Total hip replacement due to osteoarthritis secondary to dysplasia

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Abstract

Introduction: We present the results we got in a series of patients subject to total hip replacement for hip osteoarthritis secondary to dislocating dysplasia and describe the technical difficulties associated with total hip replacement in this group of patients.
Materials and Methods: Retrospective evaluation of 81 cases operated on due to hip dislocating dysplasia. Minimal follow-up of 2 years. Sixty four females (80%) and 16 males. Patients' age at the time of the surgery: <60 years old (67.5%). According to the Crowe classification, there were 24 type 1 cases (30%), 36 type 2 cases (45%), 14 type 3 cases (17.5%) and 6 type 4 cases (7.5%). We carried out (pre- and post-operative) millimeter radiographic measurement of the hip rotation center and that of the limbs length discrepancy so as to determine the changes brought about by the surgery.
Results: We found 10 complications associated with the procedure: one deep infection, 6 cases of revision due to mechanical loosening, one femoral nerve lesion, and 2 cases of early prosthetic dislocation. The implant survival rate was of 91.25% at 10-year follow-up. The acetabular rotation center was restored to anatomic position in 67 cases (up to 1 cm), and to a well-tolerated position in 12 cases.
Conclusions: Total hip replacement in dislocating dysplasia remains challenging for the specialized surgeon. We still appreciate the use of structural bone graft for the lateral defect and morcellized bone for the provoked protrusion, and that of cemented cups for large defects if a non-cemented option is not available.

Key words: Dislocating dysplasia; arthroplasty; hip; total replacement; congenital dislocation.
Level of evidence: IV

Reemplazo total de cadera en pacientes con displasia luxante

Resumen

Introducción: Se presentan los resultados obtenidos en una serie de pacientes sometidos a un reemplazo total de cadera por artrosis secundaria a displasia luxante, y se describen los problemas técnicos asociados con el reemplazo total de cadera en este grupo.
Materiales y Métodos: Evaluación retrospectiva de 81 casos operados por displasia luxante. Seguimiento mínimo 2 años. Sesenta y cuatro mujeres (80%) y 16 hombres. Edad al momento de la cirugía: <60 años (67,5%). Según la clasificación de Crowe, había 24 casos de tipo 1 (30%), 36 de tipo 2 (45%), 14 de tipo 3 (17,5%) y 6 de tipo 4 (7,5%). Se realizó la medición radiográfica en milímetros del centro de rotación de la cadera y de la discrepancia de longitud (preoperatoria y posoperatoria), para poder determinar la modificación producida por la cirugía, en estos aspectos.
Resultados: Se registraron 10 complicaciones relacionadas con el procedimiento: una infección profunda, 6 casos de revisión por aflojamiento mecánico, una lesión del nervio crural y 2 casos de luxación protésica temprana. La tasa de

Conflict of interests: The authors have reported none.

sobrevida del implante fue del 91,25% a los 10 años. El centro de rotación acetabular fue restaurado a una posición anatómica en 67 casos (hasta 1 cm), a una posición bien tolerada en 12 casos.
Conclusiones: El reemplazo total de cadera en la displasia luxante continúa siendo un desafío para el especialista. Seguimos considerando adecuada la utilización de injerto óseo estructural para el defecto lateral, y molido para la protrusión provocada, y cotilos cementados para grandes defectos si no se dispone de una opción no cementada.

Palabras clave: Displasia luxante; artroplastia; cadera; reemplazo total; luxación congénita.
Nivel de Evidencia: IV

Introduction

Total hip replacement (THR) is an effective procedure to relieve pain and improve function in patients with advanced joint wear.[1] In spite of improvement in surgical techniques and the development of implants design the mechanical loosening of the components is still the main reason for failure, what jeopardizes long-term duration.[2]

In hip osteoarthritis secondary to dislocating dysplasia (previously known as congenital dislocation), the surgeon should take into account that additional technical difficulties that clearly differentiate these procedures from conventional THR will arise more often than not. These difficulties are directly associated with the anatomic changes that these hips show, which are typically deficit of acetabular bone stock, changes in both the shape and the size of the proximal femur, and the average shorter age of the affected patients.[2] All these variants together are the reason for these patients' higher failure rates due to aseptic loosening that can be found in specialized bibliography when compared to those in the general population (24-53% in the acetabular component at year 7.5).[3-5]

In this article we report the results we got in a series of patients treated with THR due to hip osteoarthritis secondary to dislocating dysplasia and we describe the technical difficulties associated with THR in this group of patients.

Materials and Methods

Between June 1997 and June 2011 at the institution we work at, there were 2581 THRs. In 81 cases (3.13%), the diagnosis previous to the surgery was hip osteoarthritis secondary to symptomatic dislocating dysplasia. In this study, we evaluated retrospectively a series of cases. We included the patients operated on due to this condition during the aforementioned period of time with a minimal follow-up of 24 months. We considered 80 THRs in 66 patients. In 14 patients (21.2%), THR was bilateral and it was a two-time surgery. Only one case was excluded because follow-up was insufficient. It is worth highlighting that we only included patients with acknowledged diagnosis and, therefore, we left a significant number of patients unanalyzed who, although later developed a wear hip condition clearly secondary to dysplasia, were not diagnosed previously due to their less remarkable symptoms. In these patients, the typical deformities associated with dysplasia are not so obvious, but it should be acknowledged that these are probably the most frequent reasons for hip osteoarthritis in young adult female patients.

Forty percent of the patients (32 cases) reported having undergone surgery previously to joint replacement. In this sub-group the average number of previous surgeries was 1.7 (ranging from 1 to 4). These hips sometimes show significant rigidity due to both the altered shape of the head and the acetabulum, and the periarticular soft tissues fibrosis. Quite often rigidity is 40º-hip flexion or more—this is why the patient will show positive Thomas testing and compensatory lumbar hyperlordosis. Although dysplastic or dislocated hip joints that have not undergone surgical treatment may show limited mobility, hardly do they show significant rigidity. The average follow-up was of 10 years (ranging from 2.2 to 16.3). Ten patients had a <5-year follow-up; 26, a 5-to-10-year follow up, and more than half the patients (44 cases), a 10-to-15-year follow-up.

Satisfaction with the surgical procedure is reflected in the time that passed between both surgeries in the bilateral cases, which was of <2 months (4 cases), of 3-to-6 months (4 cases), of 6-to-12 months (2 cases) and of 12-to-24 months (4 cases).

The series was made up of 64 females (80%) and 16 males. The right hip was affected in 54 cases (68%), and the left one, in 26 cases. The patients' average age at the time of the surgery was <40 years old [15 patients (18.75%)], 40-to-50 years old [21 patients (26.25%)] 50-to-60 years old and 60-to-70 years old [18 patients (22.5%) each group]; only eight patients were >70 years old (10%); remarkably, 67.5% of the patients were <60 years old.

There are different systems described for the radiographic classification of this entity. The Crowe and Ranawat classification divides this condition into four groups based on the position of the femoral head with respect to the anatomic acetabulum. Based on the proximal migration of the femoral head, it can be: type 1: <50%; type 2: 50-75%; type 3: 75-100%; and type 4: >100%.[6] In this series, 24 cases were type 1 (30%); 36, type 2 (45%); 14, type 3 (17.5%); and 6, type 4 (7.5%).

The surgical approaches used were the transtrochanteric approach (Charnley) in the first 29 cases and the direct transgluteal anterior-lateral approach (Bauer/Hardinge) in

ISSN 1852-7434 (online) • ISSN 1515-1786 (printed)

the remaining 51 patients. The implant was cemented in 33 cases (42.45%), hybrid in 28 (35%) and non-cemented in 19 (23.75%), and the implants used were the Ogee-Charnley® (33 cases), the Duraloc 100-Charnley® (3 cases), the Duraloc 300-Charnley® (19 cases), the Duraloc 300-C-Stem® (5 cases) and the Duraloc 300-Corail® (8 cases) (all by Johnson & Johnson), the Trident-Exeter® (Stryker Corp.) in one case and the Fitmore-Conus® (Sulzer) in 11 cases.

Before and after the surgery we carried out the radiographic measurement of the hip rotation center and that of the limbs length discrepancy in millimeters using a 20%-magnifying rule. The aim of this assessment was to determine the changes after the surgery. The method used included a pre-operative bilateral A-P hip X-ray focused on the pubis and the sacrum 2 cm from the pubis, with these two structures coinciding in the A-P hip X-ray to check rotation. Moreover, we took an immediately post-operative X-ray with the same technical characteristics to carry out measurement, and also a final X-ray to assess the final status of the prosthetic components.

In all cases we drew a horizontal line tangent to the base of both teardrops images in the (pre-operative and post-operative) A-P hip X-rays. We identified the acetabular rotation center in the hip to evaluate and determined the distance in millimeters between the pre-operative and post-operative acetabular rotation centers, and the horizontal line previously drawn. Afterwards we determined the differences in limbs length taking into account the distance between both calcar femorale upper limits and the referential horizontal line. All measurements were registered in an Excel table to assess results.

Surgical technique (anterior-lateral approach)[7-12]

The procedure is preferably carried out under hypotensive spinal anesthesia in a laminar flow cabinet. The patient is in supine position and we carry out an approximately 15 cm-length longitudinal incision on the lateral aspect of the proximal thigh, using the anterior-superior iliac spine as reference of the proximal end of the wound. The previous incisions may be longitudinal or transverse (champagne flute incision), and it should be carefully assessed if these incisions will be ignored or used partially or totally or, occasionally, removed. Part of the previous incision is umbilicated and adhered to deep tissues more often than not—this is why it is advisable to carry out simple cutaneous plastic surgery with borders release. Dissection continues through the tensor fascia latae muscle and, if also adhered, it should be released so as to restore the anatomic planes that will facilitate wound closure. Afterwards we cut the anterior third of the medial gluteus muscle and some 2-3 cm of the vastus lateralis muscle, with what the anterior part of the femoral head and neck will show. Hip dislocation will be achieved by the limb external rotation and adduction and, although excessive neck anteversion may suggest that dislocation will come with no difficulty, the proximal migration of the femur will lengthen and thicken the capsule with adherences that can get the lesser trochanter. The anatomic changes that are typical of this condition and those due to previous surgeries will lead the surgeon to watch and palpate bone structures repeatedly so as to identify the position he or she is in. Then we position a Hohman bone lever on the lower edge of the neck and another one on its upper edge so as to facilitate joint visualization and, by increasing the limb external rotation and adduction, we will make hip dislocation and disclosure of the neo-acetabulum possible. Sometimes it is necessary to release the iliacus psoas tendon from its attachment to the lesser trochanter. Dissection always should be slow and careful—anatomy is altered not only in position but also in shapes and rotations, and this is why every structure will have to be meticulously watched, palpated and recognized.

We will find anatomic variation in both the pelvis and the proximal femur. At femoral level there is usually neck anteversion, sometimes an excessive one, which gets the proximal meta-diaphysis and therefore can cause a narrow canal with A-P ovoid layout. The head can be small or giant and it can be totally distorted, and the greater trochanter will be in posterior position. At acetabular level we can see a flat and shallow structure with a remarkably steep roof, an upper-lateral defect and anterior wall deficit. These changes are much more obvious in hip partial dislocation than they are in dislocation.

So as to determine the level of the anatomic acetabulum (paleo-acetabulum), we should identify the obturator foramen—this is one of the main stages in the procedure, since this is the only acetabular anatomic reference that is not altered in this condition. This takes a careful and relaxed technique. After hip joint dislocation, we identify the anterior and posterior edges of the iliac bone at neo-acetabulum level and, with a Hohman bone lever at each side, we establish the direction and the plane that the distally aimed dissection should continue, making always sure that the fibrotic tissue that we will remove has bony medial bottom. We re-position the levers in sequential way in the distal direction so as not to lose the 3-D reference. At the level of the obturator foramen we position a blunt Hohman lever, which will identify the distal limit of the paleo-acetabulum. At this stage we should re-position the anterior and posterior Hohman bone levers so as to start working the acetabulum in its position. The roof of the paleo-acetabulum can partially occupy the opening of the neo-acetabulum, and the bone can be quite sclerotic. Therefore, although we can start working with small drills, we suggest preferably starting with a wide chisel to remove the ivory bone circumferentially and, once the spongy bone has been disclosed, we should start with the first drill. Once we are done with acetabulum preparation we carry on to femoral preparation.

Restoring the position of the acetabulum will allow us to reconstruct the normal bio-mechanics of the hip joint and, since in general the position of the acetabulum determines the definite length of the limb, we may have to carry out some femoral shortening osteotomy. There are reports on sub-trochanteric and even low diaphyseal osteotomies, which usually take additional osteosynthesis for rotational control. We prefer to carry out sequential resection in the femoral neck so as to get joint reduction with adequate soft tissues tension in the new location.

Figure 1. (Left) unilateral hip dislocation—type IV in the Crowe classification.

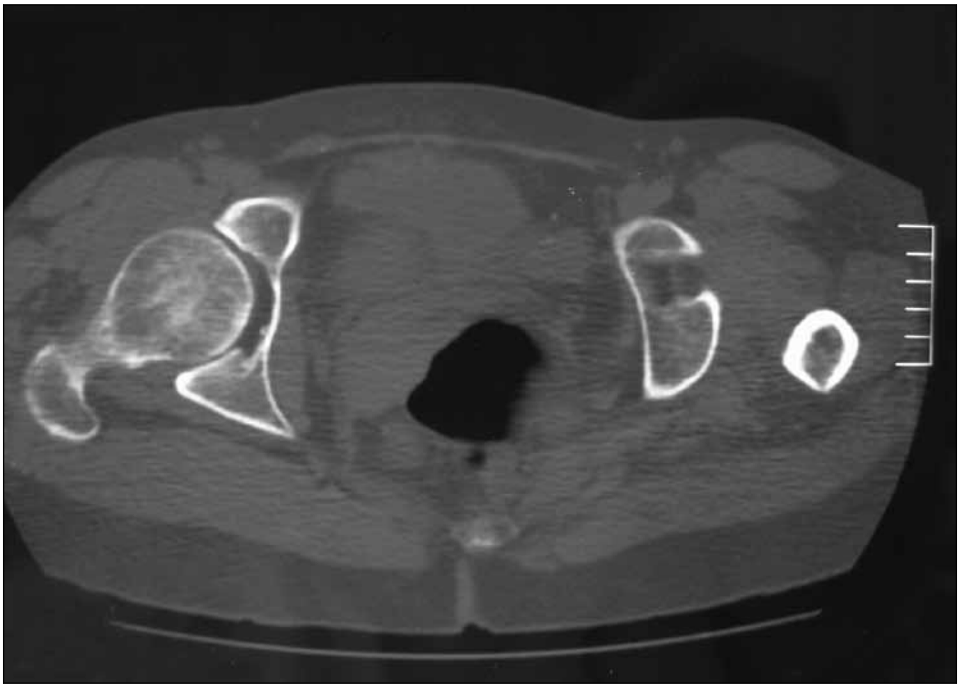

Figure 2. Transverse CT section in the patient in Figure 1. At the level of the normal right acetabulum you can see the left femoral diaphysis and paleo-acetabulum (dislocation).

ISSN 1852-7434 (online) • ISSN 1515-1786 (printed)

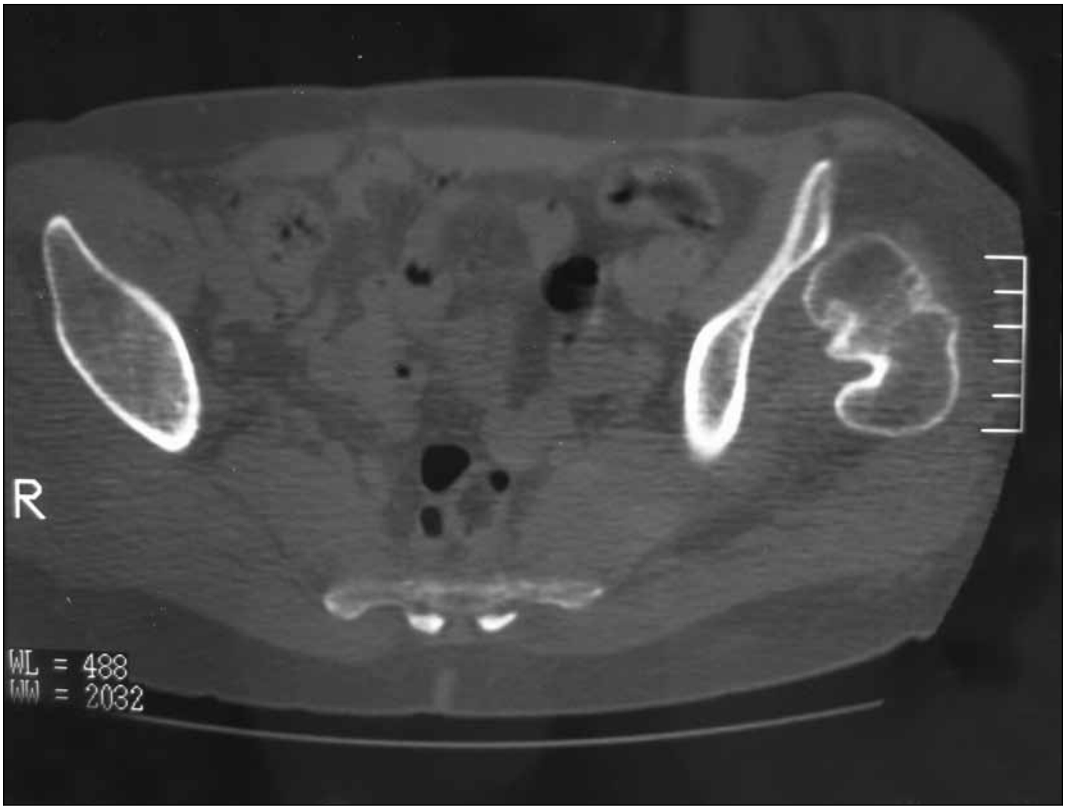

Figure 3. Upper transverse CT section in the patient in Figure 1. At the level of the left neo-acetabulum you can see the right iliac artery in an image which is typical of the unilateral type IV dislocation.

Figure 4. Post-operative X-ray. Non-cemented total hip replacement (Fitmore-Conus). You can see the (prophylactic) wire loop in the femur and medial femoral bone remaining of the proximal osteotomies for femoral shortening.

Figure 5. Yearly follow-up X-ray five years after the surgery. You can see the adequate fixation of both components. The greater trochanter undergoes non-union, but the patient shows neither symptoms nor Trendelemburg sign. The patient started with symptoms in the (left) knee homolateral to total hip replacement at year four after the surgery.

Figure 6. Left valgus knee deformity in compensation for the deformity of the hip previously dislocated. Four years after the left total hip replacement, the homolateral knee starts showing symptoms. The patient was subject to total knee replacement due to the persistence and increase of the symptoms.

ISSN 1852-7434 (online) • ISSN 1515-1786 (printed)

Since this is a condition that challenges us we surgeons with important technical difficulties, we believe that the anterior-lateral approach will facilitate both the interpretation of the anatomic variables (which are characterized by hip neck anteversion) and the adequate location of the components, along with the measurement of the limbs length, not to mention that the greater sciatic nerve will always be far from the surgical field (Figures 1-6).

Results

We found 10 complications related to the procedure. One patient suffered deep infection (1.25%), which took a two-time revision for antibiotic-impregnated-cemented spacer and subsequent re-implant.

Six cases required prosthetic revision surgery due to the mechanical loosening of the implant (7.5%). Four cases (5%) showed isolated loosening of the femoral stem; one patient (1.25%) required the isolated revision of the cup and, another one (1.25%), the revision of the two components. It is worth highlighting that in all the cases of isolated femoral failure, the stems were cemented, whereas in the case of the two components failure, the two components were cemented too. The isolated cup failure was early (45 days) in one non-cemented component due to technical failure by insufficient deepening. The patient was subject to revision with the reinsertion of the implant in the right position and no further complications.

In one case (1.25%) it was necessary to use a prophylactic wire loop with bone graft as treatment of a fake intra-operative femoral canal, which showed no further complications either and bone graft consolidation.

We found a femoral nerve lesion (1.25%) due to thermal injury by cement leaking from the side of a Hohman bone lever in an insufficient anterior wall. First we explored the nerve, removed the cement surrounding it and carried out neurolysis, with negative results; therefore, later on we carried out free nerve grafting with excellent results.

There were two cases (2.5%) of early prosthetic dislocation, which were reduced conservatively with fluoroscopic assistance and no further complications.

In one patient (1.25%), it was necessary to remove the transtrochanteric wires due to the persistence of irritating trochanteritis secondary to the osteosynthesis material, with good results.

In this series, the implant survival rate at average 9-year follow-up was 91.25%.

Other important findings were: five acetabular components showed demarcation signs (4 only in the lateral third, and 1 in the two lateral thirds), but all of them were asymptomatic. It is worth mentioning that they were cemented components with >9-year follow-up. Moreover, it should be highlighted that we found a greater trochanter non-union and the rupture of the wire of the lateral canal, both asymptomatic. One patient suffered a stroke immediately after the surgery, but the patient recovered from it.

In order to carry out a practical assessment, we should bear in mind that the anatomic acetabular rotation centre and the prosthetic acetabular rotation center in a normal primary hip are usually 20 mm above the pelvic referential horizontal line. The pre-operative acetabular rotation center was found, on average, 44.9 mm (ranging from 17 to 110) above the referential horizontal line. At the time of assessing the post-operative rotation center, we found it, on average, lowered to 23.8 mm (ranging from 10 to 44). The acetabular rotation center was restored to anatomic position in 67 cases (up to 1 cm), to tolerable position in 12 cases (between 1 and 1.5 cm), and only in one case was it more than 1.5 cm above the pelvic referential horizontal line in a Crowe type 2 hip.

With respect to limbs length discrepancy, it was necessary to differentiate two groups in the series—those patients affected and operated on by bilateral disorders, and those with a unilateral disorder. This was a key factor, since in those ones with a bilateral disorder who underwent a two-time surgery, the limbs length asymmetry seen after the first surgery was only compensated or leveled at the time of operating on the other altered hip; therefore, it would not be appropriate to assess these figures individually.

In the group with a unilateral disorder, pre-operative limbs length discrepancy was, on average, 22.8 mm (ranging from 0 to 90), and definite discrepancy was, on average, 5.6 mm (ranging from 0 to 25).

In the group with bilateral disorders, pre-operative limbs length discrepancy was 18 mm on average (ranging from 0 to 50), i.e. shorter than that seen in unilateral disorders. However, after the two surgeries definite discrepancy was, on average, 13.32 mm (ranging from 0 to 50). These data show that final limbs length discrepancy is acceptable, but greater than that in the group of unilateral disorders—this shows that this group is proportionately made up of more complex cases. In the general statistics, hips Crowe types 3 and 4 represent 25% of the series, whereas in the group of the bilateral disorders, they go up to 43%

Discussion

Total arthroplasty for the treatment of hip dislocating dysplasia represents just 1.17% of the joint replacements carried out at high-complexity centers. It is more frequent in female patients (4:1 ratio). Adults show a wide range of symptoms, from mild dysplasia to inveterate high hip dislocation, up to 40% can show limp but no pain, and partial dislocation is worse tolerated than dislocation. Bilateral presentation represents 20% of the cases and it is better tolerated than unilateral dislocation—these patients suffer more limp because they have a shorter limb with their hip in adduction and homolateral compensatory valgus knee deformity.[7-9] In our series, the prevalence of this condition was 3.13% of the cases operated on, and the female-male ratio was also 4:1.

As it has already been stated, there are different classification systems, the most widely used being the one described by Crowe and Ranawat.[6] Hartofilakidis et al. suggested dividing them into three categories depending on femoral head containment: 1, dysplasia; 2, low dislocation, and 3, high dislocation.[10]

In the beginning of the age of hip total arthroplasty, Charnley considered hip congenital dislocation as a contraindication for THR due to the lack of acetabular bone stock, and highlighted the fact that there were high rates of aseptic loosening in pre-operative dislocated hips.[13] With the new surgical techniques and implants, these drawbacks have been overcome, but it is acknowledged that the shorter patients' age and the technical complexity of the procedure determine higher surgical morbidity and worse long-term results when compared to THR in primary hip osteoarthritis.[2]

THR for the treatment of osteoarthritis secondary to hip dislocating dysplasia will be associated with technical drawbacks. On the acetabular side, there is usually insufficient upper and anterior coverage, and the defect is usually more difficult to manage than it is in Crowe types 2 and 3 or in Hartofilakidis type 2, since the femoral head develops the neo-acetabulum at the level of the anatomic acetabular roof leaving less bone stock for reconstruction. In Crowe types 1 and 4 or Hartofilakidis types 1 and 3, bone stock is usually better preserved to prepare the acetabulum in its anatomic position. On the femoral side, the head is usually enlarged, the neck is short and it is in anteversion position, the trochanter is in higher and more posterior position, the diaphysis is straight and narrow, with an ovoid and tight canal.[5,7]

The main goals of the surgery are the position of the cup in the original acetabulum, in anatomic position, the restoration of the joint biomechanics and the leveling of the length of both limbs.

Acetabular reconstruction is the most important part in the whole procedure. In general, this is what determines de type of approach, the type of bone graft, if necessary, and, many times, the type of femoral reconstruction that should be carried out. The greater bone stock is usually found at the level of the paleo-acetabulum, but this may not be the case when there have been previous surgeries with osteotomy. Getting adequate acetabular bone coverage is the key in the procedure. With this aim, diverse authors have set out different techniques so as to improve the implant survival.[2]

Authors such as Sochart and Porter, Numair et al. and Chougle et al. have reported high rates of failure with small cemented acetabular components in patients with serious or dislocated dysplasia.[3-5] Sochart and Porter report survival rates of 58% at year 20.

One of the causes of the high failure rates in cemented cups could be the insufficient medialization or the insufficient upper coverage. Dunn and Hess[14] described a controlled fracture at the acetabular bottom supplemented with autologous bone graft, which will allow the surgeon greater acetabular medialization and better coverage; the authors report satisfactory results at 22-month follow-up. With a similar technique, Hartofilakidis et al. report success rates of 100% and 93.25% at 5- and 10-year follow-up, respectively.[15]

Other authors, such as Dorr et al.,[16] Huo et al.,[17] and Anderson et al.[18] report some good experience using non-cemented fixing cups, which allow the surgeon greater medial drilling with no need of additional bone graft. Their success rates were good, with no evidence of migration or loosening, but most series had a relatively short follow-up.

The alteration of the hip rotation center changes the joint biomechanics dramatically and can influence the survival rates of the implant. Johnston et al., through a mathematic model, determined that the forces that go through the hip are weaker when the acetabulum is in lower and medial position, and these same forces get maximal when the acetabulum is in upper and lateral position—important information to determine the optimal position of the cup.[19] In 1994, Schutzer and Harris[20] evaluated 56 hips operated on with non-cemented cups in high acetabular position (average 43 mm above the teardrop image). After an average follow-up of 40 months and with no failure in the acetabular components in view, they recommended implanting the cup in a high position. Later on, with longer follow-up in cups implanted with a high rotation center, Russotti and the same Harris[21] reported a failure rate of 16% at 11-year follow-up, and many authors published much less satisfactory results with the described technique. Yoder et al.[22] evaluated 116 cemented cups and established that a cup in upper and lateral position will not affect acetabular loosening rates, but it will increase considerably femoral loosening rates. Pagnano et al.[23] established that the acetabular component implanted more than 15 mm above the teardrop image will increase considerably the acetabular and femoral loosening and revision rates. In our series, the rotation center was restored to anatomic position in 83.7% of the cases (63 cases), to an acceptable position within the 15 mm in 15% of the cases (12 cases), and only in one case the reposition of the rotation center was inadequate. Although this could condition long-term survival rates, at the time of our analysis after a 10-year follow-up, we found only one demarcation in its lateral third, which is asymptomatic.

An alternative technique is acetabular augmentation with bone graft. Harris et al. got good short-term results with structural autologous bone graft (femoral head) to cover the upper-lateral acetabular defect, implanting a cemented cup, but several components later failed (failure rates of 46% at 12-year follow-up).[24,25] At 16-year follow-up with this technique, Shinar et al.[26] found loosening in 66% of the 55 components. Other series such as Inao et al.'s[27] and Bobak et al.'s[28] report bone consolidation rates of almost 100% using the patient's femoral head. Al-

ISSN 1852-7434 (online) • ISSN 1515-1786 (printed)

though long-term results with this technique were not as promising as they initially had seemed to be, it is still a valid technique when other methods are not useful. Moreover, it is worth highlighting that the incorporation of bone graft is the rule, what will improve the pelvic bone stock and will facilitate future acetabular revision. Reconstruction at femoral level is usually complicated by the alteration in the shape and the torsion of the proximal third of the femur, a tight medullar canal and the results of previous osteotomies. The use of implant templates is very important to identify the need for special femoral stems.

Once the acetabulum has been repositioned in its real position, it is usually necessary to shorten the femur to get hip joint reduction, which is always possible. Some authors such as Cameron and col.[29] and Lewellan[30] recommend not to carry out a >4 mm limb-lengthening at the time of reducing the hip to its new position so as to avoid injuring the sciatic nerve. In our opinion, there is not a real cause for believing that the restoration of the limb normal length can represent a threat for the nerve. The sciatic nerve is not associated with the pathophysiology of this hip condition, since the nerve embryologic origin (ectoderm) is different from that of the joint (mesoderm). Although specialized bibliography prevents the surgeon from the sciatic nerve "lengthening", there are almost no references of the possible "lengthening" of other nerve trunks such as the femoral nerve, but there are reports on femoral nerve lesions due to cement or the Hohman bone lever in the anterior column. In fact, if the affected hip were to be too long in flexed-position, it would make sense to think that the sciatic nerve would be "lengthened" and the femoral nerve would be "retracted". Moreover, some hips have been operated on in childhood several times using anterior approaches, and there are retractile scars that often get the stump of the femoral cutaneous nerve. This should be analyzed before the THR by scar percussion to evaluate if there is positive Tinel testing, what may require nerve release. The "lengthening" of the sciatic nerve can occur in patients with previous surgeries or in the posterior surgical approach, where the added nerve "anchored" to the scar could affect the nerve by long and direct contact with the surgical levers. This is associated with the finding that, when the nerve has been affected, the injury is almost never complete, but the peripheral fibers belonging to the superficial peroneal nerve are the ones affected. Eggli et al.[31] revised 508 THR in 370 patients with hip dislocating dysplasia to assess the incidence of sciatic nerve injury after the surgery. They concluded that the nervous injury is more frequently caused by direct or indirect mechanic impact during the surgery than it is by nerve lengthening in itself.

There are numerous reports on the management of the femoral length. Femoral shortening can be carried out at neck level or in the sub-trochanteric area. The use of a subtrochanteric osteotomy which theoretically allows the surgeon to correct rotation is quite widespread. In these cases it is possible to use cemented or non-cemented prosthesis, and some authors describe the use of osteosynthesis to reinforce the site of the osteotomy. Osteotomy can have different orientations—transverse, oblique, "V"-shaped, or step-shaped. Each kind of osteotomy has different degrees of stability and rates of non-union.[32] We do not use sub-trochanteric osteotomy since it adds complexity to a procedure which is difficult in itself. When it was necessary we carried our femoral neck shortening "on demand" with consecutive slice osteotomies in the distal direction until getting the femoral length that allowed us hip joint reduction.

In this series, seven out of the 80 cases evaluated required revision prosthetic surgery due to implant loosening (1 septic case); therefore, the survival rate at average 10-follow-up was 91.25%.

Conclusions

THR in patients with dislocating dysplasia remains challenging for the specialized surgeon. There are reports on high failure rates using cemented cups at 10-year follow-up, which increases proportionately to the seriousness of the defect and the youth of the patient. Initial results with non-cemented cups seem to be promising, but we need more studies showing good results, with a greater number of long-term cases. We still appreciate the use of structural bone graft for the lateral defect and morcellized bone for the provoked protrusion, and that of cemented cups for large defects if a non-cemented option is not available.

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ISSN 1852-7434 (online) • ISSN 1515-1786 (printed)

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