Pregnancy and childbirth after total hip arthroplasty

We surveyed 343 young women with 420 total hip arthroplasties (THAs) regarding pregnancy and childbirth after THA. The mean age at surgery was 35 years (18 to 45). The mean length of follow-up after the initial arthroplasty was 16 years (6 to 27).

Of these 343 women, 47 (13.7%) had a successful pregnancy after their primary THA. The first baby after a THA was delivered vaginally in 30 patients and by Caesarean section in 17. Of the 343 patients, 138 underwent a revision. For the entire series, the risk of revision at five years was 5%, at ten years 24%, and at 20 years 50%. After adjusting for age at surgical intervention, the risk of revision was not significantly associated with childbirth. Of the 47 patients who had a successful pregnancy, 28 (60%) noted an increase in pain in the hip during pregnancy and ten of these patients had persistent pain after their pregnancy. Seven patients complained of pain in the groin in the replaced hip after childbirth. At the time of this survey, five of these patients (70%) had had revision THA.

Childbirth is not affected by the presence of a THA. Pregnancy after THA is not associated with decreased survival of the prosthesis. Pain in the hip is common during pregnancy in these patients. Pain in the groin which persists after delivery commonly leads to revision of the THA.

Women of childbearing age can develop end-stage arthritis of the hip from a variety of conditions such as developmental hip dysplasia, osteonecrosis, juvenile inflammatory arthritis and trauma. Some may require total hip arthroplasty (THA). Despite historical reports of poor outcomes in this age group, THA is still offered.1-5 A recent National Hospital Discharge Survey6 in the United States reported that more than 5000 THAs were performed annually in women under the age of 45 years.

There have been few published reports on the associations between THA, pregnancy and childbirth.7-12 Most have been case reports or studies of small series of patients who achieved a successful pregnancy and childbirth after THA. Despite these studies, some issues regarding pregnancy and childbirth after THA remain unanswered including doubts about the safety of pregnancy and delivery after the procedure. Our aim, therefore, was to study pregnancy and childbirth in a large group of patients who had undergone THA and to determine the effect of childbirth on the subsequent survival of the implant.

Patients and Methods
All female patients between the ages of 18 and 45 years, who had had a primary THA between 1975 and 1995 were identified from the total joint registry at the Mayo Clinic. Of these, 599 were found to fit the inclusion criteria (females; 18 to 45 years of age). Fifty-six had died by the time of the study and 27 were excluded because they either failed to give their consent or were ineligible for other reasons. A questionnaire was sent to the remaining 516 patients. This comprised 37 questions which concerned the patients' experience of pregnancy and childbirth either before or after THA. It aimed to identify the number of pregnancies and childbirths as well as the level of pain in the hip before, during and after pregnancy and childbirth. Patients were asked to identify the specific location of their pain (pubic area, groin, buttock, back or thigh). In addition, specific questions about the method of delivery, and any associated complications, were also asked.

The total number of respondents was 394 (76%). Of these, 291 replied by letter and 103 were contacted by telephone. Fifty-one patients who replied were subsequently excluded because they had undergone an earlier procedure before their THA, for example hip resurfacing or bipolar hemi-arthroplasty. The final series therefore comprised 343 women (420 THAs). For those with bilateral THAs, the
analyses were based on the first of the two procedures. The mean age of the patients was 35 years (18 to 45). The mean follow-up after the initial arthroplasty was 16 years (6 to 27). In 146 patients (43%), the THA had been performed between 1975 and 1984 and in 197 (57%) between 1985 and 1995. Table I shows the initial diagnoses before THA.

A number of different prosthesis had been used during this period of time. The type of implant was divided into three groups as follows: both components cemented (n = 129, 38%); hybrid (one component cemented and the other uncemented (n = 99, 29%)); and both components uncemented (n = 115, 33%).

Our total joint registry routinely sends a follow-up questionnaire to patients at intervals of five years after their THA. Data about revision hip surgery were collected from this as well as from returned surveys or surgeon’s clinical notes.

**Statistical analysis.** The survival of the implant was estimated using the Kaplan-Meier survival method with the Cox proportional-hazards survival method adjusting for correlated data. The primary endpoint was taken as the time to revision THA for any reason. The time-dependent Cox proportional-hazards analysis was performed with the time-dependent variable being the date of the first childbirth after the THA. The p value was set at 0.05 for statistical significance.

**Results**

**Pregnancy and childbirth after THA.** There were 627 pregnancies either before or after THA in 228 patients. Of these, 108 pregnancies occurred in 57 (17%) patients after their primary THA. The number of pregnancies per patient ranged from one to nine. The mean time from THA to the first pregnancy was 3.8 years (8.3 months to 10.7 years). Five pregnancies ended in miscarriage. Only one of these five had a second pregnancy which resulted in a live birth. Five other patients underwent a revision THA before their first pregnancy.

Consequently, of the 57 patients, only 47 were included in the remaining analyses because they had a pregnancy which had resulted in a live birth between their primary THA and either revision or last follow-up. Eighteen patients had been pregnant at least once before their THA and five had received bilateral THAs. There was no significant difference in the type of delivery when comparing patients with unilateral or bilateral THAs (p = 0.34). The first baby after THA was delivered vaginally in 30 (64%) patients and by Caesarean section in 17 (36%). The reasons for a Caesarean section varied and were not specified by three patients. Two patients noted that their obstetrician had preferred to perform a planned Caesarean section because of their THA. One patient, who had sustained an earlier acetabular fracture and subsequently underwent a THA, was told that her pelvis was too small for a vaginal delivery. In the remaining 11, a Caesarean section was performed solely for obstetric reasons as follows: in seven for delay in labour, in three for hypertension induced by pregnancy and in one for a breech presentation. All 47 pregnancies which reached term had a successful outcome. There were no immediate prosthetic complications, and specifically no dislocations, fractures or loosening during pregnancy or childbirth. There were, however, obstetric complications, including a delay in labour in seven, hypertension induced by pregnancy in three, deep-vein thrombosis in one, and anaemia requiring transfusion in one.

**Hip pain in pregnancy and childbirth.** Of the 47 patients, 28 (60%) noted that pain in the replaced hip started or increased during pregnancy. In one this occurred during the first trimester of pregnancy, in four during the second and in 16 in the third. Seven did not remember when the pain had started. This pain was limited to the replaced hip alone in 11 patients, while 16 noted pain in both hips, and one patient did not specify. The pain was graded as very severe in three patients, severe in two, moderate in ten, mild in 12, and one patient could not remember the severity of her pain. Twelve of these patients took medication for pain in the hip during the pregnancy. Eighteen noted that their pain disappeared either before term or immediately after childbirth. However, ten of the 28 patients noted that their pain did not disappear after childbirth. In seven of these patients it was in the groin, while three patients noted pain in the pubic area. Of the seven patients with pain in the groin after childbirth, five stated that the pain lasted for less than a year, and two that it lasted for six or more years. All patients who complained of pain in the pubic area noted that this resolved within a year.

**Revision THA.** Of the 343 patients included in the analysis, 138 (40%) underwent a revision. Of these, 114 had not become pregnant and 24 had become pregnant after their THA. The risk of revision for the whole series at five years was 5% (95% confidence interval (CI), 3 to 7), at ten years 24% (95% CI, 19 to 28) and at 20 years 50% (95% CI, 43 to 57) (Fig. 1). A time-dependent Cox proportional-hazards analysis was performed using revision arthroplasty as an end-point. The time-dependent variable was the date of the first childbirth after THA (n = 47 patients). The risk of revision was 1.7 times higher in women who had one or more children after their THA (95% CI, 1.1 to 2.7; p = 0.02). After adjusting for the pre-operative diagnosis, the risk of revision remained unchanged (95% CI, 1.1 to 2.8; p = 0.02). After adjusting for the type of implant, the risk of revision was 1.6 and of borderline significance (95%
CI, 1.0 to 2.6; p = 0.05). After adjusting for the age at surgical intervention, the risk of revision was 1.2 and no longer significantly associated with childbirth (95% CI, 0.7 to 2.0; p = 0.49). There was also no significant difference in the risk of revision (p = 0.5) between those patients who had undergone a Caesarean section and those who had undergone a vaginal delivery (95% CI, 0.2 to 1.3; p = 0.14).

**Groin pain after childbirth and revision THA.** Seven patients stated that their groin pain persisted after they had given birth. Four of these patients had undergone a Caesarean delivery and three a vaginal delivery. Five underwent a revision THA and two did not. Four had a revision of the acetabular component with exchange of the femoral head and one had revision of both components. The intraoperative findings in these five patients included a loose acetabular component in three patients, an acetabular cup with fibrous ingrowth in one and a loose cup with catastrophic wear of the polyethylene and osteolysis in one. The seven patients with pain in the groin were compared with the remaining 40 who had a pregnancy and childbirth but who did not complain of such pain after delivery. In this group, 26 babies were delivered vaginally and 14 by a Caesarean section. Nineteen (47.5%) of these patients had a revision. The mean time from THA to revision or the last follow-up in patients with and without pain in the groin was 8.1 years (3 to 15.4) and 12.2 years (5.5 to 25.7), respectively. The mean time from childbirth to revision or the last follow-up in patients with and without groin pain was five years (1 to 10.5) and nine years (10 months to 21.7 years), respectively.

A Cox proportional-hazards model was created to answer the question whether pain in the groin which persisted after childbirth was associated with revision. For the 47 patients in this model, time zero was the date on which the child was born. The end-point was revision. The risk of revision was 3.95 times higher for women who continued to have pain in the groin after childbirth when compared with those who did not (95% CI, 1.36 to 11.47; p = 0.01).

Pain in the groin was a significant predictor of revision when adjusting for the pre-operative diagnosis, the decade of surgery, the type of implant, pregnancy before THA, bilateral as opposed to unilateral THA and vaginal delivery as opposed to Caesarean section. In all of these models, the p value for groin pain was ≥ 0.02. However, groin pain after delivery was of borderline significance when adjusting for a patient’s age at the time of the THA (p = 0.05).

**Discussion**

There are few data on the associations between pregnancy, childbirth and THA. To our knowledge, our study represents the largest series reported in the literature of women of childbearing age who have undergone a THA and subsequently have given birth. Two previous series have dealt with this topic but these reviews were limited to a small number of patients with limited follow-up.

McDowell and Lachiewicz reported five women who had had seven THAs for inflammatory arthritis, osteonecrosis or developmental dysplasia of the hip and who also had had a successful pregnancy and childbirth. These patients were matched for age, pre-operative diagnosis, type of prosthesis and length of follow-up, with a control group of patients who did not become pregnant after THA. At a mean of eight years, there were no complications during pregnancy and delivery for those who had become pregnant after the THA and there were no subsequent re-operations in either group. Yazici et al recently reported 99 patients between the ages of 18 and 40 years who had undergone THA between 1981 and 1988 and who had replied to a survey. Twenty of these reported successful childbirth and no prosthesis-related complications at the time of delivery. However, no long-term data for survival of the prosthesis were given.

Our study has added additional insight into this association and once again shows that pregnancy and childbirth can occur successfully in patients who have undergone unilateral or bilateral THA. Furthermore, vaginal delivery is possible in most patients who become pregnant after THA with a Caesarean section being necessary for the delivery of the first baby in approximately 35% of cases. This rate is not significantly different from national rates for a Caesarean section,15 most sections being performed for obstetric reasons or because of the obstetrician’s concerns about the THA rather than for any problem with the THA itself. This has been a concern in earlier studies. Ostensen,9 reported on eight pregnant women with juvenile rheumatoid arthritis, who had had a THA and who underwent delivery by Caesarean section because of concerns about the stress of delivery on the prostheses. Our study showed that there was no risk of prosthesis-related complications such as dislocation, loosening or fracture during a vaginal delivery.
Several other points in our study warrant mention. We have shown that age at THA, not childbirth, is the most important risk factor which determines survival of the implant in this group of young women. The younger the patient, the higher the risk of revision. This has been reported before in a study by Meldrum et al\textsuperscript{16} on 109 patients (137 hips) who underwent THA with a mean follow-up of 10.5 years. They reported two revisions in 13 patients (17 hips) who had become pregnant after THA and compared this with 23 revisions in 96 patients (120 hips) who had not become pregnant after THA. They found no significant difference ($p = 0.46$). Patients who became pregnant after THA were also significantly younger and had higher mean Harris hip scores at their last follow-up (93.2 as opposed to 80.7) when compared with those who did not become pregnant.

Pain in the groin, possibly associated with gain in weight and/or ligamentous laxity about the hip, is a common complaint during pregnancy even in patients without disorders of the hip. Our study has shown that 60\% of patients who were pregnant and had had a THA experienced increased pain in the hip during pregnancy. More than a third of these patients continued to have pain after delivery. Specifically, persistent pain in the groin after childbirth in patients with a THA should raise concern since this may indicate a more serious underlying problem. In this subset of patients with a successful childbirth, pain in the groin was a strong predictor of revision THA even after adjusting for multiple variables. Five of the seven patients who had persistent pain in the groin had revision of the acetabular component at a mean of five years after childbirth. We believe that patients with persistent pain in the groin after childbirth should be assessed for loosening of the acetabular component.$^{17}$

One of the drawbacks of our study is the inherent nature of survey-collected data. Yazici et al\textsuperscript{8} had a response rate of about one-third of their postal surveys and noted that this was the typical response rate of such reviews. The response rate in our study was excellent (76\%), particularly after contacting those patients by telephone who had not initially replied to the postal survey. This is the largest series of which we are aware of patients who have undergone a THA and subsequently given birth. Although the data on pregnancy and childbirth are unknown for those patients who did not reply, we consider that there is adequate power for the results of our study to be valid.

In conclusion, childbirth is not affected by the presence of a THA. Pregnancy after THA is not associated with decreased survival of the prosthesis. Pain in the hip is common during pregnancy in these patients. Pain in the groin which persists after delivery commonly leads to revision of the THA.

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References