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PRIMARY THA

CELECOXIB VS INDOMETHACIN IN THE PREVENTION OF HETEROTOPIC OSSIFICATIONS AFTER TOTAL HIP REPLACEMENT

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INTRODUCTION. Heterotopic ossifications are a possible complication of surgery and trauma of the hip. Following hip prosthesis this complication can occur, according to different authors, in 14 to 63% of the patients, while in 2 to 13% of cases estensive formation of ectopic bone can be painful or significantly reduce the range of motion and joint function, with the need of further complex surgical intervention to remove the heterotopic ossified tissue.
Prophylaxis of this known complication is indicated after all major surgeries on the hip.
While controlled studies have shown that dyphosphonates and pulsed intra-operative lavage are not able to prevent heterotopic bone formation after hip surgery, the administration of non-steroidal anti-inflammatory drugs, as indomethacin or other aspirin-like drugs, that act by inhibition of the enzymes cyclo-oxygenase 1 (COX-1) and COX-2, have proved to be statistically effective in hip prostheses, pelvis osteotomies and acetabular fractures. Low-dose irradiation after total hip replacement has also been reported to be effective in the prevention of peri-articular ossification. While an extensive use of low-dose irradiation is limited by logistical problems, costs and concerns about irradiating a vast population of patients, the use of non-steroidal anti-inflammatory drugs (NSAIDs) is an easy to do and effective prophylaxis, that can be performed in any hospital, even if side effects can limit its use. Side effects associated with the use of COX-1 and COX-2 non-selective inhibitors should not be underestimated, especially when considering that often old patients are to be treated, already affected by concomitant gastrointestinal or cardiovascular pathologies that can negatively respond to a prolonged post-surgical administration of NSAIDs.
COX-2 selective inhibitors are a new class of anti-inflammatory drugs that have been shown to selectively inhibit the COX-2 enzyme, while leaving intact the function of COX-1. This allows significant reduction of the occurrence of side effects, especially on the gastrointestinal tract and on the platelet function, but even on the cardio-renal apparatus and on the central nervous system, while preserving the anti-inflammatory action of the drug.
To our knowledge this is the first study that compares the effectiveness and safety of a COX-2 inhibitor, celecoxib, with a COX-1 and COX-2 inhibitor, indomethacin, in the prevention of heterotopic ossification after total hip replacement.
METHODS. 250 patients receiving indomethacin 50 mg x 2 / day (according to patient's weight) and 150 patients receiving celecoxib 200 mg x 2 / day for 20 days after total hip replacement, were included in the study. The two groups were similar for age, sex and pre-operative diagnosis.
RESULTS. An overall incidence of heterotopic ossification of 17.4% and 14.3% was observed in the indomethacin and in the celecoxib group, respectively. The difference in the incidence of heterotopic ossifications between the two groups was not statistically significant ($p > 0.05$). According to the Brooker's classification Grade I ossifications were seen in 12.2% of the patients in the indomethacin group and in 10.2% in the celecoxib group and Grade II ossifications in 5.2% and in 4.1% respectively. No Grade III or IV ossifications were observed in either group. 21 patients in the indomethacin group (8.4 %) required discontinuation of treatment after a mean of 7.5 days of therapy, due to gastrointestinal side effects (15 patients), excessive bleeding (4 patients) or mental confusion (2 patients). 3 patients in the celecoxib group (2.0 %) reported nausea or gastrointestinal pyrosis that required discontinuation of treatment after 12 days of treatment, on average. The difference in the occurrence of side effects was statistically significant ($p < 0.05$).
CONCLUSIONS. A selective COX-2 inhibitor, celecoxib, showed in this study the same efficacy as indomethacin in the prevention of heterotopic ossifications after total hip replacement with significantly fewer side effects. The results also provide indirect evidence that only COX-2 enzyme is involved in the biochemical pathway that leads to the formation of ectopic bone after surgical trauma in the hip.

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THE TECHNIQUE OF PREOPERATIVE PLANNING IN THR

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While reading the introductions of papers dealing with THR, the reader always encounters the sentence "we need a good, well done, preop plan". But, how many surgeons spend time "drawing" that plan? The commonest way to make a preop plan is to put the template over the radiograph and choose the size of the stem that fits best. Sometimes, however, there are no templates for the cups.
The aim of our paper is to give technical and manual tricks in order to make a good preop plan. The steps, once learnt, will make the surgeon draw up a good plan 20 minutes or so. This time, spent the day before the operation, gives the surgeon a complete overview of the problems that he could encounter during the operation and, above all, gives him the possibility to prevent and immediately correct these problems.
First of all, we need a good A-P X-ray of the pelvis with both the hips and with the shaft of the femur (at least 20 cm distal: the lesser trochanter) and a CT scan of the femur at the level of the lesser trochanter and 10 cm distal to that point. These exams will evaluate if the femur is cylinder or sand-glass and will show the thickness of the cortical bone. On the acetabular side we study the depth, the width and the shape of the acetabulum, the presence of osteophytes or geoda. From these data we choose the kind of stem and the kind of cup that will be, theoretically, the best implant for that hip and that patient.
But we need a proof that our theories are true. The proof is the preop drawing. We need transparent sheets, templates of the stems and cups, pencils and coloured pens.
In the first sheet we draw the emipelvis with the tear-drop and the apex of the greater trochanter and the drawing of the cup (put in the best position) with the centre of rotation of the hip joint; a first line tangent to the tip of the actual greater trochanter (we call this, *"line of the old trochanter"*); a line parallel to this last line which will represent the *"future greater trochanter"* (that according to our preop program will be either distal or proximal or corresponding to the line of the older trochanter depending whether we would like to lengthen, shorten or leave the same, our limb) and a third line that will be tangent to the tip of a morse cone line put in the cup (*"morse cone line"*). Now we can measure the distances among these lines.
In the second sheet we draw the femur with a line tangent to the greater trochanter and with a second line, that is the line tangent to the morse cone, that will be distant from the trochanteric line of mm depending from our preop program of length of the limb. At this point we put a stem that will fit the femoral canal and that will have the apex of the morse cone tangent to the "morse cone line".
After this we have the final drawing assembling the second and the first drawing with the correct implant.
Sometimes we'll observe that the stem, that we had chosen theoretically, is not correct and so we'll move to another; sometimes we'll discover that there is a high medialisation of the joint or that it may be difficult to keep a good length of the limb, etc.
With good preoperative planning all these problems can be detected before surgery and the surgeon will be able to solve them in time.

RESTORATION OF FEMORAL OFF-SET DURING HIP REPLACEMENT

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Femoral off-set is defined as the perpendicular distance between the long axis of the femur and the centre of rotation of the femoral head. There has been recent interest in femoral off-set as a factor in total hip arthroplasty.
While stem design is important it is only one of the factors that contribute to a succesful total hip arthroplasty. The authors have shown that femoral off-set correlated positively with increased stability, range of motion and abduction strength. The lateral position of a hip with greater offset has been said to allow an increase in motion (Charnley 1979, Kelikian 1983) and we found that range of abduction was significantly greater in patients with greater femoral off-set.
Femoral off-set will help ensure the correct restoration of soft tissue balance and tension and the succesful reconstruction of the natural joint for each patient.
The femoral stem design with an offering of standard and extended off-set options enhances soft tissue tensioning without affecting leg length when attempting to improve joint stability. The advantages of increased stability, range of motion and abduction strength are conferred by an increased femoral off-set, but a possible disadvantage is an increase in the out-of-plane bending moment in the prosthesis. This effect in the stem is generally not important in modern THA because of the increased fatigue resistance of currently used metals (Steinberg, Harris 1992). An increase in off-set, however, could cause increased strain in the medial proximal femur, and more particularly in the medial proximal bone cement in cemented cases. These potential concerns have been allayed by two recent scientific reports (Davey 1993, Wong 1993).
In conclusion, the authors have shown that the restoration of femoral off-set during hip replacement is correlated positively with increase in range of abduction and that objective strength of abduction correlated positively with both femoral off-set and the length of the abductor lever arm.

REFERENCES

1. Charnley J. Low friction arthroplasty of the hip. Berlin: Springer-Verlag 1979.
2. Johnston RC, Brand RA, Crowninshield RD. Reconstruction of the hip. A mathemaical approach to determine optimun geometric relationship.
3. Keller A. The pros and cons of heads with diameters of 32 mm and larger. Hogrefe and Publishers 1994.
4. Kummer B. "Il trattamento del femore attraverso l'impianto di endoprotesi. Ed Sprinter, Berlino 1984.
5. Legal H. Introduzione dell'articolazione dell'anca nella biomeccanica. Ed Sprinter, Berlino 1984.
6. Lubinus P. "Pre-operative planning in total hip replacement". Video CAD from Link.
7. Lindgren JU, Rysavy J. Restoration of femoral off-set during hip replacement. *Acta Orthop Scand* 1992; 63: 407.
8. Lucas GL, Cooke SW, Frees EA. A primery of biomechanics. Heidelberg: Springer Verlag 1999.
9. McGrory BJ, Morrey BF, Cahalan TD, Kay-Nan AN, Cabanella M. Effect of femoral off-set on range of motion and abductor muscles strength after total hip arthroplasty. *J Bone Joint Surg (Br)* 1995; 77-B: 865.
10. Noble PC, Alexander JW, Lindhal LJ, Yew DT, Grandberry WM, Tullos HS. The anatomic basis of femural component design. *Clin Orthop* 1988; 235: 148.
11. Rod Davey J,O'Connor AS, Burke DW, Harris WYH. Femoral component off-set. *J Arthroplasty* 1993; 8: 23.
12. Van B. Cochran G. A primer of orthopaedic biomechanics, 1982; S244.
13. Franchin F, Sanguineti F, Pipino F. Influenza della forma dello stelo femorale sull'off-set e sulla geometria dell'anca. *G.I.O.T.* 2000; 26 (suppl 1): S183-8.

RADIOGRAPHIC EVALUATION OF THE HIP ROTATION CENTRE AFTER TOTAL JOINT REPLACEMENT IN HIP DYSPLASIA

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BACKGROUND. The overwhelming success of total hip arthroplasty has made it a surgical option for patients suffering from developmental dysplasia of the hip.
However, total hip replacement of the dysplastic hip differs from every other case due to the anatomic, biomechanic and clinical peculiarities of the disease (1).
The anatomic characteristics of this disease are represented by the modification of the normal acetabular and femoral morphology. These peculiarities influence the hip biomechanics resulting in a pathological position of the rotation center, which moves upward and outward.
The usual trend is to place the acetabular component in a physiological position that renders a sufficient covering and a primary stability in the host cavity using small dimension cups in order to recreate a para-physiological rotational center.
MATERIALS AND METHODS: From 1993 to 1999, 60 primary total hip arthroplasties were performed on 46 patients suffering from hip dysplasia at our institution.
The mean follow-up period was 66 months (range 36-102).
The mean age of the patients was 56 years (range 38-75), with a clear prevalence of females (91% corresponding to 42 patients and 55 hips).
The degree of dysplasia was evaluated using the classification proposed by Crowe (2).
At the time of the study, all cases were examined:

a) clinically;
b) functionally;
c) radiographically.

Clinical evaluation was performed using the Harris Hip Score (HHS) (3). It was calculated before the procedure, and at the final follow-up. Results above 90 were judged as excellent, between 80 and 90 as good; between 70 and 79 as fair, and below 69 as poor.
The functional evaluation was based upon the presence or not of a positive Trendelenburg sign indicating gluteus medius weakness and characterized by a relative limp.
The radiographic evaluation, of the hip rotation centre, was performed using the method proposed by Pierchon (4). A standard anterior-posterior radiograph of the pelvis, pre- and post-arthroplasty, was taken in order to identify the center of the head.
Therefore, the examiner calculated the following parameters:

a) The horizontal distance (C) to the center of rotation from the tangent line of the two radiographic tear drops.
b) The vertical distance (A) to the center of rotation from the tangent line of the two radiographic tear drops.
c) The distance (D) between the two radiographic tear drops
d) The vertical distance (E) between the sacro-iliac line space and the radiographic tear drops.

The ratio A/E and C/D represented respectively the real position of the hip rotation centre in term of height and medialisation. The average results of the obtained data have been compared using the Student's T test.
In addition, the average values obtained for gender have been compared with those indicated by Pierchon as representatives of a physiological hip (male 0.3 as C/D, 0.2 as A/E and female 0.25 as C/D, 0.18 as A/E) (4).
RESULTS: At the final examination the average HHS was 92.683 with a general satisfaction level for all the patients. The difference between the preoperative score (54.70) and the postoperative one was statistically significant according to Student's t test ($p<0.05$).
The clinical outcome of 44 hips (74%) was graded excellent, 12 (20%) as good and 4 (6.6%) as fair.
The functional evaluation revealed the presence of a positive Trendelenburg sign in 13 of the cases (21%) with

a related limp.
The radiographical evaluation of the position of the hip rotation centre revealed a statistically significant difference ($p<0.005$) between the preoperative and the postoperative values of both parameters.
DISCUSSION: The objective of this study has been to correlate the clinical result of joint replacement for the dysplastic hip with the obtained modifications of the rotation centre.
The radiological identification of the rotation centre is not easy to perform and is operator dependent. This difficulty is already present when considering a normal hip and becomes more relevant in a dysplastic joint, especially if the disease is bilateral.
The difficulty is related to its identification in an altered structure, such as the diseased femoral head. Thus, it represents the limit of a quantitative evaluation of its position.
Our results revealed that it was possible to modify the position of the pathologic rotational centre with a statistically significant difference ($p>0.05$) for both coordinates.
The general clinical evaluation relates well to the radiological evaluation. The average HHS was 92.683 with a general satisfaction level of all patients and with a significant statistical difference between the preoperative score and the postoperative one.
The attempt to correlate the functional result, i.e. relative limp, to the X-ray one was more complicated.
In these 13 cases revealed that 58% of cases (7 cases) had a higher value of medialisation (C/D) when compared to the preoperative value or to the reference one. This means we were not able to move the hip rotational point inward with respect to the preoperative coordinate or with respect to the ideal one.
However, this data does not have a statistical value that can be confirmed as a relationship between the value of medialisation and the presence of a limp. Yet, some experimental experiences give us an indirect explanation and hence a confirmation of our impression (5-7).

REFERENCES

1. Kerboul M, Mathieu M, Sauzieres P. Total Hip replacement for congenital dislocation of the hip. In Total Hip Replacement, Springer-Verlag, 1987.
2. Crowe JF, Mani VJ, Ranawat CS. Total hip replacement in congenital dislocation of the hip. *J Bone Joint Surg (Am)*, 1979; 61-A: 15-23.
3. Harris W.H. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment with mold arthroplasty. An end-result study using a new method of results evaluation. *J Bone Joint Surg (Am)* 1969; 51-A: 737-55.
4. Pierchon F, Migaud H, Duquennoy A, Fontaine C. Evaluation radiologique du centre de rotation de la hanche. *Rev Chir Orthop* 1993; 79: 281-4.
5. Tranqilli Leali P, Meyer-Kaarden K, Merolli A, Schlueter H, Dedic A. A technique for the analysis of standard AP X-rays films of the hip joint. Procedings Biosis. Annual Meeting 1991; 89-101.
6. Tranquilli Leali P, Merolli A. La ricostruzione del centro di rotazione. Atti del Convegno internazionale "Attualità e prospettive nelle protesi d'anca: i reimpianti", 1994; 138-40.
7. Tranquilli Leali P., Bartolini F., Del Bolgia F. Analisi della geometria e dei carichi agenti sull'anca mediante sistemi di calcolo ed acquisizione semiautomatici. *Minerva Ortopedica* 1983; 34: 1-14.

DISLOCATION INDEX AFTER TOTAL HIP ARTHROPLASTY

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Authors describe their first 100 patients study searching for a "dislocation index" to asses a prognostic value after a total hip arthroplasty (THA) dislocation.
Dislocation following total hip arthroplasty represents one of the major complications of total hip arthroplasty. It is a clinically important event that often leads to a *decay* of patient quality of life. In same patients the hip remains unstable with multiple dislocations. The genesis of this instability is often not easy to explain. Many factors can lead to THA instability. We have found four factors that influence the stability of a replaced hip joint:

1. Prosthesis positioning and surgical approach;
2. Implant design and sizes;
3. Psycho-physical status of the patient;
4. First dislocation effects.

Prosthesis positioning and surgical approach involve anteversion and cover angle of the cup, anteversion and retroversion of the femoral stem, bone-to-bone and prosthesis-to-bone impingement, off-set and soft tissue balance.
Implant design and sizes. Nowadays it is well known that the use of bigger heads leads to fewer dislocations. At the same time wear, range of motion and costs differ a lot.
Modular prostheses should achieve, in theory, better soft tissue balancing.
Psycho-physical status of the patient. Age, weight, mental status, concomitant pathologies, soft tissue status, patient compliance and patient way of life etc. All these factors can influence the prognosis.
First dislocation effects. Some surgeons believe that if the dislocation has occurred after an important trauma with the wrong movement of the hip and the THA has been promptly reduced there will be fewer chances of having a new event. The use of a hip tutor should decrease the possibility of new events.
We have started a study to assess the correlation between THA dislocation and different factors focusing on cup and stem orientation. A reproducible CT study has been done of all THA patients to assess cup and stem orientation angle.
Methods and first results will be shown and discussed.

ROLE OF HYDROXYAPATITE AS A BIOACTIVE MATERIAL ON A POROUS COATED SURFACE: HISTOLOGICAL AND ULTRASTRUCTURAL OBSERVATIONS ON A RETRIEVED IMPLANT

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INTRODUCTION. One of the main requirements for the long term survival of a prosthetic implant is to obtain a biological fixation with the host bone. Osseointegration may occur in two ways: through the bone apposition on a smooth surface ("ongrowth") or through the penetration of the new formed bone into the porosities of the implant surface ("ingrowth"). The use of biologically active materials such as hydroxyapatite (HA) in prosthetic surgery makes osseointegration easier. The combination of a porous surface and a bioactive coating of HA is, nowadays, the gold standard for biological fixation of a prosthetic system.
MATERIALS AND METHODS. The Authors present a histological and ultrastructural analysis of a HA on porous-coating stem removed forty days after implantation. The implant was analyzed by stereomicroscopy and then, after fixation in formalin, was cut perpendicularly to the major axis of the stem with a diamond saw (EXACT). The sections were used for histological and ultrastructural analysis at hematoxyline-eosine and scanning electron microscopy (SEM).
RESULTS. The macroscopic analysis of the implant showed a newly formed bone tightly adherent to the surface. The microscopic analysis showed, at low magnification, the presence of bone inside the porosities; at higher magnification immature bone was in contact with the beads of the coating. Moreover, we could observe the complete resorption of the HA-coatings in some areas.
CONCLUSIONS. On the basis of these preliminary observations, the authors sustain the effectiveness of the association of HA with porous coating. An early osteointegration, permits a sealing effect against diffusion of polyethylene wear debris, and may delay implant loosening.

PROBLEMS CONNECTED TO ACETABULAR REPLACEMENT IN DYSPLASTIC HIP. RESULTS AT 5 TO 13 YEARS OF FOLLOW-UP

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Total hip replacement for the patient with a dysplastic hip is difficult.
Related to acetabulum the problems are the limb-length discrepancy, the placement and coverage of the cup and theneed for small acetabular components.
Acetabular replacement in Crowe type IV is strictly connected to the method adopted for femoral replacement and represents a distinctive problem so that it is considered in this study which concerns only type II and III of Crowe.
The most important aim is positioning of the cup in the correct hip center so that limb discrepancy is corrected.
The obliquity of the ilium and the consequent unsphericity of the acetabular cavity very often imply the difficulty in inserting the cup in the desired position.
There are two possible solutions:

a) medialisation of the cup taking advantage of the bone stock in the acetabular cavity;
b) positionning the cup in the right position and filling the uncovered superior space with bone graft;

Advantages of solution a) are: no utilisation of bone graft, immediate complete stability of the cup.
Disadvantages are: reasonable excessive medialisation, need of small cups and consequent thinness of the polyethylene liner.
Advantages of solution b) are: no medialisation, use of cups of normal size.
Disadvantages are: the surface of the cup to be covered must not exceed 30% of the entire circumference, immediate cup stability is uncertain.
The objective of this study is to verify the results obtained with both methods in 46 hips of 44 patients type II and III of Crowe submitted to hip arthroplasty for dysplasia:

1) 10 had a small cup (Ø from 48 to 42 mm),
2) 32 a normal cup + bone graft,
3) 4 had a stemmed cup (McMinn).

Follow-up ranged from 5 to 13 years with a mean of 9.7 years.
The age of the patients varied from 46 to 68 years (mean 58.4 years); 10 were male and 34 female.
All the cups of group 2 and 3 are surviving at the recent control.
In the group 3 two cups has been revised because of excessive wear of the polyethylene liner.

STEMMED CUP IN SECONDARY ARTHRITIS FROM CONGENITAL DYSPLASIA OF THE HIP

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Total hip replacement in congenital dysplasia of the hip (CDH) presents some characteristics:
1) The patient is young and active;
2) There is a very superficial, large, deformed and vertical acetabulum;

3) femural head is large and deformed.
From a technical point of view it is very difficult to obtain stable fixation of the cup and a good position of the center of rotation. In severe cases there is very little bone stock on which to fix the prosthesis. These factors are very challenging for the surgeon, and failures are frequent.
In 1999 we began to use the stemmed cup in CDH. After approximately one year, a modification of McMinn cup was performed by the senior author (F. S. S.), producing a cannulated ancillary instrumentation. An aiming device was used to ensure the exact positioning of the reamer, and a cannulated instrumentation to place the stemmed cup safely.
We performed 37 cases; 1 infection, treated with antibiotics, 0 dislocations, 0 loosenings were registered.
In the operating room it is mandatory to initially check the good viewing of X-ray projection in AP and oblique plane. The entry point of the guide wire is partially posterior, and in the inferior quadrant of acetabulum. On Ap plane optimal inclination is chosen, on oblique projection a check of good position in the iliac *histmus* is obtained. The reamer should prepare the posterior wall of the acetabulum, never destroying it. The superolateral portion of the acetabulum is not prepared by the cannulated reamer, but by a normally spherical reamer, just to refresh the bone bed on which to put the grafts. Very often we use bone chips of 1 cm.sq. to fill the defect on the superolateral part. The chips are laid down and vigorously impacted by dedicated impactors to achieve a good rehabilitation.
According to us at the moment the stemmed cup is the best solution for CDH, on account of the immediate stability achieved. When the case is severe we put bone grafts in between the cup and the bone bed. In 5 cases we used special mesh (generally used in revision surgery) to maintain bone grafts. According to us it is very helpful to impact the grafts, that are biomechanically "protected" by the prosthesis. In this manner there is neither overstress nor resorption of bone chips, and a very fast rehabilitation of bone grafts is noted. This allows immediate partial weight bearing avoiding the long period of immobilization we prescribed in the past.

A MODIFICATION OF THE TRILOGY CUP SYSTEM FOR CERAMIC-CERAMIC COUPLING

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BACKGROUND. The problem of wear in THA is well known (1, 2). Ceramic-ceramic, thanks to its very good tribological features, is one of the couplings most used. At the present, the long experience and the evolution of the designs and materials has made it a safe and a very low wear system (3-6). Moreover the pure titanium fiber metal coating is a widely clinically proven socket fixation (7, 8). This kind of surface finishing is very effective in favouring the bone ingrowth both in primary and in revision acetabular replacement (9, 10).
From those statements a modification of the Trilogy system (Zimmer™) was created: the Trilogy AB cup, with an alumina liner, fixed by a cone angle, in a metal back shell.
We analysed our experience with this implant.
MATERIALS AND RESULTS. A series of 250 cups with liners in ceramics for heads of 28 mm of diameter, installed between February 2000 and September 2003 at Istituto Ortopedico Galeazzi in Milan, are evaluated. The average age of patients is 58.7 years (min. 20, max. 87).
The primary THA are 213 with diagnosis of primary arthritis (126 cases), DDH (53), fractures of the femoral neck (22), post-trauma (6), head necrosis (4), arthrodesis (1), post-SCFE (1). The revisions are 37 (16 only of the cup).
Uncemented stems were associated in 193 implants and cemented stems in 41.
There were no problems of breakage of the materials. One implant was removed because of deep infection. In this case the liner removal was very easy thanks to the specific instrumentation. There were two cases of loosening: one in a severe DDH and one in a case of revision with a great loss of bone stock.
DISCUSSION. This cup has shown to be a satisfactory implant. The fiber metal coating assures a very good ingrowth also in case of sclerotic bone, such as in dysplastic hips or previous surgeries, and in revision surgery with loss of the bone stock.
Moreover the alumina-alumina coupling should guarantee a long life of the implant. A precise surgical technique is mandatory such as in ceramic-ceramic implants.

REFERENCES

1. Willert HG, Bertram H, Buchorn GH. Osteolysis in alloarthroplasty of the hip: the role of ultra high molecular weight polyethylene wear particles. *Clin Orthop* 1990; 258: 95-107.
2. McKellop HA, Campbell P, Park SH, Schmalzried TP, Gregoris P, Amstutz HA, Sarmiento A. The origin of submicron polyethylene wear debris in total hip arthroplasty. *Clin Orthop* 1995; 31: 3-20.
3. Willmann G. The evolution of ceramics in total hip replacement. *Hip International* 2000; 10: 193-203.
4. Garcia-Cimbrelo E, Sayanes, Minuesa JM. Ceramic-ceramic prosthesis after 10 years. *J Arthroplasty* 1996; 11:773-81.
5. Sedel L. Evolution of alumina-on-alumina implants: a review. *Clin Orthop* 2000; 379: 48-54.
6. Toni A, Terzi S, Sudanese A, Bianchi G. Fracture of ceramic components in total hip artrhoplasty. *Hip International* 2000; 10 (1): 49-56.
7. Tompkins GS, Jacobs JJ, Kull LR, Rosenberg AG, Galante JO. Primary total hip arthroplasty with a porous-coated acetabular component: seven to ten year results. *J Bone Joint Surg (Am)* 1997; 79-A: 169-76.
8. Berger RA, Jacobs JJ, Quigley LR. Primary cementless acetabular reconstruction in patients younger than 50 years old: 7 to 11 years results. *Clin Orthop* 1997; 344: 216-26.

9. Lachiewicz PF, Poon ED. Revision of a total hip arthroplasty with a Harris-Galante porous-coated acetabular component inserted without cement: a follow-up note on the results at five to twelve years. *J Bone Joint Surg (Am)* 1998; 80-A: 980-4.
10. Deaborn JT, Harris WH. Acetabular revision after failed total hip arthroplasty in patients with congenital hip dislocation and dysplasia: results after a mean of 8.6 years. *J Bone Joint Surg (Am)* 2000; 82-A: 1146-53.

A COHERENT, CONICAL, PRESS-FIT HIP PROSTHETIC SYSTEM: THE C.P.C. CUP AND THE C.P.S. STEM

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This paper focuses on the C.P.C.-C.P.S. hip prosthetic system, trying to underline its major founding concept, that the **dynamic press-fit** represents the lowest common denominator of both the prosthetic components.
Over the last decades many authors have been working hard in designing and developing cups of different shape, with the aim to obtain a valid and durable integration of the metal with the host bone. Looking back at the different schools of thoughts it can be said that, intraoperatively, for the implant of the cup three main solutions have been adopted:
- cementing technique, using the cement as a filler to fix the prosthesis in a cavity which may be even roughly prepared;
- cup screwing, fixing the prosthesis into an accurate cavity, having a smaller diameter than that of the cup;
- simple press-fit, by fixing the implant into an accurate bed, so that a wide contact area may be obtained.
This latter technique leads to a quite good immediate stability, thanks to its elastic fitting, while, over the months, the forces that normal walking discharges on it are able to enhance the adherence and favour the gripping, so that a good bone integration may be achieved and maintained over time.
The ordinary press-fit implants are hemispherically-shaped and have to be fitted into cavities which must be slightly undersized. Biomechanically speaking, this layout has two principal drawbacks:
- the chance for the cup to slide, because a contact between spherical surfaces may favour, due to the weight-bearing itself, the rotational dislocation of the implant;
- there may be contact between the floor of the bone cavity and the dome of the cup. This, sometimes, may concentrate on the loading forces on the implant, lessening, in this way, the interference effect along its border.
As a consequence of this, subsidence, migration and loosening of the implant may be observed. In order to overcome these drawbacks one of the authors (E.C.) has designed, developed and put into clinical practice, since 1993, a conical press-fit cup (C.P.C.). Shaped as a frustum of cone, the cup can be fitted into an accurately prepared cavity by means of simple pressure, thanks to its sliding profile, which allows its proper embedding, and to its longitudinal fins, which increase the grip. As a consequence the axial forces may stabilize the implant.
The intraoperative procedure gains a valid early fixation, while. later on. the weight-bearing itself leads to a constant rise of adherence.
Eight sizes of the C.P.C. ring are available, with a diameter ranging from 48 to 62 mm. Very few instruments are needed to implant it: a set of conical cutters and a simple device, the same for its positioning and its removal.
The C.P.C. ring is usually coupled with a femoral stem (C.P.S.) that shows similar biomechanical properties. It is well known that the simplest and surest form of driving is that of a cone pushed into a congruent site: this is the source of a quite valid and stable mechanical matching. The C.P.S. stem is a prosthesis that is proximally shaped as a frustum of pyramid and changing in conical going distally: it is driven by simple pressure into a properly shaped metadiaphyseal site and then is stabilized by the segmental forces acting locally. The maximum metal-bone adherence is due to their good congruence, consequence of an optimal matching between the geometry of the prosthesis and that of the femoral canal. Two major factors play a role in that:
- the similarity of the prosthetic geometry to that of the medullary canal. The section of the femoral canal is potentially trapezoidal in the intertrochanteric metaphysis, elliptic in the subtrochanteric metaphysis and round in the diaphysis. For proper matching the C.P.S. stem presents a variable section; it is proximally trapezoidal and, going distally, it changes in elliptical and finishes to be round at the tip.
- the finishing of the medullary canal is corresponding to the prosthetic geometry. The homogeneous bone-metal adherence is related to a well-balanced distribution of the contact forces, avoiding, in this way, subsidence, loosening or stem malposition.
The stem is provided with a series of longitudinal fins which act as load absorbers, distributing the forces, widening the contact with the bone and calling to work unexploited areas. They also increase the bearing surface and favour the rotational stability.
The stem is available in 5 sizes, from 7 to 11. The ordinary indication is the first implant, but it can be utilized also in revision surgery when the proximal femur presents a good bone stock, especially when treating cases of loosening of uncemented short stems.
The authors present the results of their ten year long experience with this prosthetic system, implanted on more than 1000 patients, highlighting the clinical and radiographic outcomes.

INDICATIONS AND RESULTS OF THE VERSYS ET STEM

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BACKGROUND. The actual rationale of a non-cemented stem is (1, 2):
1. To obtain a reliable primary stability (mechanical);
2. To transmit the majority of forces to the proximal part of the femur, in order to avoid bone resorption due to stress shielding phenomenon;
3. To achieve the secondary stability (biological) by bone apposition.

The wedge shape of the stem is very effective in getting an excellent mechanical stability and moreover it is self-locking (3). The Versys Enhanced Taper stem (Zimmer™) was designed to follow these statements (4). An "aggressive" design with sharp corners and fins causes concentration of stresses leading to an improvement of stability at the level of the proximal femur, while the small distal part of the tapered stem has mainly the function of orientating the device.
The bony apposition is possible only in presence of a complete primary stability and is promoted by a biocompatible material (Titanium alloy), with adequate roughness (corundumblasted) and related to the quality of the bone (5).
The indications for this uncemented stem come from (6): the bone shape (the sand-glass shape medullar canal), the bone quality (to allow the mechanical stability and to promote bone ingrowth such as in "young" patients below the age of 70) the bone size (it is not indicated in very large canals, in fact there is a limitation of the number of sizes excluding massive devices which causes stiffness) (7, 8).
A precise surgical technique is mandatory. The most dangerous error is the positioning of the stem in varus. Also the under sizing of the device should be avoided.
According with these criteria, we now consider suitable for an ET stem roughly 50-60% of our primary cases.
MATERIALS AND RESULTS. A prospective series of 100 consecutive cases (95 patients, 5 bilateral) of primary THA performed between 1/9/1996 and 30/06/1997 by one single surgeon (R.G.C.) is evaluated.
Patients coming from distant locations with no possibility of follow-up (7 cases) were excluded. The surgical technique and approach (postero-lateral) were the same.
The average age of the patients was 62 years (36-75). 39 were males and 56 females.
The diagnosis were: primary arthritis 59 cases, post DDH 27, rheumatoid arthritis 3, post-traumatic 3, head necrosis 3, acetabular fracture 1, femoral neck fracture 2, post SCFE 1, post-coxitis 1.
Intra-operative complications were: 2 greater trochanter fractures (treated with Kirschner wires) and 2 proximal femur fractures (treated with cerclage), all healed in the first X-ray follow-up at three months after the operation.
The average follow-up is 77.4 months (72-82). 1 case was lost to follow-up: (female, 73 years, degenerative arthritis). There was one stem failure: a female, 72 years old, with degenerative arthritis. This failure was probably related to an undersized and varus positioning of the stem, which required a revision 2 years after the operation.
The average pre-operative Harris Hip Score was 66.8 (38-84) and post operative 95.3 (71-100), which is a significant improvement for the patients.
DISCUSSION. The experience with an enhanced tapered uncemented stem suggests that very good results are achieved if indications are strictly followed and the surgical technique is precise: never undersize the implant, but, which is more important, never put it in varus. The clinical and radiographic good results are confirmed in a consecutive series of patients at a mean follow-up of 77.4 months.

REFERENCES

1. Giacometti Ceroni R, Pace A. CLS femoral component. *Orthopedics* 1989; 12(9): 1195-2000.
2. Grappiolo G, Blaha JD, Gruen TA, Burastero G, Spotorno L. Primary total hip artroplasty using a grit-blaste, press-fit femoral prosthesis. Long-term results with survivorship analysis. *Hip International* 2002; 12 (2): 55-72.
3. Giacometti Ceroni R, Castelli C, Cherubino P. Filosofie nella protesizzazione dell'anca: lo stelo. La fissazione prossimale. *Giorn It Ortop Traumatol* 1996; 22 (suppl 1): S383-90.
4. Cherubino P, Zatti G, D'Angelo F, Surace M. Tapered ET primary stem: philosophy and first results. *Hip International* 2002; 12 (2): 198.
5. Feighan JE, Goldberg VM, Davy D. The influence of surface-blasting on the incorporation of titanium-alloy implants in a rabbit intramedullary model. *J Bone Joint Surg (Am)* 1995; 77-A: 1380-95.
6. Zagra L, Giacometti Ceroni R. Basi teoriche e indicazioni dello stelo non cementato ET. In: Franchin F. La protesi d'anca di primo impianto. Milan: Springer-Verlag 2003; 247-50.
7. Engh CA, Bobyn JD. The influence of stem size and extend of porous coating on femoral bone resorption after primary cementless hip arthroplasty. *Clin Orthop* 1988; 231: 7-28.
8. Bobyn JD, Glassman AH, Goto H. The effect of stem stiffness on femoral bone resorption after canine porous-coated total hip arthroplasty. *Clin Orthop* 1990; 261: 196-213.

TOTAL HIP REPLACEMENT AND SPORTS ACTIVITY

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INTRODUCTION. Total hip replacement is a treatment option when significant functional impairment exists due to degenerative

joint disease. However, concerns emerge when treating the younger or more active patient because expectations for recovery are high. Young or active patients undergoing total hip replacement have high expectations for recovery and want to resume their former level of physical activity. Factors such as wear, implant load, intensity of activity and type of prosthesis must be considered when discussing patient expectations and making recommendations for appropriate sport activity. In a series of 116 total hip replacements, Ritter et al reported no evidence of adverse effects related to low-impact sports activities at 3-year follow-up. In a study evaluating the effects of high-impact activity on hip replacement, Mont et al studied 75 total hip replacement patients who played tennis. At 8-year follow-up, 4% of the patients required revision surgery. Kilgus et al, in a series of 25 cemented hip replacement patients involved in high-impact activities at 6-year follow-up, found double the risk for mechanical injury. This risk increased dramatically at ten years. The purpose of our study is to evaluate what effect hip arthroplasty and hip resurfacing has on patient participation in sports and to determine whether involvement in sport activity influences the success of a hip replacement.

MATERIALS AND METHODS. In the first series, thirty-one patients with a mean age of 50.9 years (31-59) were treated with uncemented HA-coated total hip replacement. In the second series, 45 patients with a mean age of 48 years (16-71) were treated with Birmingham hip resurfacing. HHS was assessed for all patients with a mean follow-up of 28.6 months (24-36) for the first series and 9 months (5-28) for the second series. Routine hip x-rays were examined to assess aseptic loosening. To analyze the effect of athletic involvement on hip replacement, a questionnaire was sent to all patients. Patients were requested to describe sport activity before and after surgery, type of activity, and frequency of sport activity.

RESULTS. In the first group, the mean HHS was 90.3. x-rays showed no signs of aseptic loosening. There was a decrease in all forms of activity after surgery, with the exception of bicycling and walking. Only 9 patients resumed low-impact sport activity, such as swimming, cycling and doubles tennis, more than once a week. 12 patients resumed sports once a week or less. Ten patients did not participate in any activity except walking. In the second group, mean HHS was 97. There were no signs of aseptic loosening on x-ray. All hip resurfacing patients who formerly played sports, including high-impact, i.e., soccer, body-building and running, resumed activity without pain. Ten patients, who before surgery did not engage in sports, had begun low-impact sport activity.

DISCUSSION AND CONCLUSION. Hip replacement can improve function and quality of life. Evidence suggests that the active, conventional total hip replacement patient is at greater risk for wear and loosening of the implant, therefore, high-impact activity is contraindicated. Although most patients do not resume sports following hip replacement, this study shows that intelligent participation in low-impact activities such as walking, bicycling, swimming and doubles tennis does not adversely affect the outcome of total hip replacement. Patients who participate in low-impact sport activities do not appear to be at increased risk, although whether this affects the long-term stability of the implant remains unclear. Moreover our findings suggest that hip resurfacing patients have better functional results than conventional hip arthroplasty patients.

REFERENCES

1. Kuster MS. Exercise recommendations after total joint replacement: a review of the current literature and proposal of scientifically based guidelines (Review). *Sports Med* 2002; 32 (7): 433-45.

2. Goldsmith AA, Dowson D, Wroblewski BM, Siney PD, Fleming PA, Lane JM. The effect of activity levels of total hip arthroplasty patients on socket penetration. *J Arthroplasty* 2001 Aug; 16 (5): 620-7.

3. Goldsmith AA, Dowson D, Wroblewski BM, Siney PD, Fleming PA, Lane JM, Stone MH, Walker R. Comparative study of the activity of total hip arthroplasty patients and normal subjects. *J Arthroplasty* 2001; 16 (5): 613-9.

4. Kilgus DJ, Dorey FJ, Finerman GA, Amstutz HC. Patient activity, sports participation, and impact loading on the durability of cemented total hip replacements. *Clin Orthop* 1991; (269): 25-31.

5. Healy WL, Iorio R, Lemos MJ. Athletic activity after joint replacement (Review). *Am J Sports Med* 2001; 29 (3): 377-88.

6. Gschwend N, Frei T, Morscher E, Nigg B, Loehr J. Alpine and cross-country skiing after total hip replacement: 2 cohorts of 50 patients each, one active, the other inactive in skiing, followed for 5-10 years. *Acta Orthop Scand* 2000; 71 (3): 243-9.

7. Mont MA, LaPorte DM, Mullick T, Silberstein CE, Hungerford DS. Tennis after total hip arthroplasty. *Am J Sports Med* 1999; 27 (1): 60-4.

8. Zahiri CA, Schmalzried TP, Szuszczewicz ES, Amstutz HC. Assessing activity in joint replacement patients. *J Arthroplasty* 1998; 13 (8): 890-5.

9. Espehaug B, Havelin LI, Engesaeter LB, Langeland N, Vollset SE. Patient satisfaction and function after primary and revision total hip replacement. *Clin Orthop* 1998; (351): 135-48.

10. Mallon WJ, Callaghan JJ. Total joint replacement in active golfers. *J South Orthop Assoc* 1994; 3 (4): 295-8.

11. Johanson NA, Charlson ME, Szatrowski TP, Ranawat CS. A self-administered hip-rating questionnaire for the assessment of outcome after total hip replacement. *J Bone Joint Surg (Am)* 1992; 74 (4): 587-97.

12. Ritter MA, Meding JB. Total hip arthroplasty. Can the patient play sports again? *Orthopedics* 1987; 10 (10): 1447-52.

SEPTIC HIP PROSTHESIS: A CLASSIFICATION PROPOSAL

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Patients affected by septic hip prosthesis have histories, clinical presentations, indications to the treatment and prognosis that differ widely.
A classification system of these patients could allow the surgeon to choose the treatment more consciously, making at the same time more easy to compare and understand the results of different case histories.
The classification system should be able to describe the general and local conditions of the patient concerning both the implant and the septic process. It should be simple enough to be used by the majority of the surgeons, to introduce a common language.
After a brief demonstration of the diagnostic tools today available for infection in hip prostheses, the authors show a new classification system based on seven paramenters:

1. Host type, based on the classification of Cierny-Mader for osteomyelitis.
2. Bacteria, in which antibiotic sensitive Gram positive microorganisms, Methicillin-resistants, Gram negative and mixed florae are differentiated.
3. Implant stability, that distinguishes among stable, partially loosened and loosened prostheses.
4. Bone-stock, that indicates residual bone according to the G.I.R. classification.
5. Duration of the infection: early, delayed and late infections are differentiated.
6. Activity of the infection: acute, subacute and chronic infections.
7. Extension of the infection: absent or minimum, partial of estensive peri-prosthetic bone involvement.

A simple score, from 0 to 14, drives the indication to the treatment, medical or surgical, providing information on the prognosis. The classification system is discussed in the light of clinical examples.
In particolar are reported the results of a clinical ongoing study, in cooperation with the Dipartimento di Medicina Nucleare dell'Ospedale Maggiore di Milano, regarding the use of the P.E.T. (Positron Emission Tomography) in the topographic definition of the septic process around the prosthetic implant.
Every classification system in medicine introduces approximations in the effort to define a biological process. This is still more evident when very complex conditions, as joint prosthesis infections, are under study. Even if we are well aware of the limits of the classifications systems, we should also carefully consider the advantages that the classifications have provided to improve the clinical practice and scientific knowledge. In this view, this classification system is proposed and offered to the discussion of the Colleagues.

OUR PRELIMINARY EXPERIENCE WITH ANTERIOR MINIMAL INVASIVE HIP ARTHROPLASTY

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The minimally invasive anterior approach, a modified and limited Smith Petersen exposure, has been adopted in elective patients due to its potential reduced postoperative morbidity compared to conventional direct lateral approach as a result of preservation of the miotendinous insertion despite of its superior technical demands to adapt this exposure to specific requirements of THR.
In particular the exposure of the proximal femur has been shown to require some specific adaptations, such as the use of traction table and hooks for femoral exposure. Standard acetabular cups and femoral components may be inserted using conventional tools (conventional acetabular reamer, conventional inserters); Off-set rasps and femoral inserters of traditional femoral components may be more suitable for femoral insertion without interfering with the iliac wing.
We selected 20 patients; 10 of them were suffering from a dislocated femoral neck fracture and were submitted to cemented hemiarthroplasty. 8 patients suffering from OA and 2 suffering from aseptic femoral head necrosis were treated with cementless THR.
Skin incision ranged from 6 cm to 9 cm. All wounds healed per primam without complications.
Patient's subjective grading has been evaluated according to a numeric pain scale (0 –10); early functional outcome has been rated on p.o. day two, seven and thirty according to a modified functional scale considering active flexion and active abduction.
Average active flexion on p.o. day two was 65°, active abduction 10°. At day 7 active flexion measured 80°, active abduction measured 25°. At day 30 flexion measured on average 90°, abduction 25°. All patients with cementless THR were mobilized on two crutches from p.o. day 2 with partial weight bearing according to our standard protocol.

HIP RESURFACING

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INTRODUCTION. Preservation and restoration of the anatomy and biomechanics are fundamental aims in orthopedic surgery. Therefore, surface replacement of the hip has always been an attractive procedure, and ever since the fifties has undergone considerable development. Unfortunately, however, this type of prosthesis was far less durable than conventional ones (1, 2). However, critical analysis of the clinical results of revised surface prostheses and surrounding

tissues have provided important information about the mechanisms that caused these prostheses to fail. Several studies (1-5) have shown how the main cause of revision was due to loosening of the acetabular component and not necrosis of the femoral head or fracture of the femoral neck. Histological studies on revision samples have, in fact, highlighted that the main cause of loosening was due to osteolysis produced by the activation of macrophages by the particles of polyethylene released, during weightbearing, by contact between the components. The presence of active osteocytes inside the femoral head, a sign of its viability, has also been reported. Osteolysis was also favored by the large size of the components (1) and was more common in young active subjects (6, 7).

Better knowledge about the properties of materials and their treatment has prompted a return to using this type of prosthesis, especially with a metal-metal coupling. In fact, the encouraging results of McMinn's work have shown a survival rate of 98% at 6-7 years follow-up in 1,720 hybrid implants, high patient satisfaction and good function. There were only 17 cases of failure in hip resurfacing arthroplasty. All of the young patients treated were able to resume the activity they carried out before surgery, with marked functional improvement. An early and extensive ingrowth in the hydroxyapatite coated porocast socket (8) was observed. Instead, with regards to the femoral component, it was seen that cementing the head is the best fixation technique, which is helped by a patent network of spongy bone, because it contributes to avoiding loosening and subsidence. No wear has been observed in the metal of the revisions so far carried out. The blood level of metal in the active patients was not significant, and low friction torque was measured by a pendulum experimental model. In a study of 21 resurfacing arthroplasties with metal-metal couplings implanted from 1993, Amstutz reported greater ROM, and a better clinical score compared to total hip arthroplasty, and no cases of femoral neck fracture, dislocation or infection (1).

Treatment of hip diseases in young active subjects is a difficult choice, mainly because of the unsatisfactory long-term results that are achieved by total hip arthroplasty. When the lesion is contained and not severe, an alternative procedure is preferred which can preserve as much bone as possible and delay a definitive procedure, such as total hip arthroplasty. Surgical indication for resurfacing arthroplasty is young age and high functional demand (9-13). Young and active subjects are indicated for resurfacing because it is a less traumatic conservative technique, which enables them to resume the lifestyle they were accustomed to before the operation. Pain and functional limitation of the hip make normal daily life difficult for these subjects, and for most of them high functional performance is a necessity (demanding jobs, need to walk long distances, etc.), or a personal choice (sports). The main diseases that require this type of operation are osteoarthritis, congenital hip dysplasia, rheumatoid arthritis, partial osteonecrosis, and post-traumatic arthritis. The main advantages obtained by resurfacing arthroplasty are: normal anatomy is maintained (off-set, limb length and femoral anteversion), viability in the femoral head is preserved, the risk of dislocation is reduced to a minimum, proprioceptivity is preserved, and in case of revision, total hip arthroplasty can be performed.

MATERIALS AND METHODS. In our ward we carried out 45 resurfacing arthroplasties in 44 patients. Mean age was 48 years (16-71), etiology of the lesion was: 12 cases of arthritis secondary to congenital hip dysplasia, 25 cases of primary and post-traumatic osteoarthritis, 1 case of epiphysiolysis sequela, and 6 cases of rheumatoid arthritis. Surgery was performed through a posterior approach to the hip, which enabled the femoral head to be exposed better. Patients were assessed at the moment of follow-up by the Harris Hip Score.

RESULTS. At a mean follow-up of 9 months (5-28 months) HHS was 97. All patients had an early return to walking (1 month after surgery), physiologic range of movement in the hip, and a "normal hip" feeling while practicing sport. With regards to surgical technique, some steps and surgical stages need to be followed in order to get successful results. In fact, in many cases the articular morphology is severely altered. For example, in cases with severe congenital hip dysplasia it may be necessary to use cups which can be fixed by three screws (3 cases) to improve stability, or a derotational femoral osteotomy may be needed (2 cases) in cases with excessive anteversion of the femoral neck. On the other hand, in subjects with severe necrosis (1 case) of the femoral head spongy bone grafts may be useful. In arthritis secondary to acetabular fracture, where the anatomy of the acetabulum is altered, a bridging cup (2 cases) can be used, which, being thicker than normal cups, enables the hip to be restored to its correct position. We had complications only in three cases: two cases of dislocation (one post-traumatic), and 1 case of circumflex artery lesion, which was embolized. In conclusion, we can state, based on our short-term results, that hip resurfacing arthroplasty gives better clinical and functional results than those of conventional total hip arthroplasty, and is especially indicated for young and/or active patients.

REFERENCES

1. Schmalzried TP, Fowble VA, Ure KJ, Amstutz HC. Metal on metal surface replacement of the hip. Technique, fixation, and early results. *Clin Orthop* 1996; 329 (suppl): S106-14.

2. Amstutz HC, Dorey F, O'Carroll PF. THARIES resurfacing arthroplasty. Evolution and long-term results. *Clin Orthop* 1986; 92-114.

3. Mai MT, Schmalzried TP, Dorey FJ, Campbell PA, Amstutz HC. The contribution of frictional torque to loosening at the cement-bone interface in Tharies hip replacements. *J Bone Joint Surg (Am)* 1996; 78 (4): 505-11.

4. Campbell P, Mirra J, Amstutz HC. Viability of femoral heads treated with resurfacing arthroplasty. *J Arthroplasty* 2000; 15 (1): 120-2.
5. Schmalzried TP, Guttmann D, Grecula M, Amstutz HC. The relationship between the design, position, and articular wear of acetabular components inserted without cement and the development of pelvic osteolysis. *J Bone Joint Surg (Am)* 1994; 76 (5): 677-88.
6. Amstutz HC, Thomas BJ, Jinnah R, Kim W, Grogan T, Yale C. Treatment of primary osteoarthritis of the hip. A comparison of total joint and surface replacement arthroplasty. *J Bone Joint Surg (Am)* 1984; 66 (2): 228-41.
7. Kilgus DJ, Dorey FJ, Finerman GA, Amstutz HC. Patient activity, sports participation, and impact loading on the durability of cemented total hip replacements. *Clin Orthop* 1991; (269): 25-31.
8. Amstutz HC, Kilgus DJ, Thomas BJ, Webber MM. Evaluation of bony ingrowth by technetium diphosphonate and sulfur colloid scanning in porous hip resurfacing. *Hip International 1987*; 257-70.
9. Kim WC, Grogan T, Amstutz HC, Dorey F. Survivorship comparison of THARIES and conventional hip arthroplasty in patients younger than 40 years old. *Clin Orthop 1987;* (214): 269-77.
10. Markolf KL, Amstutz HC. Mechanical strength of the femur following resurfacing and conventional total hip replacement procedures. *Clin Orthop 1980;* (147): 170-80.
11. Tooke SM, Amstutz HC, Delaunay C. Hemiresurfacing for femoral head osteonecrosis. *J Arthroplasty* 1987; 2 (2): 125-33.
12. Amstutz HC. The THARIES hip resurfacing technique. *Orthop Clin North Am* 1982; 13 (4): 813-3.
13. Amstutz HC. Conventional versus resurfacing total hip arthroplasty. A long-term prospective study of concomitant bilateral implantation of prostheses. *J Bone Joint Surg (Am)* 1986; 68 (9): 1464.

FIRST EXPERIENCES WITH BHR

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INTRODUCTION. Total hip replacement (THR) is one of the most successful and cost-effective surgical interventions in medicine (1), in particular for middle aged or elderly patients. The durability of THR in young and active patients has remained poor (2).
However, there are at least two problems that a young or active patients faces with regard to the prosthetic joint (3). First the use of the implant is more intensive because of physical activity. Second, the patient's life expectancy is longer and the potential total number of loading cycles is proportionally increased.
In chronological order, the categorical factors limiting the function and the longevity of a THR are the surgical technique of fixation of the implant to the bone, osteolysis (often associated with wear of the bearing), fatigue failure of the implants, and long term skeletal remodelling.
The goal of the actual bearing combinations is to reduce the number of the biologically active wear particles. The clinical outcomes with the contemporary total hip system with metal-on-metal bearings have generally been good(4).
PURPOSE OF STUDY. At our service, since the year 1998 only metal-on-metal bearings have been used in younger patients (5) (under 65) and in some older patients who participate in activities predicted to shorten the life of THR.
Recently, we have been interested in obtaining a solution for the problem of irreversible bone stock loss in young patient undergoing THR. Conservative hip arthroplasty with resurfacing of the acetabulum and femoral head is an attractive concept (6-8).
The theoretical advantages are less wear, less bone resorption, less leg length discrepancy and offset problems, an anatomical reconstruction, avoidance of "stress-shielding", minimal risk for dislocation and easier surgical revision.
The aim of our study was to evaluate the performance of this prosthesis.
MATERIALS AND METHODS. From February 2002 till June 2003 we performed 11 Birmingham hip resurfacing (Midland Medical Technologies). We used hybrid fixed resurfacing implants: press-fit smooth metal, hydroxyapatite coated for the acetabular component and cement fixation for the femoral component.
Data were collected in a prospective way, the parameters that we evaluated were:
etiology, age, gender, blood loss and operating time, clinical and radiographic score, pain complaint, complications, heterotopic ossification.
To avoid the risk of femoral neck fracture, the patients were selected on the basis of clinical history and dexa scan so that they had a good bone stock quality (9).
CLINICAL EXPERIENCE. Our preliminary data do not allow us to perform a statistical evaluation; however our experience with these implants has generally been clinically satisfactory.
We did not record any failures requiring revision, probably because of the selection criteria of the patient.
The functional outcome has been good in this group of patients. Plain X-rays have shown very satisfactory appearances. Meticulous surgical technique is a key to a good postoperative and long term results.
We are planning to develop cross correlations to determine if the placement of the prosthesis plays a role in the long term clinical and radiological outcome.
Actually we have no statistical significant clinical results.
CONCLUSION. Hip resurfacing has had a troubled history and needs further evaluation, however the resurfacing devices that are now available were found to give favourable outcomes (8).
Hip resurfacing offers a viable treatment alternative for the younger and more active patients.
Some open questions are left:
- Metal on metal bearings for arthroplasty and large implants

release metal ions (cobalt and chromium), which may have potential harmful long term effects.
-The improper indications (e.g. osteoporosis)
-Young patients require a mini invasive surgery
-The extent of risk of fat embolism during reaming of the femoral head
-Extended indications for use in hip dysplastic disease
-The high cost: hip resurfacing implants are equivalent in price to the most expensive THR implants.

REFERENCES

1. Garellick G, Malchau H, Herberts P, Hansson E,Axelsson H, Hansson T. Life expectancy and cost utility after total hip replacement. *Clin Orthop* 1998; 346: 141-51.
2. Huo M. What's new in hip artroplasty. *J Bone Joint Surg (Am)* 2002; 84-A: 1894-905.
3. Heisel C, Silva M, Schmalzried T. Bearing surface options for total hip replacement in young patients. *J Bone Joint Surg (Am)* 2003; 85-A: 1366-79.
4. Wagner M, Wagner H. Medium term result of a modern metal-on-metal system in total hip replacement. *Clin Orthop* 2000; 379: 123-33.
5. Dorr L, Wan Z, Longjohn D, Dubois B, Murken R. Total hip arthroplasty with use of the Metasul metal on metal artriculation. *J Bone Joint Surg (Am)* 2000; 82-A: 789-99.
6. McMinn D,Treacy R, Lin K,Pinsent P. Metal on metal surface replacement of the hip. Experience of the McMinn prosthesis. *Clin Orthop Rel Res* 1996; 329 (suppl): S89-98.
7. De Smet K, Pattyn C, Verdonk R. Early results of primary Birmingham hip resurfacing using a hybrid metal on metal couple. *Hip International* 2002; 12: 158-162.
8. Mc Minn D. Development of Metal/Metal Hip Resurfacing. *Hip International* 2003; 13 (2): S41-53.
9. Watanabe Y, Shiba N, Matsuo S, Higuchi F, Tagawa Y, Inoue A. Biomechanical study of the resurfacing hip arthroplasty: finite element analysis of the femoral component. *J Arthroplasty* 2000; 15 (4): 505-11.

EXPERIENCE WITH A FEMORAL NECK RETENTION SYSTEM: STELCOR-ARTEK

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The Stelcor-Artek system is a neck retention total hip prosthesis (Fig. 1), with a metal-on-metal 38 mm. diameter head. The stem design allows to preserve almost entirely the femoral neck, and the low profile monoblock cup eliminates the risk of impingement of the femoral neck. The 38 mm. femoral head permits a wide range of motion of the hip, with the metal-on-metal articular surface to preserve from particulate debris.
From 1994 to 2001 we implanted 61 prostheses in 53 patients, 8 bilateral;
30 males and 23 females with average age of 45 years (min. 16, max. 64).
Indications are young patients with a normal morphology of the femoral neck; surgical diagnosis was in most of the cases primary osteoarthritis (37), followed by post-traumatic osteoarthritis in 6, femoral neck necrosis in 6, juvenile rheumatoid arthritis in 4, hip dysplasia in 6 and psoriasis in 2. Average follow up is 5.3 years (min. 2, max. 9).

The Harris Hip score demonstrates a significant improvement ($p<0.001$) of clinical conditions, especially for the functional part of the score indicating the return to previous work and sport activities of those young patients. Beside these good clinical results we had to revise 8 implants (13%); the reason of this has been early cup mobilization in 6 cases, 1 stem malposition during learning curve, and 1 stem and cup mobilization. In all the cup's failure we revised the stem also because of the risk of impingement between the femoral neck and the revision cup; in all of these stems we found a complete bone ongrowth with preservation of the femoral neck, no signs of lytic lesions or interface membrane. The revision has been easy and in every case has been done with the use of standard primary stems and cups with complete recovery of function of the patients.
The cause of this cup unreliability is that, despite a good primary mechanical stability, the design and the surface treatment do not promote the secondary stability made by bony ongrowth.
For this reason we suspended in 2001 this promising experience with this bone preserving system, waiting for the improvements of the cup's design and surface.

ULTRA-SHORT STEM WITH LATERAL FLARE LOAD TRANSFER

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AIMS. Bone preservation is essential when performing THR in young patients. Furthermore, the best gift we can give to our young patients, is to leave them the highest chances of a good revision, i.e. a good bone structure, should failure of the primary implant occur.
For this purpose a CAD-CAM titanium cementless femoral stem was developed. This stem is studied to be implanted with minimal femoral resection and to fill completely the

proximal metaphysis transferring loads on both the lateral flare and the calcar. With this kind of stress distribution, it is possible to remove the diaphyseal portion of the stem. In this implant the stem is prolonged only just about 1 centimetre below the lesser trocanter.
METHODS. Since 1995, we implanted 92 stems in 85 patients. Average age at the time of surgery was 51 yrs (30-63), 41 females and 44 males. Mean follow-up is 45 months (min.12, max. 84 months). In all cases an hemispherical press-fit cup was employed. Metal to polyethylene interface was used in the first 30 implants whilst metal-to-metal coupling was chosen for the latter 62 hips. All patients were evaluated radiographically at 1, 3, 6 months and then on a yearly basis. Clinically, patients were evaluated with Harris Hip Score.
RESULTS. Average preoperative value of HHS was 42.4, postoperative 98. Tight pain was never recorded. All the stems appeared stable radiographically, we had no subsidence, no radiolucent lines, no stress shielding, no osteolysis. In 26.4% of cases we had mild proximal calcar resorption.
CONCLUSIONS. Results obtained in this group of relatively young patients have been extremely encouraging. Clinical and radiographic results confirm that axial and torsional loads can be properly controlled even without the distal portion of the stem. We believe that maximal bone stock preservation in young patients undergoing THR is mandatory in view of the high possibility for these patients to require multiple revisions in the future.

ACETABULAR REPLACEMENT WITH "TRABECULAR METAL": 5 YEARS FOLLOW-UP RESULTS

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INTRODUCTION. Trabecular Metal (porous tantalum) offers a viable solution to several challenges in orthopaedic reconstructive surgery, including monoblock acetabular cups because of its porosity, strength, flexibility, and biocompatibility.
MATERIALS AND METHODS. From January 1998 to January 2003, 200 acetabular replacements with a Tantalum hemispherical monoblock cup were performed at the Orthopaedic Department of Università Cattolica; the patients, 116 females and 84 males, mean age 65 years (44-82), underwent total hip replacement with the following pre-op diagnosis: osteoarthritis (156), rheumatoid arthritis (21), medial femur fracture (14), osteonecrosis (9).
Radiographic and clinical follow-up (ranging from 1 to 5 years) with use of Harris hip ratings were performed peroperatively, at six months, and yearly thereafter.
RESULTS. The mean preoperative Harris hip score was 36 points, which increased to 95 points at the time of final follow-up. No hip had aseptic loosening or deep infection. No osteolysis was observed, no revisions were performed; we observed DVT in only 2 cases.
CONCLUSIONS. Our results show that the Tantalum acetabular component has a high biocompatibility, has no potential for PE backside wear, and increases the initial stability helping in the prevention of loosening and osteolysis.
Thanks to the elastic modulus, very close to bone, and to the extensive volume available for bone in-growth, it is possible to achieve an earlier and more extensive osseointegration with the maximum bone-implant contact.

CERAMIC-CERAMIC COUPLING WITH A POLYETHYLENE SANDWICH CUP: CLINICAL AND RX FOLLOW-UP

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BACKGROUND. The outcome of a hip arthroplasty is directly linked to the wear of the joint components (1, 2). Ultra high molecular weight polyethylene, coupled with metal or ceramic heads, due to its high rate of wear, has been indicated as the main responsible of late loosening of arthroplasty (3, 4). That is the reason why other couplings, such as metal-on-metal and ceramic-on-ceramic (5, 6), have been getting greater popularity in the last decades, thanks to their high resistance to wear. Our experience with the alumina-alumina coupling is very satisfactory (7).
A consecutive prospective series of 520 uncemented cups (SPH-Contact, Lima™) performed at Istituto Ortopedico Galeazzi in Milan between August 1996 and March 2000 is evaluated. This cohort includes all the implants of this type utilised in primary THA till now in our Department.
The aim of the study is to evaluate the effectiveness of the ceramic-ceramic coupling with UHMWPE-alumina sandwich liners (8) and titanium metal back in 28 mm diameter heads.
MATERIALS AND RESULTS. The cohort includes 311 females (59.9%) and 209 males (40.1%); the mean age was 57 years (min. 25 - max. 77 years). At an average follow up of 60.2 months (37-84), we were able to collect clinical and radiographic data of 480 cases (out of 520). 40 cases are lost to the follow-up (2 deceased and 38 not found).
The early complications, the signs of osteolysis, the reliability of the materials and the survival of the cups were analysed: 1 cup was removed because of infection, 7 reoriented due to recurrent dislocation and 6 revised for loosening. Complications linked to the materials were: one disassembling liner-metal back 6 months after the operation and one breakage of the ceramic liner. X-rays were examined according

to De Lee and Charnley method. For the clinical evaluation the Harris Hip Score was calculated (mean preop = 67.6, mean postop = 96).
At an average 5-year follow-up the results of such a ceramic acetabular cup are quite encouraging.
DISCUSSION. In our experience alumina-alumina coupling in metal back sockets, till now, has shown to be a safe and durable system according to literature (9-11). In this series the absence of periacetabular or femoral radiolucency and of socket migration could mean less debris formation, less acetabular wear and, consequently, a longer life of the implant. At present we don't know if the interposition of polyethylene in the liner is really useful, but we can state that it is not harmful at least and, not being in contact with the head, it is not subject to wear.
Moreover the introduction of the liner is easier and forgiving and, in case of revision, the removal is simpler and more safety. Longer follow-up is needed for definite conclusions.

REFERENCES

1. Huo M, Brown B. What's new in hip arthroplasty. *J Bone Joint Surg (Am)* 2003; 85-A: 1852-64.
2. Learmonth ID, Schmotzer H. Alternative bearing surfaces: Crosslinked polyethylene. *Hip International* 2003; 13 (3): 125-6.
3. Willert HG, Bertram H, Buchorn GH. Osteolysis in alloarthroplasty of the hip: the role of ultra high molecular weight polyethylene wear particles. *Clin Orthop* 1990; 258: 95-107.
4. Lerouge S, Huk O, Yahia L, Witvoet J, Sedel L. Ceramic-ceramic and polyethylene total hip replacement: comparison of pseudomembranes after loosening. *J Bone Joint Surg (Br)* 1997; 79-B: 135-9.
5. Sedel L. Evolution of alumina-on-alumina implants. *Clin Orthop* 2000; 379: 48-54.
6. Toni A, Sudanese A, Paderni S, Guerra E. Ceramic-on-Ceramic: Long-term clinical experience. Bioceramics in Joint Arthroplasty. *Georg Thieme Verlag*, Stuttgart, 2001: 2-5.
7. Zagra L, Marciano E, Giacometti Ceroni R. Alumina-on-alumina coupling with 36mm heads. *Hip International* 2002; 12 (2): 200.
8. Fenollosa Gomez J, Benazzo F, Fraschini GF, Ravasi F, Pazzaglia U, Dalla Pria P, Costa L. The UHMWPE Behaviour in the Double Conical Sandwich Liners. Proceedings 6th Symposium on Ceramic Wear Couple, 2001 - Stuttgart. Enke, Stuttgart, 89-90.
9. Bohler M, Knahr K, Plank H, Wlater A, Salzer N, Schriber V. Long term results of uncemented alumina acetabular implants. *J Bone Joint Surg (Br)* 1994; 76-B: 53-9.
10. Garcia-Cimbrelo E, Sayanes, Minuesa JM. Ceramic-ceramic prosthesis after 10 years. *J Arthroplasty* 1996; 11: 773-81.
11. Gualtiei G, Nirgrisoli M, Dallari D, Catamo L, Gualtieri I. A study of the mechanical and biological behaviour of Bioceramics hip arthroplasty followed-up after more than 10 years. *Chir Organi Mov* 1993; 78 (4): 213-22.

JOINT REPLACEMENT FOR ANKYLOSED HIPS

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ABSTRACT. From January 1990 to December 2001 in the VII ward of Rizzoli Orthopaedic Institute we performed 50 total hip arthroplasties in 35 patients with ankylosed hips. In 41 cases the ankylosis was spontaneous and in 9 cases it was surgically induced. Mean follow-up was 7.4 ± 2.1 years. We obtained good improvement with regards to pain, walking, and especially range of motion, despite achieving inferior results compared to prostheses implanted for usual diseases. Preoperative limb length discrepancy was 3.5 cm (range 0–7 cm), whereas at the last follow-up it was 1.1 cm (range 0–3 cm). Lumbar pain disappeared in 30% of cases, and was markedly reduced in 62%. Homolateral knee pain was reduced in 55% of cases. Reverse fusion and total hip arthroplasty is technically difficult treatment, but if carried out on carefully selected patients, it can give good results in the treated hip and in nearby joints.
INTRODUCTION. Ankylosis of the hip is defined as a total loss of movement in the joint and may occur spontaneously or be induced surgically. More and more often patients with ankylosed or fused hips are asking for total hip arthroplasty. In fact, even if the joint is locked in a correct position, besides the restrictions of the ankylosis itself, patients complain of lumbo-sacral back pain and pain in the homolateral knee (1, 2).
However, the conversion of an ankylosed hip into total hip arthroplasty is a difficult operation. Because of the initial disease, residual muscular function, previous operations, and altered anatomic relationships, reverse fusion followed by total hip arthroplasty is technically more difficult than primary total hip arthroplasty (3-5).
The aim of this study was to assess the clinical and radiographic results of 50 hip prostheses implanted in ankylosed or fused hips.
MATERIALS AND METHODS. From January 1990 to December 2001 in the VII ward of Rizzoli Orthopaedic Institute we performed 50 total hip arthroplasties in 35 patients with ankylosed hips. Mean age was 54.5 years + 10.2 (range 34-74). In 41 cases the ankylosis was spontaneous, 35 of which were due to ankylopoietic spondylitis, and in 9 cases it was surgically induced. Mean follow-up was 7.4 + 2.1 years (range 2-11) (see Tab. I, on next page).

TABLE I -

	Spontaneous	Postoperative
Osteoarthritis	2	3
Traumatic	4	2
Developmental dysplasia	-	4
SAP	35	-

Before surgery, all patients underwent careful planning, including radiographs of the hip, pelvis, lumbo-sacral spine, and panorama of the lower limbs. Comparative electromyography of the gluteal muscles was also carried out to test for weakness in the ankylosed side. In cases of ankylosis due to coxitis, the persistence of the septic process needs to be excluded by scintigraphy with labeled leukocytes, and possibly also needle biopsy.

The surgical approach was lateral, and once the bone plane was reached, landmarks were used under the image intensifier to detect and resect the original acetabulum.

The prostheses used were 30 cementless, 14 cemented in both components, and 6 hybrid (stem cemented, cup cementless).

For clinical evaluation we used the Merle D'Aubignè scoring system (6), which assigns a score from 1 to 6 according to pain intensity, walking, and range of movement. For radiographic evaluation we used the Gruen method of subdividing areas.

RESULTS. Preoperative clinical scores were: pain 2.9 (range 2-5), walking 2.1 (range 2-5), range of motion 1.4 (range 1-3). The latest follow-up gave the following results: pain 5.6 (range 3-6), walking 5 (range 3-6) range of movement 4.8 (range 2-6). A marked improvement was achieved on all three parameters, especially range of motion, although results were inferior to those of total hip arthroplasty for usual diseases. Preoperative limb length discrepancy was 3.5 cm (range 0-7 cm) compared to the latest follow-up of 1.1 cm (range 0-3 cm).

With regards to postoperative complications, we had one deep vein thrombosis, one non-fatal pulmonary embolism, a peroneal nerve palsy, which fully healed, and a recurring dislocation that required revision surgery of the cup.

In this type of surgery heterotopic ossifications represent a frequent complication. In our series we managed to keep this complication within acceptable limits by the use of roengentherapy (300 Gy single dose on day 2-5) that was carried out in 35 cases out of 50. Grades 3 and 4 ossifications according to Brooker (7) were found mostly in the cases that did not undergo radiotherapy, especially in patients with ankylopoietic spondylitis.

Concerning nearby joints, lumbar pain disappeared in 30% of cases, and was markedly reduced in 62% of cases, whereas it remained unchanged in 8%. Homolateral knee pain was reduced in 55% of cases.

In 5 cases total knee arthroplasty was required, and in 2 cases knee osteotomy was performed.

Of the 50 prostheses implanted, 2 were removed after 8 years and 9 years, 3 months respectively due to aseptic loosening. In 2 more cases only the cup had to be replaced due to aseptic loosening, and in one case the cup was replaced due to recurring dislocation.

The other prostheses were radiographically stable.

CONCLUSIONS. Reverse fusion and total hip arthroplasty is a form of treatment that on one hand provides great advantages, but on the other it is technically difficult and produces inferior results compared to total hip arthroplasty carried out for usual diseases. In fact, the surgeon is often faced with tissue altered by previous surgery or infection, contractures and muscle alterations, and anatomical relationships that need to be restored. Therefore, it is important to select patients by careful preoperative planning, inform patients about the possible need for surgery on nearby joints, and plan an intense pre and postoperative physiotherapy program.

REFERENCES

1. Amstutz HC, Sakai DN. Total joint replacement for ankylosed hips. Indications, technique, and preliminary results. *J Bone Joint Surg (Am)* 1975; 57-A: 619-25.

2. Hardinge K, Williams D, Etienne A, McKenzie D, Charnley J. Conversion of fused hips to low friction arthroplasty. *J Bone Joint Surg (Br)* 1977; 59-B: 385-92.

3. Kilgus DJ, Amstutz HC, Wolgin MA, Dorey FJ. Joint replacement for ankylosed hips. *J Bone Joint Surg (Am)* 1990; 72-A: 45-54.

4. Reikeras O, Bjerkreim I, Gundersson R. Total hip arthroplasty for arthrodeses hips. 5- to 13-year results. *J Arthroplasty* 1995; 10: 529-31.

5. Strathy GM, Fitzgerald RJ. Total hip arthroplasty in the ankylosed hips. A ten-year follow up. *J Bone Joint Surg (Am)* 1988; 70-A: 963-6.

6. Merle D'Aubignè R. Numerical classification of the function of the hip. *Rev Chir Orthop Reparatrice Appar Mot* 1990; 76: 6.

7. Brooker A, Bowerman J, Robinson R, et al. Ectopic ossification following total hip replacement: incidence and a method of classification. *J Bone Joint Surg (Am)* 1973; 55-A: 8.

HIP PROSTHESIS IN GIRDLESTONE'S OPERATION

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ABSTRACT. Between 1987 and 2000 we performed hip revision surgery in 11 patients who had previously undergone Girdlestone's arthroplasty due to infection at the hip prosthesis. Mean follow-up was 57 months ± 45 (11-154). We had good results with regards to pain and movement, excellent for gait; 9 out of 11 could walk without canes. Pre-

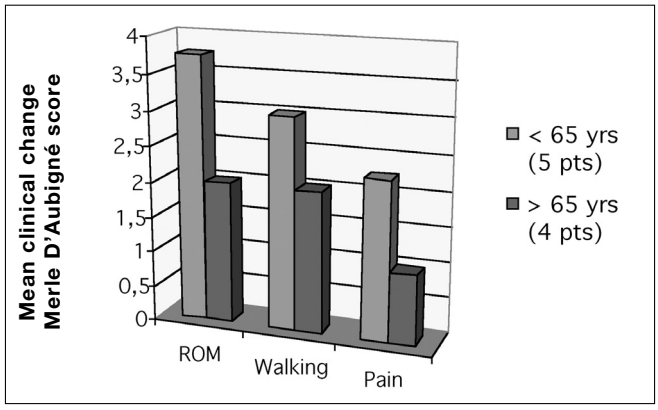
operative limb length discrepancy was 47 mm ± 16 (15-73), whereas at the last follow-up exam it was 8 mm ± 5 (0-30). The best results were obtained in patients under 65 years.

INTRODUCTION. Girdlestone's operation is successful at treating the infection in most cases and gives good results with regards to pain and movement (1-8), but produces instability in the hip and limb length discrepancy that force patients to use walking aids and leaves them with a limp (2-4, 8). Therefore, it is common for the orthopaedic surgeon to be asked by patients, especially young ones, to replace the Girdlestone with hip revision surgery (8). Patients with Girdlestone sequelae must be carefully selected (8, 9) before undergoing hip revision surgery. In fact, revision surgery, besides the considerable technical problems it entails, might lead to recurrence of the infection that was generally the cause for removal. The aim of this study was to report our series (11 cases) of Girdlestone's arthroplasty in order to assess how to select patients for this operation.

MATERIALS AND METHODS. Eleven patients (9 female and 2 male) We treated between 1987 and 2000 by conversion of Girdlestone's arthroplasty. The Girdlestone operation had been carried out in all patients because of infection at the hip prosthesis. Hip revision surgery was indicated only for patients who presented with hematochemical values in the norm for infection (9, 10) (hemochrome with leukocyte formula, VES, PCR) granulocytes marked negative with skeletal scintigraphy (10). To plan the operation a standard radiograph of the pelvis, a lateral one of the hip, and a panoramic one of the lower limbs were taken in all patients to assess the degree of limb length discrepancy. To assess the bone stock of the acetabulum and femur a CT scan of the pelvis and hip was performed (9). A direct lateral approach was always used. In 6 cases prostheses with two cementless components were used (press fit cup and anatomic stem). In 5 patients the stem was cemented and in 3 of these vancomycin was added to the cement. A cemented cup was used in only one case. In 3 cases homoplastic bone grafts were used, 2 at the cup and 1 at the stem. The Merle D'Aubignè method was used to assess the results (11); the Gruen method radiographic results (12); and the Brooker method for periprosthetic ossifications (13). Mean follow-up was 57 months ± 15 (16-173).

RESULTS. Mean age at the primary total hip arthroplasty was 56 years ± 12 (33–68); at Girdlestone's arthroplasty it was 61 years ± 12 (34–71); at revision surgery it 65 years ± 8 (51–73). The mean amount of time between the operation to remove the prosthesis and the operation to implant a new one was 41 months ± 58 (6–205). Girdlestone's arthroplasty was always carried out because of infection at the prosthesis. Mean limb length discrepancy after Girdlestone's arthroplasty was 45 mm ± 16 (15–73): 6 patients walked with 1 cane, 5 with 2 canes; 4 patients out of 11 used an insole of more than 3 cm thick. The Merle D'Aubignè clinical was 4 ± 1 (2–5) for pain, 3 ± 1 (1–4) for walking; 3 ± 2 (1–5) for movement. Of the 11 patients who underwent revision surgery, 2 had to have the prostheses removed due to recurrence of infection, 9 months and 2 years respectively after surgery. In both patients cementless prostheses and homoplastic bone grafts had been used. In the remaining patients the clinical scores after revision surgery were 6 ± 1 (4–6) for pain, 5 ± 1 (4–6) for walking; 6 ± 1 (4–6) for movement. 4 patients out of 9 had the same length in both legs. Mean leg length discrepancy after revision surgery was 11 mm ± 9 (0–35). 6 patients out of 9 totally abandoned the use of canes, 2 used only 1 cane, and 1 patient used 2 canes due to problems in the contralateral hip. After revision surgery only one patient used an insole greater than 3 cm thick. The best results for movement were achieved in patients older than 65 years (Tab. I). According to the Gruen method, 1 patient had a radiotransparent vallum greater than 1 mm in zone 3 of the acetabulum. 1 patient had a Brooker grade 1 ossification in the treated hip.

TABLE I - Comparison of the mean differences of clinical scores according to age (under or over 65 years).



CONCLUSION. In the past Girdlestone's arthroplasty seemed to be the definitive (9). Our study highlights how revision surgery after Girdlestone's arthroplasty leads to a considerable reduction in limb length discrepancy and a marked improvement in walking ability. Patients under 65 years old had an improvement in movement (to a lesser extent, pain and walking ability too) compared to patients over 65 (Tab. I). Unlike some authors (6, 8), in our series most patients (67%) abandoned antebrachial crutches, and had a good recovery of movement and walking ability. In two cases of loosening in our series the revision prostheses had been implanted early and homoplastic bone grafts had been used. In conclusion, if indications are right, Girdlestone's arthroplasty still represents an excellent option of treatment, and can be converted into total hip revision if there is an improvement in the patient's local and general condition. Pa-

tients indicated for total hip revision should be carefully examined in order to avoid any further failure (8, 9). If necessary, we recommend using bone grafts and cement with added antibiotics.

REFERENCES

1. Bohler M, Salzer M. Girdlestone's modified resection arthroplasty. *Orthopedics* 1991; 14: 6.
2. Bourne RB, Hunter GA, Rorabeck CH, et al. A six year follow up of infected total hip replacements managed by Girdlestone's arthroplasty. *J Bone Joint Surg (Br)* 1984; 66-B: 3.
3. Castellanos J, Flores X, Llusa M, et al. The Girdlestone pseudarthrosis in the treatment of infected hip replacements. *Int Orthop* 1998; 22: 3.
4. Grauer JD, Amstuz HC, O'Carroll PF, et al. Resection arthroplasty of the hip. *J Bone Joint Surg (Am)* 1989; 71-A: 5.
5. De Laat EAT, Van der List JJJ, Van Horn JR, Slooff TJJH. Girdlestone's pseudarthrosis after removal of a total hip prosthesis; a retrospective study of 40 patients. *Acta Orthop Belg* 1991; 57: 2.
6. Renvall S, Einola S: Girdlestone operation. An acceptable alternative in the case of unreconstructable hip arthroplasty. *Ann Chir Gynaecol* 1990; 79: 3.
7. Scalvi A, Campacci A, Marcer M, et al. Girdlestone arthroplasty for loosening of the total hip prosthesis: evaluation and results. *Chir Organi Mov* 1995; 80: 3.
8. Schroder J, Saris D, Besselaar PP, et al. Comparison of the results of the Girdlestone pseudarthrosis with reimplantation of a total hip replacement. *Int Orthop* 1998; 22: 4.
9. Berman AT, Mazur D. Conversion of resection arthroplasty to total hip replacement. *Orthopedics* 1994; 17: 12.
10. Fitzgerald RH. Infected total hip arthroplasty: diagnosis and treatment. *J Am Acad Surg* 1995; 3: 5.
11. Merle D'Aubignè R. Numerical classification of the function of the hip. *Rev Chir Orthop Reparatrice Appar Mot 1990;* 76: 6.
12. Amstutz HC, Smith RK. Total hip replacement following failed femoral hemiarthroplasty. *J Bone Joint Surg (Am)* 1979; 61-A: 8.
13. Brooker A, BowermanJ, Robinson R, et al. Ectopic ossification following total hip replacement: incidence and a method of classification. *J Bone Joint Surg (Am)* 1973; 55-A: 8.

PROSTHETIC REPLACEMENT IN METASTATIC CANCER OF THE PROXIMAL FEMUR

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ABSTRACT. Patients affected by metastatic cancer of the proximal femur with good life expectancy can be treated by oncological resection and prosthetic reconstruction.
The interdisciplinary approach is recommended: orthopaedic surgeon, oncologist and radiotherapist can play together their own role in order to define the correct treatment.
The EFORT guidelines in bone metastatic cancer consider as decisional parameters:
- expected survival;
- stage of the tumour;
- type and sensitivity of the tumour to chemo/hormone/radiotherapy;
- patient's physical conditions;
- time interval from the primary lesion;
- risk of pathological fracture.

According to these protocols we treat the proximal femur metastasis as a primary tumour in "class 1" patients, performing a resection and a prosthetic reconstruction.
The same approach is suitable with "class 2 and 3" patients, i.e. in case of pathological fracture or impending fracture.
In different classes the excision of the affected bone is performed with 'wide' or 'marginal' margin, depending on the above mentioned parameters, thus depending on the surgical goal, either therapeutic or palliative.
The current means we use in achieving hip reconstruction are modular endo- or total prosthesis, generally fixed with cement to the remaining bone. In fact, cement offers the possibility of a strong and permanent bone fixation even in poor quality bone; moreover, it can be a good 'adiuvant' inducing cellular necrosis and helping in local neoplasm control. The choice between endoprosthesis or total hip replacement needs careful consideration of patient's status and could be different compared with non-oncological cases.
The prosthetic devices have to be adaptable for the different situations also for wide resections, modular and available in event of intraoperative changes, offering some chance to re-attach of tendons and muscles to achieve a restored function as much as possible.

BIARTICULAR PROSTHESIS OF THE HIP: CLINICAL-STATISTICAL REVISION

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The authors report a clinical-statistical revision regarding the use of biarticular prosthesis of the hip in case of femoral neck fracture and, more rarely, in case of coxarthrosis affecting patients aged over 70.
Our analysis refers to 150 cases treated in the last seven years from January 1995 to January 2002.
We treated with biarticular prostheses elderly patients affected by a series of even severe comorbidities. Those patients, before being affected by the femoral neck fracture, presented a spontaneous and sufficient deambulation.
Rarely, always in elderly patients, we performed this technique even in the presence of coxarthrosis.
We used two types of prosthesis:

Universal autocentring biarticular cup Spheri Lock which uses the biomechanical principle of the positive eccentricity, that allows to obtain an excellent load distribution, as it presents a favorable valgus orientation. To the cup we assembled a "Cemented plus" Versys stem. This is a type of straight stem with a collar, having a proximal "macrotexturing " surface, and a distal and proximal lining in PMMA. The head used is in cr-co ∅28mm (–3.5mm to +7mm). The Link endoprosthesis with moving cup with polyethylene and high density spherical bowl armoured and with metallic smooth mirror lining. To the cup we assembled a stem Link in cr-co in the right or left versions. The head used is in cr-co ∅28mm.
In both the endoprostheses we used a distal reabsorbable plug together with a cementation of the prosthesis stems.
The surgical via of access used is that lateral direct with the reconstruction of the articular cup (Bauer).
Among the most severe complications we have frequently had the shock caused by the cement (in one case it was mortal), but anyway within the limits indicated by other authors equal to 3% (Sanborn et al, 1990).
That's the reason why we think that the Endoprostheses are a very useful means in the treatment of the femoral neck fractures in elderly patients with correlated pathologies because the invasivity of the surgery is reduced as it eliminates the preparatory phase of preparation of the pelvic acetabular; even though, from a biomechanical point of view, Endoprostheses are not a perfect system.

MORTALITY RATE AFTER HIP HEMIARTHROPLASTY: ANALISYS OF RISK FACTORS

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BACKGROUND. The femoral neck fracture is actually the most important traumatic event in the elderly, because of its high rate and the terrible complications related to the fracture.
In spite of progressions in surgical and anaesthesia mortality rate remain high. All authors agreed in considering hemiarthroplasty as the best treatment.
The aim of this study is to understand the principal risk factors associated to the increasing of mortality after hemiarthroplasty.
MATERIALS AND METHODS. In this study we considered 314 patients treated in our institution with a bipolar implant for femoral neck fracture, between January 1992 and December 1998. At the final follow-up we lost 15 patients. The average follow-up was 5 years (range 2 to 8 yrs).
We studied the association of mortality with different factors.
The statistical analysis of all the data was made using the free statistical package "R" for Windows. Twelve predictor variables were included in the dataset: age, sex, mental status, preoperative ability, waiting for surgery, pulmonary dysfunction, aetiology, ischemic heart disease, heart failure, hypertension, cerebrovascular disease, chronic renal failure.
RESULTS. Mortality index during the first six months was 19% (ratio 55/299) and in the first year 25% (ratio 76/299).
Values of the exponential of the coefficients were used to estimate the risk associated to the different variables.
The risk of mortality increase according to the following variables: age (increasing the age of 11 years the risk becomes twice), gender (M:F=2:1) and waiting for surgery.
DISCUSSION. In spite of development of several prosthesis models, either mono or bipolar, and improvement of surgical and anaesthesiology techniques, mortality rate is still high in the elderly if compared with the same age healthy people.
In the past a lot of authors (1-5) compared this rate with some prognostic factors such as: age, waiting for surgery, medical illness, mental status and haematic values.
Our study shows that waiting for surgery is a significant factor for mortality at 6 and 12 months. Patients surgically treated in the first 24 hours had lower mortality than people who had to wait longer.
According to some authors (6, 7) we divided our people into two representative samples, younger than 85 years and older ones, and we noticed that in the second group mortality considerably increased in the first year after fracture.
The objection which can be raised, is that older patients die easier than younger ones. For this reason we compared the mortality of women aged between 80 and 85 from the healthy population of Varese and our sample since it is more representative.
We noticed that in the first year after surgery the rate of mortality was four times higher in our group than in the other one (25% vs. 6.8%), and most of the deaths occurred in

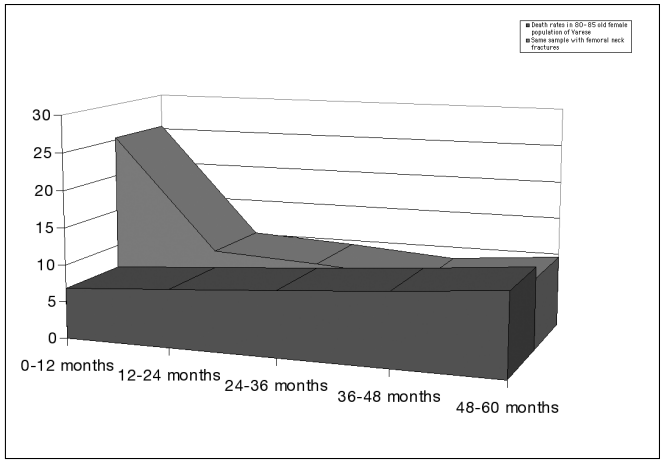

Fig. 1 - *See text for explanation.*

the first six months (ratio 14/20). This difference disappears during the second and the third postoperative years. Therefore we conclude, agreeing with literature, that femoral fracture is a risk factor for survival only in the first year after trauma, above all in the elderly (Fig. 1).

REFERENCES

1. Eiskjaer S, Ostgard SE. Risk factors influencing mortality after bipolar hemiarthroplasty in the treatment of fracture of the femoral neck. *Clin Orthop* 1991; 270: 295-300.
2. Davidson TI, Bodey WN. Factors influencing survival following fractures of the upper end of the femur. *Injury* 1986; 17: 12.
3. Kitamura S, Hasegawa Y. Functional outcome after hip fracture in Japan. *Clin Orthop* 1998; 348: 29-36.
4. Klein DM. Operative treatment of hip fractures in patients with renal failure. *Clin Orthop* 1998; 350: 174-8.
5. Jennings AG, DE Boer P. Should we operate on nonagenarians with hip fractures? *Injury* 1999; 30: 169-72.
6. Evans GJ, et al. A prospective study of fractured proximal femur: Factors predisposing to survival. *Age Ageing* 1979; 8: 246-50.
7. White BL, et al. Rate of mortality for elderly patients after fracture of the hip in the 1980's. *J Bone Joint Surg* 1987; 69: 1335-40.

PAEDIATRICS

ULTRASONOGRAPHIC EVALUATION OF HIP MORPHOLOGY IN ACHONDROPLASIA

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From 1985 to 2002, 24 hips of 12 children with achondroplasia, ranging from 9 days to 2 years and 5 months of age at time of initial sonogram, were evaluated by ultrasonography. Ultrasonography was performed using Siemens Imager 2300, Sonoline SL1 with 5.0-linear and 7.5-MHz frequency transducer. Children were scanned according to the technique developed by Graf. Recorded ultrasonographic findings included the following: presence or absence of coxa vara deformity, configuration of the acetabular bony rim, configuration of the acetabular roof, echogenicity of the head and acetabular cartilage, presence of the femoral ossific nucleus, bony coverage percentage of the femoral head according to Morin et al, beta angle according to Graf and dynamic evaluation of hip instability (Fig. 1).

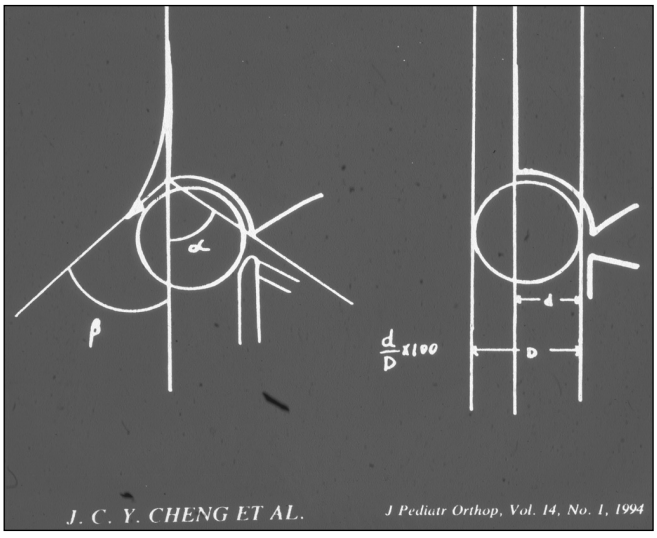

Fig. 1 - *Hip morphometry according to Graf (left) and coverage of the femoral head according to Morin et al (right).*

All hips had a sharp acetabular bony rim, a horizontal actebular roof, thickened acetabular cartilage, and normal echogenicity. The femoral head was well centered and deeply contained in the acetabular fossa with no coxa vara deformity. The mean coverage was 86% (range, 81-90%) and showed progressively larger values with increasing age. The

mean value of the beta angle was 22° (range, 10°-38°). The value of the beta angle tended to decrease as age increased. All hips were stable. The ossific nucleus was present only in two children. The characteristic findings in hip ultrasonography in children with achondroplasia can aid in its early diagnosis (Figs. 2 and 3).

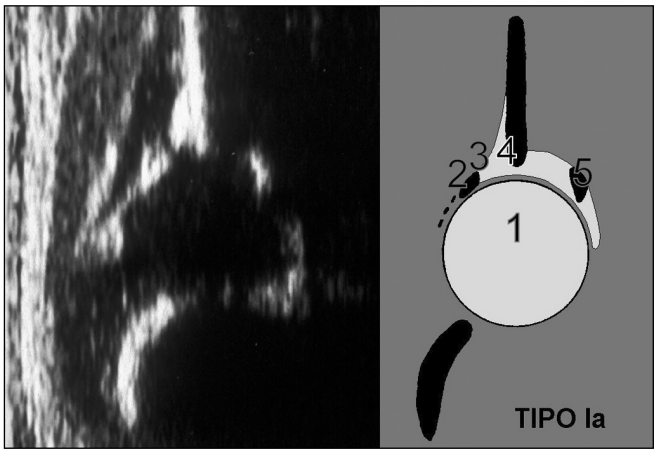

Fig. 2 - *Ultrasound image and diagram of a normal hip according to Graf. 1) femoral head, 2) labrum, 3) cartilaginous roof, 4) acetabular bony rim, 5) inferior part of the ilium.*

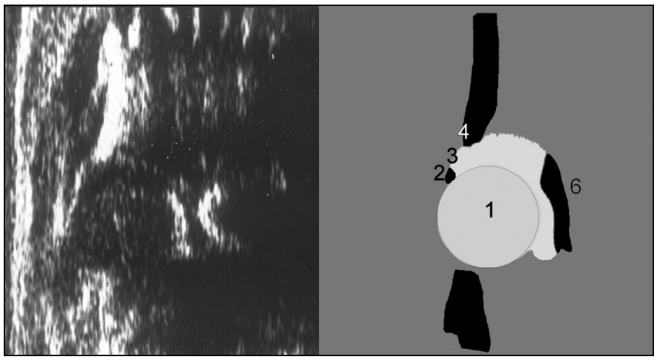

Fig. 3 - *Achondroplasia. Ultrasound image and diagram of the hip 1) femoral head, 2) Labrum, 3) cartilagineus roof, 4) acetabular bony rim, 6) os ischium. Absence of the inferior part of ilium.*

COXA VARA DEFORMITY IN CHILDREN. EVALUATION BY ULTRASONOGRAPHY

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ABSTRACT. Coxa vara deformity in children frequently occurs in association with congenital femoral deficiency and skeletal dysplasias. In the first year of life, prior to the presence of the proximal femoral ossific nucleus, a pelvic radiograph may or may not show the abnormality of the proximal femur and distinguishing it from developmental dysplasia of the hip can be difficult. The hips of 9 children with unilateral congenital femoral deficiency and those of 17 children with different skeletal dysplasias were evaluated by ultrasonography. Two methods for assessment of the coxa vara are described: the first measuring the angle (delta) subtended between a line from the center of the femoral head to the tip of the greater trochanter and the base line which is parallel to the os ilium (Fig. 1); the second visualizing the position of the femoral head in relationship to the trochanteric apex (Fig. 2). To establish normal values for the assessment of the epiphyseal/metaphyseal relationship a control group of fifty normal children (hundred hips) ranging in age from one month to sixteen months were examined by ultrasound. The median value of the delta angle in normals was 82 degrees (range 72-88) and the center of the femoral head was always above the apex-trochanter line. The twenty-five hips with coxa vara showed a median delta angle of 110 (range 96-122) degrees and the center of the femoral head was always below the apex trochanter line. Statistical comparison (Mann-Whitney test) showed a p=0.0001. Hip ultrasonography is useful to assess coxa vara in infants. Because of delayed ossification in many of these affected children it can be used for hip evaluation in older children than is possible in normal children.

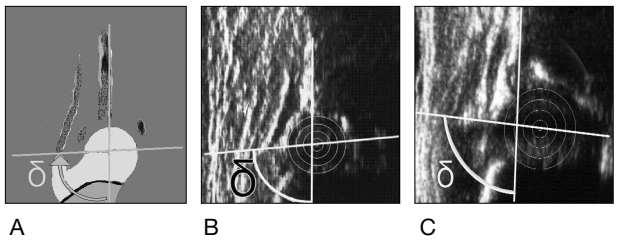

Fig. 1 - *The measurement of the angle?*
Diagram of normal hip Corresponding ultrasound image.
Ultrasound image of a coxa vara

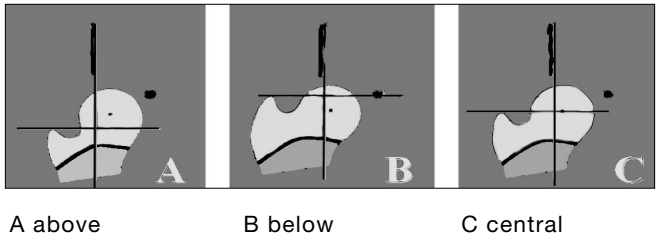

Fig. 2 - *The ABC-Method for visualizing the position of the femoral head in relationship to the trochanteric apex.*

ONE STEP HIP SURGERY IN TOTALLY INVOLVED CEREBRAL PALSY PATIENTS

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The indications for treatment in totally involved Cerebral Palsy (CP) patients is still under discussion.
Subluxation or dislocation of hip can be primary or secondary and associated with pelvic asymmetry and spine deformity. The hip on the convexity of the spinal curve normally dislocates antero superiorly while the controlateral posteriorly.
Aim of the study was to determine the improvement of hip containment and function with One Step Hip Reconstruction in severely compromised total body involved CP patients with one hip dislocation.
The range of movement, achievement of hip symmetry, increase radiological hip joint congruity, relief of pain and achievement of a higher level of function in patients with cerebral palsy were evaluated pre- and postoperatively.
Simultaneous pelvic and femoral osteotomy associated with open reduction of the hip joint were performed in all patients on the dislocated side.
Improvements were seen: in the range of abduction and adduction of the hips in flexion (decrease of the Windsweep Index) and reduction of fixed flexion contracture; in hip containment using both Reimers' Migration Percentage and the Centre Edge Angle of Wiberg and in pain relief.
All parameters studied seemed to have improved substantially after the operation.
One step surgery obtains better overall results and avoids the risk of repetitive GA.
The longer the follow-up time the worse the results probably due to the natural history of the disease.

MISCELLANEOUS

ASSOCIATION BETWEEN INTERLEUKIN-6 GENE POLYMORPHISM AND INCREASED RISK OF OSTEOARTHRITIS OF THE HIP: A CASE CONTROL STUDY

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INTRODUCTION. IL-6 is a multifunctional cytokine playing a crucial role in inflammation and tissue injury. Cytokines seems to play a role in the pathogenesis of osteoarthritis. Recently, a common polymorphism of the IL-6 gene, associated with differences in the transcription rate of the protein, has been described. We evaluated association between IL-6 gene polymorphism and augmented risk of hip osteoarthritis in a case control study.
MATERIALS AND METHODS. 110 patients affected by osteoarthritis and 110 age and sex matched controls were studied. IL-6 genotype in all subjects was evaluated by polymerase chain reaction followed by restriction enzyme analysis.
RESULTS. The distribution of IL-6 genotype was in the patients with OA: 48 GG, 44 GC, 18 CC; control subjects: 35 GG, 42 GC, 33 CC.
The CC genotype was more common in control patients ($p = 0.017$). Logistic regression analysis indicated the presence of CC genotype significantly decrease the risk of OA (odds ratio 0.4 [0.2-0.9], $p = 0.033$).
CONCLUSIONS. IL-6 CC genotype appears to be protective in development of OA. Our data support the hypothesis that inflammatory mechanism are important in the pathophysiology of the cartilage deterioration responsible for OA.

HIP ARTHROSCOPY: INDICATION, TECHNIQUE, POTENTIAL EVOLUTIONS

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Hip arthroscopy is an excellent tool for investigating and treating various hip diseases. By now, arthroscopy of this joint is a well-established technique. The indications have been well formulated for both diagnostic and interventional purposes. These indications do continue to evolve as both skills and technology mature.
My personal experience is of 82 hip arthoscopies performed in the last 5 years. Most common indication for hip arthoscopy has been chronic pain after failure of conservative treatment. This happens very often because of the

poor ability of conventional radiology to detect a number of pathological entities of this joint.
Other indication or arthroscopic findings have been labral pathology, synovial chondromatosis, osteoarthritis, calcium pyrophosphate disease, ligamentum teres damage, chondral damage, post-traumatic loose bodies, avascular necrosis, sepsis, villonodular synovitis. More recently, I have started to give indication for hip arthroscopy and debridment in patients with peri-prosthetic osteolysis due to polyethylene wear.
In conclusion hip arthroscopy can be performed for a variety of hip disorders with reasonable expectations of success. Although operative hip arthroscopy is a technically demanding procedure, the indications for hip arthroscopy will increase and hip arthroscopy will be an alternative to conventional operations.

DO GENERAL MEDICAL COMPLICATIONS PLAY A ROLE IN SELECTING THE TYPE OF FIXATION IN LATERAL HIP FRACTURES?

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A few years ago we sent to a selected group of Italian orthopaedic surgeons a questionnaire regarding different aspects of the profession. Among others a question was devoted to lateral hip fracture and the reasons for selecting the osteosynthesis device; one of five possible answers was: low incidence of general medical complications. It was, by far, the least selected (the others being: mechanical stability, influence on rehabilitation protocols, technical skill needed, implant philosophy). We expected a higher rate of selection. We therefore designed a retrospective study in which we looked for medical general complications (such as bleeding, transfusion requirement, alteration of blood test) in two groups of elderly patients operated on for reduction and synthesis of lateral hip fracture, with two different approaches. In the first group are patients treated in the fifth department of Orthopaedic surgery of the University of Milano, Istituto Policlinico San Donato: all received close or open reduction and stabilization of the fracture with a dynamic hip screw and plate. The second group is made of patients treated in the Casa di Cura Lecco by close reduction and close osteosynthesis by Ender nails. The study design was a retrospective case-control study in which for every patient treated in Loco in the years 1998-2002 a similar (age, sex, type of fracture according to AO classification, mechanism of injury, body mass index, type of anaesthesia) case was selected between those treated in San Donato. The observation period was limited to short term results (as long as the hospital stay); we were not able to collect sufficient information at longer follow-up, being the patients transferred to a large number of different rehabilitation facilities. We therefore looked for intra-hospital data (mortality, blood count, blood transfusions, ESR, CRP, albumin, coagulation parameters, renal and liver function). Since the two hospitals use different laboratory systems, every value was normalized and expressed as percent of the ideal one. Even if seven different surgeons were involved, all came from the same Medical School and have similar technical and cultural background. For each group 45 cases were enrolled. The basic characteristics of the two groups were similar and no statistically significant differences were found ($p<0.05$). The results showed significant differences in blood loss and blood transfusions between the two groups, with definite lower blood loss in the Ender group (with far lower transfusion requirement). No differences in short term mortality, liver and kidney function, coagulation parameters and CRP levels were found. Albumin was lower and ESR higher in the DHS group, but with no statistical significance (the second parameter could be influenced by lower blood cells count). Since we reviewed only short term post operative radiograms, we are not able to discriminate possible secondary displacements at the fracture site (theoretically frequent in case of imperfect positioning of Ender nails, without the ideal “Eiffel tower” arrangement). Duration of surgical procedures differ significantly in the two groups: Ender nail positioning is faster, but we must stress that all interventions were performed by a single surgeon, well accustomed to such method of treatment. Average x-ray exposure was higher for Ender nails, but this aspect is meaningless for the patients, due to the high mean age of the population in study; furthermore we could not find any difference in the history of x-ray exposure for any of the surgeons involved in the study (we examined the “year exposure tables” given to each surgeon by the preventive medicine departments of the two institutions). Open internal fixation of lateral hip fractures by sliding screw and plate is considered, in general, easier, or at least, less technically demanding, than close reduction and fixation with Ender nails. In our study general medical complications, at least for as regards blood loss, were fewer with the latter method. We therefore feel that in case of very old and unstable patients osteosynthesis with Ender nails could be the method of choice in order to minimize surgical trauma.

REVISION

ILIAC BONE AUTOGRAFTS IN ACETABULAR REVISION SURGERY

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The acetabular component revision surgery often requires bone grafts to manage cavitary deficiencies of the acetabulum. Careful preoperative evaluation of the type of bony deficiency and surgeon's personal experience will orientate towards one or another type of reconstruction. We report about our experience in use of iliac bone autografts to fill acetabular defects. Since 1995 we routinely perform socket revision surgery with this type of technique in presence of bone defects. During this period we have performed acetabular reimplantation with iliac bone autografts in 120 patients either with uncemented hemispherical porous coated sockets with fixation enhanced by screws or with cemented cups requiring some kinds of reinforcement rings and antiprotrusio cages. Press-fit sockets were used in small segmental deficiencies while in large supero-lateral or medial defects Muller and Ganz reinforcement rings or Burch-Schneider antiprotrusio cages were adopted in dependency of bone loss. We report about 59 cases in which the follow-up is between 2 and 7 years. All the patients achieved good clinical and radiographic results with prompt healing of the grafts and good restoration of the acetabular bone stock. No major complications correlated to the use of the autografts were observed, particularly no donor site problem or mechanical failure or massive resorption of the grafts occurred. We think this kind of technique offers some advantages such as insuperable biological properties that only patient's native bone has, no risk of transmissible diseases and possibility to really restore the acetabular defect. Disadvantages include a time consuming surgery, the limited quantity of the grafts, the difficulty to adopt this technique in some cases of massive acetabular disruption and the donor site problem reported by some authors. In conclusion we retain this technique indicated in most cases of acetabular revision surgery. The question as to whether failure rates will increase with time – in comparison to what we largely reported in long term follow-up for the allograft series – needs more time observation.

ACETABULAR RECONSTRUCTION WITH GANZ ROOF REINFORCEMENT RING

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The Ganz acetabular roof reinforcement ring has a hook that fits over the edge of the cotyloid notch (Centerpulse, Baar, CH). The hook helps to restore the anatomic hip center and provide further mechanical stability in acetabular revision. The purpose of this study was to review the midterm clinical and radiographic results of acetabular reconstruction with Ganz ring.

MATERIALS AND METHODS. 25 consecutive cases of revision acetabular revision were reviewed at mean follow-up of 5.4 years. According to the G.I.R. classification (Pipino 1994) the acetabular bone defects were: type 2 three cases, type 3 sixteen cases, type 4 six cases. Preoperative and postoperative Harris hip scores were calculated for each patients. The surgery was performed through the lateral approach in all cases. Acetabular reconstruction was performed using the Ganz ring and a cemented polyethylene cup. Autoclaved morselized bone allografts were performed behind the ring to fill any superior or medial bone defects. Radiographic examination was performed to evaluate the location of the hip center and the inclination of the ring. The hip center was measured on the preoperative and postoperative anteroposterior radiographs of the pelvis as the vertical distance between the center of the femoral head and a horizontal line drawn across the top of both obturator foramina. In the follow-up radiographs the implant fixation was evaluated according to criteria of Gill et al (1999).

RESULTS. The mean preoperative Harris Hip score was 45.6 (range 30-60); the mean postoperative score was 92.5 (range 75-100).

The prerevision position of the hip center averaged 3,72 cm (range 0- 4.5) superior to the obturator line and averaged 2.37 cm (range 0-3.5) superior to the same line after revision. The mean inclination of the ring was 45° (range 40-50°). There were no cases of revision, or broken screws or ring migration. Of 25 hips, 3 cases (12%) were classified as possibly or probably loose because of radiolucencies medial and superior to the ring. All bone grafts were incorporated.

CONCLUSION. The Ganz acetabular reinforcement ring obtains immediate fixation through multiple screws directed toward ileum and through the hook fits at level of cotyloid notch. This study showed the midterm efficacy of the procedure with respect to clinical results and implant fixation in selected patients with superolateral and/or medial acetabular bone deficiencies.

REFERENCES

1. Gill TJ, Siebenrock K, Oberholzer R, Ganz R. Acetabular reconstruction in developmental dysplasia of the hip. *J Arthroplasty* 1999; 14: 131.
2. Pipino F, Molfetta L, Capozzi M. La tecnica di reimpianto in relazione al difetto osseo. *Chir Organi Mov* 1994; 79: 295.
3. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. *J Bone Joint Surg (Am)* 1969; 51-A.

McMINN STEMMED CUP IN ACETABULAR DISCONTINUITY AT 4 YEARS FOLLOW-UP

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BACKGROUND. Authors describe their results with the McMinn stemmed cup analyzing their first series of 23 patients with an average follow-up of 4 years.
The McMinn stemmed cup is a revision titanium cup that achieves primary stability through a stem inserted in the iliac wing. Thus allows the orthopedic surgeon to achieve a good primary stability in difficult revision cases with huge acetabular bone defect with loss of foramen obturator hanging capability.
METHODS. 23 patients underwent 23 cup replacements with a McMinn stemmed cup during the period 1998-1999.
All cases presented massive bone loss with lost of obturator foramen congruity.
All 21 patients were interviewed during the preparation of this paper using a standardized questionnaire module.
Clinical evaluation and x-ray evaluation were performed by the same operator.
RESULTS. 2 patients died for unrelated pathologies during this period. 1 patient had a deep infection. 1 patient had a superficial wound infection treated with antibiotics. Two patients had prosthesis dislocation (one traumatic). One of them underwent new surgery with cup reorientation. Most of the patients reported no or mild pain 13 (62%), 7 patients reported moderate pain (33%). Just 1 (4.8%) case reported severe pain. X-ray evaluation did not show cup mobilization. Radiolucency of part of the stem were found in 4 (19.4%) patients with no clinical or further radiological signs of mobilization. Radiolucency was not observed till now at cup interface. A septic loosening has been reported in 1 case.
CONCLUSIONS. Acetabular reconstruction in severe bone deficiencies is a challenge for orthopedic surgeons.
Furthermore, in these cases, clinical outcomes are much less impressive than primary hip replacement and type I or II deficiencies. The McMinn cup represents a valid choice in the hands of experienced surgeons. Aim of this prosthesis, when used in this group of patients, is to achieve a good secondary stability, a painless hip joint and as few limitations as possible in everyday life.

REVISION SURGERY FOR ACETABULAR DEFECTS WITH AN OBLONG CUP

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Aseptic loosening is defined as a progressive loss of stability of an implant originally stable.
The tissue reactions to wear debris can lead to periprosthetic bone resorption and prosthetic components migration.
Wear debris generated osteolysis and loosening of the acetabular cup usually cause proximal and posterior migration of the cup with bone resorption in the posterior-superior wall, giving the acetabular cavity an oblong shape.
Thus, in order to achieve a stable primary fixation, to re-establish the articular biomechanics and to salvage bone stock, special acetabular revision techniques and implants have been developed. Among those, the LOR (längsovalen Revisionspfanne) cup showed to overcome the reported problems, allowing a stable primary fixation on healthy host bone, an extensive bone ongrowth, a good integration of bone grafts with subsequent satisfactory bone stock restoration.
In the "M. Boni" Orthopaedics and Trauma Department of the University of Insubria, a retrospective review was conducted to determine the mid-term results of the LOR oblong revision cup.
From July 1995 to March 2000, 41 acetabular revision surgeries were performed for what was considered to be aseptic loosening of the acetabular cup. Acetabular defects were classified, according to Paprosky's criteria, as: 4 (9.5%) type 2A, 12 type 2B (28.6%), 6 type 2C (14.3%), 14 type 3A (33.3%) and 6 type 3B (14.3%). Morselized bone grafts were used in 19 cases (45.2%). Follow-up assessment was conducted on 40 hips of 39 patients, 28 females and 11 males, who returned for clinical and radiographic evaluation at a mean period of 60.6 months (range, 30 to 89 months). It was not possible to review two patients, who deceased within one year from surgery because of causes unrelated to revision hip surgery. Clinical assessment with the Harris Hip Score showed an improvement from 46 points to 82.2 ($p<0.001$). At follow-up, no sign of cups' loosening was detected at radiographic analysis. Statistics revealed a significant correlation between cup dimension, caudally displaced rotational center of the insert, leg lengthening and postoperative pain.
At follow-up, neither rotation or migration of the cups could

be detected. The x-ray evaluation did not show any radiolucent line in 26 cases (65%), while in 13 cases (32.5%) a non progressive, smaller than 1 mm line was noted. Five cases showed a postoperative radiolucent line of about 55% and in 3 of them radiolucency reduced to 40% at the follow-up examination. In the remaining 2, radiolucency at follow-up was 50%. Radiolucent line extension and final result did not correlate ($p>0.05$). In one case (2.5%) a non-progressive radiolucent line larger than 2 mm extended to all the three De Lee-Charnley zones, but the patient was clinically asymptomatic. Concerning those 21 cases (52.5%) where no bone chips where grafted, remaining acetabular defects manifested postoperatively in 11 cases (27.5%); none of these defects could be seen at follow-up x-rays, them being filled by new host bone.

THE ASYMMETRICAL LOR CUP IN ACETABULAR REVISION SURGERY

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INTRODUCTION. Hemispherical uncemented acetabular components with porous coatings that use supplemental screw fixation have clearly improved the success rate of revision surgery. However, in many cases of acetabular revisions the socket has a prevalent superior migration and therefore the acetabulum becomes oblong rather than round, and its longitudinal diameter is greater than its transverse diameter.

In this cases an oval cup rather than an hemispherical cup should adapt better to the pre-existing bone defect without further sacrifice of residual bone and a press fit between the cup and the host bone could be achieved.

The purpose of this paper is to evaluate the two to five years results associated with the use of an oval revision cup, designed with its longitudinal diameter elongated compared to its transverse diameter, for acetabular revisions in the presence of bone loss.

MATERIALS AND METHODS. Thirty-nine acetabular revisions with a Longitudinal Oval Revision cup were implanted in the Orthopedic Clinic of the University of Cagliari and in the II Orthopedic Clinic of the University of Florence from 1996 to 2000.

Seven patients were lost to follow-up; this left thirty-one hips who were available for a clinical and radiological review with a minimum of two years follow-up and an average follow-up of 3.7 years (range: 2 to 5 years). The average age of patients at time of index operation was 73.5 (range 62 to 82).

According to Paprosky acetabular defects classification in 5 cases (16.1%) it was a type 1, in 7 cases (22.6%) a type 2a, in 12 cases (38.7%) a type 2b, in 2 cases (6.5%) a type 2c and in 5 cases (16.1%) a type 3a.

A LOR cup was used for all hips; in the transverse axis this cup looks like a hemisphere without the pole segment since the longitudinal axis is elongated by 6 to 12 mm. In the longer socket two plastic liner are available where the center of rotation in centrally or 6 mm caudally displaced. The average number of screws was 3.2 (range 2 to 5). In only 5 cases (16.1%) we limited the screws fixation to the cranial area in the iliac bone, in all the remaining cases we always added a screw caudally in the ischial bone. In all the cases non structural allografts were used and in the last 16 cases we used allografts augmented with demineralized bone matrix.

The Harris Hip Score was determined pre-operatively and at the most recent follow-up. A-P and lateral radiographs were made pre-operatively and at each follow-up examination

RESULTS. One implant migrated more than two mm in the first year, then stabilized; it was a case in which no caudal screws were applied.

At the latest follow-up examination the average Harris hip score improved from was 34 pre-operatively to 79. Results were rated as excellent in 9 (29.0%) hips, good in 16 (51.6%), fair in 4 (12.9%) and poor in 2 cases (6.4%).

All the acetabular components were considered radiographically stable at the final follow-up examination. Radiolucent lines were present in 7 sockets in 1 or more than 1 zone, but they were non progressive and less than 2 mm in width. We had a complete incorporation of the grafts in 28 cases (90.3%) and a partial resorption was recorded in 3 cases (9.6%).

DISCUSSION. In our experience the ideal indication for the use of this cup were acetabular revisions with bone defects of type 2a, 2b, and 3a according to Paprosky classification. We could achieve a good primary stability in most of the cases, but screws supplementary fixation is mandatory for the stability of the implant, the allograft incorporation and to allow the early mobilization of the patients. However in our experience screws should not be limited to iliac bone, but a caudal screw in ischium should be added. The geometry of the cup and the option of two PE liners allowed us to restore the physiological center of rotation in most of the cases.

In conclusion, our two to five results are encouraging, we had no aseptic loosening, and no late migration of the cup.

REFERENCES

1. Cameron HH. Modified cups. *Orthop Clin North Am* 1998; 29: 277-95.
2. Koster G, Willert HG, Kohler HP, Dopkens K. An oblong revision cup for large acetabular defects. *J Arthroplasty* 1998; 13: 559-69.
3. Paprosky WG, Perona PG, Lawrence JM. Acetabular defect classification and surgical reconstruction in revision arthroplasty: a 6 years follow-up evaluation. *J Arthroplasty* 1994; 9: 33-40.
4. Whaley AL, Berry DJ, Harmsens WS. Extra-large hemispherical acetabular component for revision total hip arthroplasty. *J Bone Joint Surg (Am)* 2001; 83-A: 1352-7.

RESULTS OF FEMORAL REVISION WITH THE MODULAR PROSTHESIS (MP)

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INTRODUCTION. The goal of femoral revision arthroplasty is to ensure stable fixation of the component. Proper selection of implant requires an accurate preoperative planning which should analyse the cause of failure, the bone defects and the patient's age and expected activity (1). It is difficult to achieve a successful revision total hip replacement in severe femoral bone loss. The MP revision stem (Link, Hamburg, Germany) has some theoretical advantages, the modularity of this prosthesis allows to obtain good distal fixation and to restore leg length and proximally hip stability.
MATERIALS AND METHODS. The MP reconstruction prosthesis is made in titanium alloy (Tilastan) with a microporous texture. The distal tapered stem is angled about 3° and this allows the introduction of the prosthesis into the femur without osteotomy. The proximally attachable neck segments are available with and without collar and with CCD angle of 126° and 135°. Implantation of the stem may thus performed in the most advantageous position and consecutively the optimum anteversion angle and length is set with the attachable neck segment.
We evaluated 35 revision hip using MP modular stem with average 3.5 years follow-up. The average age of the patients at the time of revision was 67.4 years. The indication of revision was aseptic loosening in 26 hips, septic loosening in 4 hips and periprosthetic fracture in 5 hips.
Using the G.I.R. classification of femoral bone loss (2), 1 hip was classified as type I, 12 hips as type II, 13 hips as type III and 4 hips as type IV.
All operations were performed with transgluteal approach. In three cases were performed trocantheric osteotomy. Cement were removed from femur by hand and by power instruments. In five hips preventative cerclage were placed around femora before prosthetic insertion. The two-stage procedure was performed in septic loosening.
RESULTS. One patient with preoperative septic loosening was rerevised for reinfection occurred after 14 months. On the remaining 34 hips clinical evaluations were performed according WOMAC evaluation form (3) and the average 3.5 year follow-up hip score was 83.4.
One hip sustained a postoperative dislocation and was treated successfully with closed reduction. Radiographic data analysis revealed in 31 cases stable fixation through intimate contact stem-host bone in the distal femur. Progressive subsidence ranged from 3 to 6 mm was noted in 3 stems (14.2%). The most recent radiographs showed good restoration of the proximal femur in 31 hips (91%).
DISCUSSION. High failure rates after revisons with cement have led to the promotion of uncemented long-stem femoral prostheses. A review of the literature has shown lower rates of failures after revision arthroplasties with an uncemented femoral component and most such failures had occurred within the first few postoperative months because the primary stability of the stem was not good (4). Wagner has popularized the technique of distal fixation of the cementless one-piece stem in revision surgery (5). The modular stem allows more options intraoperatively to optimize fixation, stability, version and length which can reduce the prevalence of stem subsidence and hip dislocation (6).
CONCLUSION. In our experience, use of the MP modular femoral stem in revision arthroplasty allowed intraoperative customization obtaining reliable fixation and restoring hip biomechanics. At average 3.5 years follow-up we evaluated satisfactory clinical results in 80% of patients (WOMAC > 69) and good stem fixation with restoration of bone stock in 91% of hips.

REFERENCES

1. Capone A, Gusso MI, Ennas F. La chirurgia di revisione nelle artroprotesi d'anca. *Rivista Italiana di Biologia e Medicina*, 2000, Ed. Minerva Medica 20 (suppl.1).
2. Pipino F, Molfetta L. GIR Classification of acetabular and femoral bone loss in revision hip arthroplasty surgery. *J Orthop Traumatol* 2000; 2: 69-77.
3. Villani C, Romanini E, Giordano MC, Persiani P, Casella F. Artroprotesi totale d'anca non cementata: valutazione orientata dal paziente a medio termine. *G.I.O.T.*, 2000; 26: 67-73.
4. Bohm P, Bichel O. Femoral revision with the Wagner SL revision stem. *J Bone Joint Surg (Am)* 2001; 83-A: 1023-31.
5. Wagner H. Revision of femoral stem with important loss of bone stock. Postgraduate lectures, EFORT, 1993; 1: 64-74.
6. Bono JV, McCarty J, Lee J, Carangelo R, Turner R. Fixation with a modular stem in revision total hip arthroplasty. *J Bone Joint Surg* 1999; 81: 1326-36.

THE RECEMENTING TECHNIQUE IN REVISION HIP SURGERY

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BACKGROUND. The complete removal of the cement mantle in hip revision surgery can be a very hard and destructive procedure for the femur. The possibility of recementing a prosthesis in the old cement taking out only the broken or unstable part has been described since 1978 (1). Further experiences showed good results when the surgical technique is precise (2).
The indications are old patients or patients with poor physical activity (3). The aim is to preserve the old cement and the bone stock and to reduce the surgical stress. Advantages are shorter surgical time, less damage of the femur and good primary stability.
Mandatory points of the technique are: removal of blood and complete drying of the old cement surface, rasping of the cement surface with a mini-drill, early introduction of fresh cement at low viscosity and cleaning of the osteolytic areas.
MATERIALS AND RESULTS. Our experience with this technique started in 1994. So far, 44 patients underwent the cement-within-cement stem procedure. The average age of patients was 73 years (min 44, max 88). 35 were females and 9 males. The diagnosis for revision were: cup loosening (7 cases), stem loosening (23), loosening of both the components (13) and recurrent dislocation (1). 9 hips were already revised once or more before this operation. In 25 cases the old stem was recemented, in 19 cases a new one was implanted. Intraoperative complications were 5 cases of fracture of the greater trochanter.
We observed a generally lower rate of femoral and general complications in these patients and shorter surgical time. At follow-up results are quite good with only one case of re-operation (with a long revision stem).
DISCUSSION. The cement-within-cement technique is a quite safe and simple procedure. The same removed stem, if not damaged, can be re-implanted or a smaller one, of a compatible material, can be employed.
In old patients with low level of activity and a mantle of well fixed intact cement, it should be considered a first choice option. The steps of the technique must be strictly followed.

REFERENCES

1. Greenwald S, Narten N, Wilde A. Points in the technique of recementing in the revision of an implant arthroplasty. *J Bone Joint Surg (Br)* 1978; 60-B: 107-10.
2. Lieberman JR, Moeckel BH, Evans BG, Salvati EA, Ranawat CS. Cement-within-cement revision hip arthroplasty. *J Bone Joint Surg (Br)* 1993; 75-B: 869-71.
3. Giacometti Ceroni R. La ricementazione dello stelo nei reimpianti di protesi totale d'anca. *Cementi ossei. Attualità e prospettive*, C. Castelli, et al. Wichtig Editore 1996; 78-80.