).

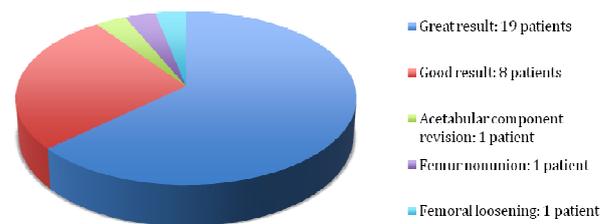


Diagram 2 – Diagram showing the results we achieved

Discussion

The question regarding high hip dislocations was first asked by Crowe, suggesting at the same time the classification for adult developmental dysplasia of the hip assessment [2]. The problems that are mentioned in his paper from 1979 as to location, fixation and size of the acetabular component are even today a matter of discussion, pointing out at the same time that the biggest bone stock is placed in the true acetabulum. That principle is clearly determined and a tendency exists to place the acetabular component in the true acetabulum (the

percent of loosening of the acetabular component is 13% compared to its placement proximal to the true acetabulum, where the loosening frequency is 42%). In most cases by implantation of a cementless total hip endoprosthesis to dysplastic hips good primary fixation of the acetabular and the femoral component of the replacement is achieved, always paying attention not to leave more than 1/3 of the acetabular cup uncovered with bone. Whereas putting the femur in the true acetabulum leads not only to lengthening of the extremity by several centimeters, which leads to leg length discrepancy, but also to injury of the surrounding nerve structures in dislocations of Crowe type IV. Therefore, searching for an appropriate solution surgeons came across the subtrochanteric shortening of the femur, which was primarily used as a treatment for congenital hip dislocation in older children [5], but from the 1980s has found its way in total hip replacement of the dysplastic hip [6]. Another problem that rings a bell in these patients are the contractures of the soft tissues around the joint, that seeks deliberate release of these structures, beginning from the joint capsule, to the adductors, abductors and other muscles around the hip, giving special attention to the gluteus medius muscle, that represents the main force in the abductors in the hip, having an important role in stability and movement [7].

Conclusion

The essence of the technique we use is constructing normal biomechanics by complex remodelling of the disturbed biology. The increase of the Harris Hip Score from the preoperative 41 points to the postoperative 85 (postoperative increase in Harris Hip Score of 44 points) in these patients proves the efficiency of the method that we used in patients with Crowe types III and IV dysplasia.

Type I	hips have less than 50% subluxation
Type II	hips have between 50% and 75% subluxation
Type III	hips have between 75% and 100% subluxation
Type IV	hips have more than 100% subluxation

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Резиме

АНАЛИЗА НА РЕЗУЛТАТИТЕ ОД ИМПЛАНТАЦИЈАТА НА БЕСЦЕМЕНТНА ТОТАЛНА ЕНДОПРОТЕЗА НА КОЛКОТ КАЈ ТЕШКА ДИСПЛАСТИЧНА КОКСАРТРОЗА

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Вовед: Целта на оваа студија е низ анализа на добиените резултати да се реafirмира

значењето на оперативното лекување на диспластичните коксартрози со имплантација на тотални бесцементни ендопротези.

Материјал и методи: Во оваа ретроспективна студија се опфатени 28 пациенти (30 колка) со диспластична коксартроза, лекувани со имплантација на тотална бесцементна ендопротеза на колкот на Универзитетската клиника за ортопедски болести во Скопје. Кај 26 пациенти дисплазијата беше унилатерална, а кај двајца пациенти билатерална. Инклузиони критериуми беа радиографски дијагностицирана тешка дисплазија според Stowe тип III и IV. 21 пациент беа од женски, а 7 од машки пол, возрастната дистрибуција беше од 30 до 65 години. Инкорпорацијата на тоталната ендопротеза беше евалуирана со помош на клиничкиот метод, рендгенографскиот метод и сцинтиграфија со Tc99m. Резултатите се следеа во период од пет години. Резултатите се евалуираа користејќи Harris Hip Score.

Резултати: 19 од оперираните колкови беа со одличен резултат, 8 со добар резултат и со присутна перзистентна болка до 6 месеци по оперативната интервенција, кај еден случај беше направена оперативна ревизија и реимплантација на ацетабуларната компонента, додека кај еден пациент имаше nonunion на местото на суптрохантерната остеотомија. Потполно оптоварување без помош на патерици беше постигнато три месеци по оперативниот зафат без посериозни рани постоперативни компликации.

Дискусија и заклучоци: Во најголем број случаи при имплантација на тотална бесцементна ендопротеза на колкот кај диспластични коксартрози се постигнува добра примарна фиксација на ацетабуларната и феморалната компонента на протезата, секогаш водејќи сметка да не се остави повеќе од 1/3 од ацетабуларната капа непрепокриена со коска. Средната постоперативна вредност на Harris Hip Score изнесува 85. Мускулната сила и решавање на проблемот со накривувањето се надминува со помош на физикална терапија во вкупен временски период од четири и пол месеци.

Клучни зборови: развојна дисплазија на колк, бесцементна ендопротеза на колк, Stowe-класификација, Harris Hip Score.