

ONE-STAGE BILATERAL TOTAL HIP ARTHROPLASTY A SIMULTANEOUS PROCEDURE IN 79 PATIENTS

J. O. LAURSEN, H. HUSTED, N. B. MOSSING

The authors retrospectively studied 79 patients who had undergone simultaneous bilateral total hip arthroplasty during the period 1982 to 1994. Forty one patients were examined clinically and radiographically at least 5 years postsurgery. The procedure was associated with few early postoperative complications and so far excellent results at 7.5 years with regard to patient satisfaction, Hip Functional Index and survival of the prostheses. It is concluded, that in selected patients with bilateral hip disease necessitating bilateral hip replacement, the bilateral operation may be advantageously carried out in one session.

Key words : hip joint ; total hip replacement ; bilateral ; simultaneous.

Mots-clés : hanche ; prothèse totale de hanche ; bilatéral ; simultané.

Since the 1960's bilateral hip arthrosis has been treated successfully by total hip arthroplasty (THA).

This bilateral hip replacement is most often performed as two unilateral operations separated by several months. However, a few authors have reported their experience with one-step bilateral total hip arthroplasty, in which both hips are replaced simultaneously (2, 8, 11, 12, 14).

We report our experience and results with 79 patients who underwent one-stage bilateral total hip arthroplasty from June 1982 to June 1994. Forty-one patients representing 82 replaced hips were clinically and radiographically examined at least 5 years postsurgery.

MATERIALS AND METHODS

Seventy-nine one-stage bilateral total hip arthroplasties were performed in our department from June 1982 through June 1994 representing 158 hips.

All patients had severe complaints from both hips and expressed interest in the simultaneous replacement. The patients were carefully evaluated preoperatively. Patients with cardiopulmonary disease, hypertension, difficult anatomy of the hips, severe obesity and prior history of thromboembolic episodes were excluded.

All operations were performed in a laminar airflow operating room. Femoral and acetabular components were fixed with cement using a polyethylene plug, lavage and pressure technique with a cement pistol ("third-generation technique"). The most affected hip was replaced first, and if this could be done without major bleeding or anaesthetic complications, the second hip was replaced after changing position, rescrubbing, redraping and using a new set of instruments. A blood-saver was not available, and we did not use blood donations or other means to save blood. All patients had a suction drainage on each site, but reinfusion of drained blood was not used.

All patients received intravenous antibiotics (cloxacillin or meticillin, 2 g) perioperatively as well as thrombosis prophylaxis (heparin, low dose or low molecular-weight heparin and TED-stockings).

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As the operation is rather long, a urethral catheter was inserted and removed on the first postoperative day. Abduction pillows were used in bed. All operations were performed by an orthopedic specialist; the average operating room time (anaesthesia time) was 3 1/2 hours (range : 2 1/2 - 4 1/2 hours).

At the end of each operation, subfascial suction drainage was used for all the patients.

Postoperative mobilisation was instituted as follows : exercises from the first postoperative day and walking with protected weight-bearing from the fourth day. Patients were seen routinely in our outpatient clinic after 6 weeks (clinical evaluation), 3 months and one year (clinical and radiographic examination).

From 1982 till 1988 we used the Richards Series 2 prosthesis (fixed 32-mm head). From 1987 to 1988 we changed to the Lubinus SP (fixed 30-mm head) and shortly after to the Richards International Total Hip (ITH - with a modular 28-mm head).

Of the 158 replaced hips 83 Richards Series 2, 21 Lubinus SP and 54 ITH prostheses were inserted.

Data from records

The patients were evaluated preoperatively regarding hip pain, walking ability and range of motion of the hips and a Hip Functional Index (HFI) (3) was estimated based on the records, taking into account the poorest hip for each patient.

Data were recorded as to age at time of operation, sex, length of operation (anaesthesia time), blood loss during surgery, transfusions given during admission, type of prosthesis inserted, bone transplantation, type of anaesthesia used, perioperative complications, duration of postoperative stay, postoperative complications, and whether the patient returned to his/her home or for further rehabilitation in an institution.

Our patients include 47 men and 32 women, and the diagnoses were : primary arthrosis (68), rheumatoid arthritis (5), arthrosis secondary to developmental abnormality (4) and avascular necrosis (2).

Seventy-five patients were operated under general anaesthesia and 4 were given epidural anaesthesia.

Follow-up

Fifty-seven patients had their hips replaced during the period of 1982 to mid - 1989, i.e. at least 5 years previously, and were requested to return for further examination. Thirteen had died 5 to 8 years after their bilateral THA of causes not related to the operation, and

3 patients did not want to participate but explained over the phone that their hips functioned well and they were without pain. Forty-one patients representing 82 replaced hips were examined and had their hips xrayed (AP view).

The hips were examined clinically with respect to leg length, pain, range of motion and walking ability and radiographically by one of the authors using criteria described by Harris *et al.* (4) dividing the acetabulum into 3 and the femur into 5 zones, and considering :

1 = stable : no migration and radiolucent zone/zones < 2 mm in less than half the zone in 1-2 zones. **2 = possibly loose** : migration < 2 mm and/or radiolucent zone < 2 mm in more than half the zone in 2-3 zones.

3 = probably loose : migration > 2 mm and/or radiolucent zone > 2 mm in more than half the zone in 2-3 zones.

4 = definitely loose : considerable migration and/or radiolucent zone > 2 mm in more than half the zone in more than 3 zones. Without specific methods such as RSA or EBRA, migration was measured as subsidence in mm of the femoral stem.

Ectopic ossifications were graded according to Brooker *et al.* (1).

Statistics

A Chi-square test was used for statistical analysis of the unpaired data, whereas analysis of variance was used for paired data, both with a 95% confidence limit. A Kaplan-Meier survival analysis was used as to "effective number at risk" with 95% confidence limits.

RESULTS

All our one-stage bilateral total hip arthroplasties were cemented, and for all patients, it was their first hip replacement. Two patients had prior surgery on the hips : one had an osteotomy performed on the right hip, and on the hips of the other patient a bilateral drilling had been performed earlier. During the operation two patients had bone transplantation at one site on the acetabulum owing to fragility of the acetabular wall.

We encountered 2 perioperative complications, neither of which was caused by the one-stage procedure or prolonged anaesthesia time : one patient was allergic to penicillin and developed a brief

decrease in pulse rate; the scalpel broke during surgery in another patient and a fragment — which could not be retrieved — stayed parallel to the femoral neck. The latter caused no trouble to the patient.

The mean anaesthesia time was 210 minutes (range : 150-270 minutes).

The mean blood loss was 1260 ml (range : 400-2800 ml) perioperatively, and an average of 4.8 transfusions (range : 0-18) were administered during the hospital stay. The mean postoperative stay was 15 days (range : 8-75 days).

Table I shows data for the 79 bilateral THA's and especially for the 25 first versus the last 25 patients operated in a simultaneous procedure with respect to mean age, anaesthesia time, blood loss, transfusions given and duration of postoperative stay. For the last 25 patients operated, mean blood loss was 1205 ml with 4 transfusions given. Mean hospital stay was 12.5 days (table I).

Seventy three patients were discharged home, while 4 entered an institution for additional rehabilitation (of these, three had rheumatoid arthritis), one patient returned to a nursing home and one was transferred to a university hospital for venous thrombectomy in the thigh.

Table I. — Data from 79 bilateral THA's operated in a simultaneous procedure. Mean values for the first 25 and the last 25 patients operated

	All 79 patients	First 25 patients	Last 25 patients
Age (years)	62	65	60
Anaesthesia time(min)	210	231	199
operation (ml)			
Perioperative blood loss	1260	1490	1205
Transfusions while in hospital (units)	4.8	7	4
Postoperative stay in hospital (days)	15	18	12.5

Mean values for several variables in 79 bilateral total hip arthroplasties operated in a simultaneous procedure and mean values for the first 25 and last 25 operated patients.

Early postoperative complications

Eight patients were treated for early postoperative complications (table II). Three patients developed urinary tract infections (acute cystitis) and were treated with appropriate antibiotics. Two patients had an episode of clinical pulmonary embolism, neither of which was fatal. One of these patients was transferred to a university clinic for embolectomy of the veins in the thigh and had a major pulmonary embolus from which she recovered after intensive treatment and stayed 74 days in the hospital. It was later disclosed, that she had a record of earlier thromboembolic episodes, and should, according to our criteria, have been treated with a two-stage operation.

No episodes of deep infection, decubitus ulcers, cardiac complications or dislocation of the replaced hips were recorded. No deaths followed the procedure during the postoperative stay in our department.

Table II. — Number of early postoperative complications in the first 25 and last 25 patients

	All 79 patients	First 25 patients	Last 25 patients
Urinary tract infection	3	3	0
Superficial wound infection	2	2	0
Deep wound infection	0	0	0
Pulmonary embolus	2	2	0
Cardiopulmonary (other)	0	0	0
Dislocation of hip	0	0	0
Decubitus ulcer	0	0	0
Additional surgery	2*	0	1
Deaths	0	0	0

79 bilateral total hip arthroplasties operated in a simultaneous procedure and number of early postoperative complications in the 25 first and 25 last operated patients. Wound infections are considered superficial if the infection is limited above the fascia, deep if the infection is below. *Two patients had additional surgery, including one of the patients with a superficial wound infection. One developed significant ectopic ossification around both hips.

Two patients had a superficial infection above the fascia. One infection was with *Klebsiella* species and one with *Staphylococcus aureus*; one of these needed incision and healed without further complications. Additional surgery was performed in one other patient, who developed grade 3 ectopic ossifications around both arthroplasties, but with significant symptoms only on one side. Eight patients had early postoperative complications: seven occurred among the first 25 patients operated on, while only one was recorded for the last 25 patients (table II).

Follow-up > 5 years postsurgery

Fifty-seven patients had their hips replaced at least 5 years earlier, and they were all asked to return for a clinical and radiological examination. Forty-one responded, 3 did not want to participate, and 13 had died.

The 41 patients filled in a questionnaire regarding their recovery. All were satisfied with the results, and nearly all found the number of routine outpatient follow-up examinations to be sufficient. The vast majority (38/41) found their replaced hips to be functioning well or even better compared to their last visit several years before. Only two patients had seen their general practitioner over the years for pain related to one or both hips. Five patients found the number of routine appointments in the outpatient clinic to be insufficient.

Eight patients occasionally had pain from one of the replaced hips when walking, seven of whom used mild or moderate analgesic drugs (NSAID's). However, all the patients were satisfied with the operative result and none had had a revision-arthroplasty performed or expressed interest in one at the present time.

CLINICAL EXAMINATION

The 41 patients representing 82 hips were evaluated at a mean of 7.5 years (range: 5-12 years) post surgery. At this examination they were evaluated with respect to hip pain, walking ability and range of motion of the hips, and a Hip Functional

Index (3) (HFI) was again estimated for each replaced hip.

The preoperative HFI was 7.2 (range: 2-12) and was estimated from the records registering the lowest scoring hip. At follow-up the HFI was estimated for each hip and was found to be 16.7 (range: 12-18) ($p < 0.05$). Walking ability was estimated for the patient in general, as we found it impossible to discriminate between the hips in this matter. Functional leg length was found to be equal within 1 cm on both sides for all patients.

RADIOLOGICAL EXAMINATION

The radiological examination of the 82 THA's inserted revealed that 76 (93%) of the acetabular components and 76 (93%) of the femoral components were stable. Five sockets and 6 femoral stems were possibly or probably loose; one socket was definitely loose (table III)

The postoperative HFI, sex and age were found not to be related to radiographic signs of loosening (N.S.) (table III & IV).

A Kaplan-Meier survival analysis (with revision as endpoint) showed a prosthesis survival of 100% at the time of evaluation after a mean of 7.5 years.

Table III. — Radiographic signs of loosening of components related to age at operation and Hip Functional Index (HFI) at follow-up in 41 patients

	Number of THA's	Age (years)	HFI follow-up
Stable hips (1)	70	61.3 (40-72)	16.7 (12-18)
Possibly or probably loose hips (2+3)	11	65.3 (61-77)	16.1 (12-18)
Definitely loose hips (4)	1	57	16

Radiographic signs of loosening related to age and Hip Functional Index (HFI) in 41 patients more than 5 years post-operatively.

Table IV. — Radiographic signs of loosening of components more than 5 years postsurgery related to sex and age in patients representing 82 THA's (164 components)

Age at operation	Sex	Stable components (1)	Possibly or probably loose(2 + 3) components	Definitely loose components (4)	Total number of components*
< 60 years	male	34	1	1	36
< 60 years	female	20	0	0	20
> 60 years	male	44	4	0	48
> 60 years	female	54	6	0	60
Total		152	11	1	164

Radiographic signs of loosening more than 5 years postsurgery related to sex and age in 41 patients representing 82 THA's and 164 components. Patients with signs of loosening of one component all had 3 stable components also. There are no significant differences between groups.

DISCUSSION

Bilateral total hip replacement for patients with bilateral hip disease can be performed during one or two hospital admissions. It has been estimated that 25 to 50% of patients suffering from idiopathic hip arthrosis or rheumatoid arthritis affecting the hips will need an operation on both hips (5, 9).

It has also been estimated that the number of total hip arthroplasties will increase by 32% in Denmark from 4,013 in 1989 to 5,307 in 2020, provided the age- and sex-related incidences are unaltered (10). Facing this increasing demand for hip arthroplasties and knowing that many patients will eventually need replacement of both hips, we find that both patients and society would benefit from the simultaneous procedure in which both diseased hips could be replaced by prostheses.

The operations performed on the 79 patients in this study required an average of 3 1/2 hours of operating room time as opposed to an average of 1 1/2 hours for unilateral replacements performed by the same staff (6).

Results regarding blood loss, transfusions given and the anaesthesia time are similar to those in other studies published from this time period (11–13) and for the first two variables only slightly above the values for unilateral replacement arthroplasties (13, 14). The mean postoperative stay in the hospital was 15 days in this study and between

18 and 25 days in other studies from the seventies and eighties (11–14). After most unilateral replacements during the seventies and eighties most patients stayed 14 to 20 days in hospital (8, 11–14). During the nineties however, the hospital stay has been reduced to half these figures.

Table I lists data and comparisons between the first 25 patients and last 25 patients who had bilateral total hip arthroplasties performed as a simultaneous procedure. The patients tend to be younger, and the other variables listed also indicate that the one-stage operation is primarily performed on young healthy patients according to our careful preoperative evaluation. The decreasing complication rates and values of anaesthesia time, blood loss and units given intra- and postoperatively also indicate increasing experience of the operating team.

Of the 79 patients reviewed only eight were treated for early complications, none of which was fatal. The overall incidence of 10% — and only 1.5% for the most recently operated 54 patients lies far below incidences reported by some authors (11, 13) and equals the results of others (12, 14). Comparison of the early postoperative complications in one-stage versus two-stage bilateral total hip arthroplasties showed no significant statistical difference in other studies (8, 13) and the incidence is no greater than following unilateral hip arthroplasty performed in our department and reported by Laursen *et al.* (6)

We saw only one instance of severe ectopic ossification, Brooker grade IV (1). This occurred bilaterally, but the patient only needed treatment in the form of excision of the ossifications on one side. Five more patients had developed some degree of ectopic ossification around one or both hips at the follow-up examination.

Others (12) have found far greater incidences up to 36%, but this may be associated with different approaches and operating technique. We also used the posterior approach, while others have used the lateral approach with trochanteric osteotomy and cruciate wiring technique.

The results presented at follow-up after a mean of 7.5 years among the 41 patients reviewed in this study were thus far excellent. All patients are satisfied, and the vast majority have equally or even better functioning hips today compared to their last outpatient control. Eighty-five percent of the hips showed no signs of loosening and only one acetabular component was definitively loose. The patient in which the left acetabular component had loosened, found his hip functionally poorer than the contralateral hip but had no pain. He worked as a farmer and could perform his job without any problems and therefore did not want the cup exchanged. He will, together with the 11 patients with possibly or probably loose components, be seen at intervals of 6 months in the out-patient clinic to ensure proper treatment, should the symptoms worsen.

Laursen *et al.* in 1994 (6) estimated a prosthesis survival of 93% after 10 years for the Richards Series 2 prosthesis, and a similar value has been estimated for the Lubinus SP prosthesis by Malchau *et al.* (7). Wejknier *et al.* in 1988 (15) rated 96% of Charnley prostheses as clinically successful in their study.

The prosthesis survival rate (revision as endpoint) of 100% after 7.5 years in this study is outstanding and it will be interesting to see if it drops to similar values as those for the unilateral hip replacement within the years to come.

The economic costs of the two-stage operation far exceed the costs associated with the simultaneous procedure. It has been estimated that using the Richards ITH prosthesis, the total costs in 1993 for the insertion of one prosthesis is approximately

25,500 Dkr (16). The costs for two separate admissions during which the patient has one hip operated at a time thus amounts to 51,000 Dkr, whereas the cost for the simultaneous procedure only equals 35,000 Dkr. This represents savings of 31% for each patient.

Estimating that approximately 25% of the patients needing bilateral hip arthroplasty can actually be operated in a single procedure owing to restriction on selection (8) and that 25% (9) up to 50% (10) of the patients with diseased hips due to idiopathic arthrosis or rheumatoid arthritis will need bilateral operation, we calculated that in 2020 total savings in the area of 5 to 10 million Dkr (1993 value) could be achieved in Denmark by using the simultaneous procedure on selected patients whenever possible.

CONCLUSION

We recommend the one-stage procedure for patients with bilateral hip disease necessitating the replacement of both hips, provided a careful preoperative evaluation of each possible candidate is carried out. Patients with cardiopulmonary disease, hypertension, distorted anatomy of the hips, severe obesity and prior history of thromboembolic episodes must be excluded. Under these conditions, we find the procedure to be safe and associated with very few early complications.

During the past 10 years we operated approximately 8% of all our THA's in one session, and very rarely was a planned one-stage operation changed to a two-stage operation because of the restrictions mentioned.

It is concluded that in selected patients with bilateral hip disease necessitating bilateral hip replacement, the two operations may advantageously be carried out in one session, and we find our results more than 5 years postsurgery excellent clinically as well as radiographically, and the survival of the prostheses used in this study are comparable to the best data reported.

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SAMENVATTING

J. O. LAURSEN, H. HUSTED, N. B. MOSSING. Bilaterale totale heuparthroplastie in één tijd bij 79 patiënten.

De auteurs hebben retrospectief 79 patiënten nagekeken waarbij in één tijd een bilaterale totale heupprothese werd geplaatst.

Bij 41 patiënten was er een klinisch en radiologisch onderzoek met een follow-up van 5 jaar minimum. De operatie had niet meer complicaties vroegtijdig en tot heden met een gemiddelde follow-up van 5,7 jaar uitstekende resultaten voor wat de tevredenheid van de patiënt betreft. Eveneens de heupfunctie-index en de overleving van de prothese was gunstig.

De auteurs besluiten dat voor geselecteerde patiënten met een bilaterale heuppathologie het plaatsen van een bilaterale heupprothese in één tijd voordelig is.

RÉSUMÉ

J. O. LAURSEN, H. HUSTED, N. B. MOSSING. Prothèse totale de hanche bilatérale en un temps : résultat chez 79 patients.

Les auteurs ont revu de manière rétrospective 79 patients qui ont bénéficié entre 1982 et 1994 d'une arthroplastie par prothèse totale des deux hanches en un temps.

Quarante et un patients ont été examinés cliniquement et radiologiquement avec un recul d'au moins 5 ans. Les complications précoces ont été rares ; avec un recul de 7,5 ans, les résultats sont excellents en ce qui concerne la satisfaction du patient, la fonction de la hanche et la survie des prothèses. Les auteurs concluent que, pour des patients sélectionnés, présentant une pathologie coxo-fémorale bilatérale, une arthroplastie bilatérale peut avantageusement être effectuée en un seul temps opératoire.