



# Long-term results of total hip arthroplasty in patients with juvenile rheumatoid arthritis

## Juvenil romatoid artrit hastalığında total kalça artroplastisinin uzun dönem sonuçları

Nafiz BİLSEL,<sup>1</sup> Alper GÖKÇE,<sup>2</sup> Hayrettin KESMEZACAR,<sup>1</sup> Erhan MUMCUOĞLU,<sup>3</sup> Huri OZDOĞAN<sup>4</sup>

*Istanbul University Cerrahpaşa Medica Fakulty, <sup>1</sup>Department of Orthopaedics and Traumatology, <sup>4</sup>Department of Rheumatology; <sup>2</sup>Namık Kemal University School of Medicine, Department of Orthopaedics and Traumatology; <sup>3</sup>Istanbul Education and Research Hospital, Department of Orthopaedics and Traumatology*

**Amaç:** Bu çalışmada, juvenil romatoid artritli (JRA) hastalarda total kalça artroplastisinin (TKA) uzun dönem sonuçları değerlendirildi.

**Çalışma planı:** Çalışmaya, JRA'ya bağlı kalça dejenerasyonu nedeniyle TKA uygulanan 23 hastanın (22 kadın, 1 erkek; ort. yaş 22; dağılım 17-30) 37 kalçası alındı. Tüm ameliyatlar aynı cerrah tarafından anterolateral yaklaşım ile gerçekleştirildi. Hastaların ortalama vücut yüzeyi 1.5 m<sup>2</sup> (dağılım 1.1-1.7 m<sup>2</sup>), semptomların başlangıcı ile cerrahi tedavi arasındaki süre ortalama 12 yıl (dağılım 7-16 yıl) idi. Yirmi üç kalçada çimentolu TKA, 14 kalçada hibrid tip protez kullanıldı. Femoral medullası dar ve asetabulumun sığ olduğu yedi kalçada GKD tipi (gelişimsel kalça displazisi zeminde uygulanan) protez tercih edildi. Hastaların klinik değerlendirmesinde Harris kalça skoru kullanıldı. Takip radyografilerinde prostetik gevşeme ve pozisyon kaybı araştırıldı; heterotopik kemik oluşumu değerlendirildi. Ortalama takip süresi 135 ay (dağılım 58-212 ay) idi.

**Sonuçlar:** Ameliyat öncesinde ortalama 27.2 (dağılım 11-69) olan Harris kalça skoru ameliyat sonrasında 79.5'e (dağılım 37-87) yükseldi. Son kontrollerde tüm hastaların tedaviden memnun olduğu ve desteksiz yürüyebildiği gözlemlendi. İki hastada olmak üzere üç kalçada (%8.1) revizyon ameliyatı uygulandı. Kaplan-Meier analizinde implant ömrü %86.5 bulundu. Harris kalça skoru ile radyografik gevşeme veya protez çevresi kalsifikasyon bulguları arasında ilişki bulunmadı. Radyografik incelemelerde, 17 kalçada (%46) derece I heterotopik kemikleşme gözlemlendi.

**Çıkarımlar:** Kalça tutulumu olan JRA'lı hastalarda TKA ameliyatı genç yaşta uygulanmasına rağmen yaşam kalitesini ciddi oranda düzeltmektedir; ayrıca, bu hastalarda protez ömrü kısa olmamaktadır.

**Anahtar sözcükler:** Artrit, juvenil, romatoid/cerrahi; artroplastisi, replasman, kalça; kalça eklemi/cerrahi; kalça protezi.

**Objectives:** We evaluated the long-term results of total hip arthroplasty (THA) in patients with juvenile rheumatoid arthritis (JRA).

**Methods:** The study included 37 hips of 23 patients (22 females, 1 male; mean age 22 years; range 17 to 30 years) who underwent THA for hip degeneration secondary to JRA. All arthroplasties were performed through an anterolateral approach by the same senior surgeon. The mean body surface of the patients was 1.5 m<sup>2</sup> (range 1.1 to 1.7 m<sup>2</sup>) and the mean symptom duration to surgery was 12 years (range 7 to 16 years). Twenty-three hips received cemented, 14 hips received hybrid prostheses. In seven hips with an extremely narrow femoral medulla and shallow acetabulum, a CDH prosthesis was used. The hips were evaluated using the Harris hip score. Prosthetic loosening and displacement and heterotopic bone formation were assessed on follow-up radiographs. The mean follow-up period was 135 months (range 58 to 212 months).

**Results:** The mean Harris hip score increased from 27.2 (range 11 to 69) to 79.5 (range 37 to 87) postoperatively. At final follow-ups, all the patients were satisfied with the outcome and were able to walk without support. Three hips (8.1%; 3 patients) required revision. The overall Kaplan-Meier implant survival rate was 86.5%. There were no significant correlations between the Harris hip score and radiographic loosening and the presence of calcification around the prosthesis. Heterotopic bone formation of grade I was observed in 17 hips (46%).

**Conclusion:** Even though it is performed at young ages, THA considerably improves quality of life of patients with JRA having hip joint involvement and has a comparable implant survival.

**Key words:** Arthritis, juvenile rheumatoid/surgery; arthroplasty, replacement, hip; hip joint/surgery; hip prosthesis.

Juvenile rheumatoid arthritis (JRA) or juvenile idiopathic arthritis (JIA) as proposed by ILAR (international league of associations for rheumatology), is the most common rheumatic disease of childhood, with an onset before age 16, characterized by inflammation of one or more synovial joints for at least 6 weeks, which is associated with increased morbidity and mortality.<sup>[1, 2]</sup> It has 6 distinct clinical subtypes, namely oligoarticular-, polyarticular-, systemic-onset JRA, juvenile psoriatic arthritis, enthesitis-related arthritis, and non-classifiable arthritis. Polyarticular – and systemic-onset diseases are associated with worst prognosis of all subtypes. The severity of the systemic illness together with corticosteroid treatment retard linear growth.<sup>[3,4]</sup>

Articular inflammations with repetitive effusions are leading to chondral degeneration and soft tissue contractures and early confinement of epiphyses. Furthermore steroid treatment induces avascular necrosis and diffuse osteoporosis associated with short extremity length and body weight.

Physical functions approximately 15 % of these patients with hip joint involvement were affected and they require total hip arthroplasty (THA). Variations in skeletal size and the presence of deficiency of pelvic bone stock and quality have to be considered in fixation of implants. The obligation of long prosthesis survival, contractures in the surrounding soft tissues, early confinement of epiphysis, inadequate medical and rehabilitation support are other major problems, which should be encountered in treatment. The aim of the present study is to report long term outcome results of THA prosthesis in patients with JRA.

## Patients and methods

Thirty-seven hips of 23 patients, 22 female (95.7%) and one male (4.3%) patient, with a mean age of 22.3 years (range 17 to 30 years) were evaluated, who underwent THA between 1988 and 2000 by the same surgeon. All patients were treated and followed by a group consisted physicians from rheumatology, rehabilitation, orthopaedics departments of the same university-hospital. Fourteen patients, who did not attend the regular visits were excluded. Three patients had enthesitis-related arthritis and the rest of the patients had polyarticular disease either with poly- or systemic onset. Mean body surface area was 1,5m<sup>2</sup> (range 1.1 to 1.7m<sup>2</sup>). The mean duration from

the onset of the disease to arthroplasty was 12 years (range:7-16years). Twenty-three hips underwent cemented THA (MS-30 Protek AG, Bern, Switzerland) while the other 14 had hybrid THA (cemented acetabular component, uncemented femoral component). Congenital dislocation of the hip type (CDH) prostheses were used in 7 hips with extremely narrow femoral medulla and acetabulum. Acetabular components of small sizes (36-40) were used in 3 hips and autograft (taken from the femoral head) in one hip in order to support acetabular bone stock. Furthermore, 2 patients had bilateral total knee arthroplasty on a single stage operation. 14 patients underwent hybrid THAs. In nine patients CLS Spotorno acetabular components (Protek AG), in further five patients Sulzer Medica acetabular components were used (Sulzer Medica, Winterthur, Switzerland).

Follow-up examinations were done in the first, third, sixth months after the operation and once a year thereafter in accordance with Harris<sup>[5]</sup> hip scoring system. Hip radiographies were taken to detect component loosening and clinical evaluation. The loosening in acetabular component was determined in compliance with zones indicated by De Lee and Charnley<sup>[6]</sup> while femoral component loosening was decided upon the zones designated by Gruen et al.<sup>[7]</sup> Brooker classification<sup>[8]</sup> was used for rating the heterotopic bone formation. The change in the distance from the center of the head to the lesser trochanter was used to determine the axial subsidence of the stem. In hips with a cemented femoral component, loosening of cemented stems was defined as subsidence of more than 5 mm or continuous demarcation around the stem, and probable loosening as subsidence of 2–5 mm or a radiolucent line surrounding 50% of the stem or more.<sup>[9]</sup> The mean follow-up period was 125.4 months (range 48 to 202 months). Two patients died because of renal insufficiency secondary to amyloidosis, 48 and 63 months after the operation. Kaplan Meyer survival analysis and Pearson correlation analyses, were used. The end points for survival analysis were the death of a patient, the date of the revision procedure or the end of the year 2005.

## Results

Harris<sup>[8]</sup> scores were improved from 27.2 (range:11-69 points) to 79.45 points (37-87 points) postoperatively. Demographic features of the patients are given in Table 1. All patients were satisfied with



**Figure 1.** (a) Pelvis x-ray of a 20 years old female patient with juvenile rheumatoid arthritis showing hip joint destruction (1989). (b) Pelvis x-ray after bilateral total hip replacement. (c) Radiographs of the knee joints of the same patient. (d) Standing Orthorontgenogram at the 16th years follow-up.

their surgeries; none of them were using any support while walking. Three revision surgeries, two of them in the same patient were performed. Implant survival was 86.5% in Kaplan-Meyer analysis (Figure 3).

Three hips of two patients operated with hybrid total arthroplasty were revised at 85th and 115th months sequentially. The first patient underwent revision arthroplasty bilaterally due to cup breakage and loosening. Protrusio acetabuli was observed in the acetabular component in an other case. Radioluscencies of 1- 2 mm , mostly in zones I and II, were seen in the bone-cement composite in 10 hips (29.41%).

Despite to observed radioluscent lines in radiographic investigations at ten (%27) acetabular cups and femoral components, loosening was not detected.

Acetabular polyethylene were worn out more than 5 mm in 4 hips with cemented cups and two hips with uncemented cups. There was any correlation ( $r > 0.05$ ) between Harris hip scores and radiographic loosening or periprosthetic calcification. Radiographic analysis of the operated joints revealed first grade heterotopic bone formation in accordance with Brooker Classification,<sup>[8]</sup> in 17 hips (46%). Higher grades of heterotopic ossification was not detected in any of the cases.

**Table 1.** Patients

	Cemented Acetabular socket				Uncemented metall back acetabular socket		Total
	Cement		CDH		n	Mean±SD	
	n	Mean±SD	n	Mean±SD			
Number of hips	16		7		14		37
Number of patients	9		5		10		23*
Age at op. time(SD)		23.4±4.5		18.8±1.3		22.6±4.2	22.3±4.7
F/U time in month(SD)		144.8±46.1		143.4±49.1		120.4±36.2	135.4±43.7
Preop MD		2.4±0.5		1.8±0.9		2.2±0.9	2.3±0.7
Postop MD		5.5±0.5		5.0±1.3		5.7±0.7	5.6±0.8
Preop Harris(SD)		26.9±8.3		24.3±12.5		28.9±11.4	22.2±10.2
Postop (SD)		85.5±14.1		86.3±2.9		92.4±5.1	89.5±10.3
Body surface(SD)		1.5±0.1		1.3±0.1		1.6±0.2	1.5±0.2
Revision	1		–		2		3
Periprosthetic Calc.	7		4		6		17
R.luscent line in femur	5		2		2		9
R.luscent line in femur							
R.luscent line in acetab	5		2		3		10

\*:One patient underwent THA bilaterally; left side cemented right side hybrid Op.: Operation; preop.:preoperatively; SD:Standart Deviation;

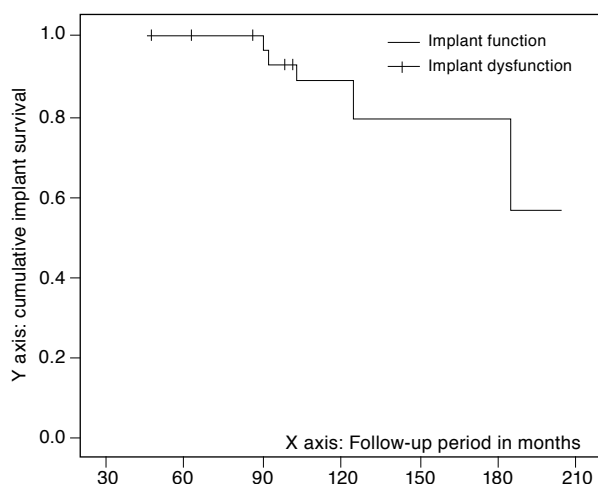
postop.:postoperatively;

Calc.:Calcification; R.luscent.:Radioluscent; Harris: Harris hip score

## Discussion

THA operations in skletally immature patients were being still hesitated by the orthopaedic surgeons, despite to recent technologic advancements. However this treatment option may the only choice in these young JRA-population, whose hip joint is frequently affected by the disease.<sup>[1-3,9-15]</sup>

Total hip arthroplasty in JRA patients has important advantages, considering it as a sistemic chronic illness



**Figure 2.** Graph of Kaplan Meyer prosthesis survival analysis in 95%confidence interval

limiting activity through affecting multiple joints and causing growth disturbancies. Implant survival was longer comparing results from children with juvenile rheumatoid arthritis with those with secondary osteoarthritis or other causes.<sup>[16,17]</sup> The results of growth disturbance are more remarkable especially in early onset JRA patients and hip joint inflammation progress earlier to end-stage degeneration. Procurement of small size implants appropriate for these patients was difficult.<sup>[10,18,19]</sup> Thus we also had to use CDH type prostheses at that time of operation, when we couldn't find small size implants. In following years it was able to provide small size components (especially 34, 36, 38, 40 mm acetabular components and femoral heads with the diameter of 22 mm ) even in our country. In this study 7 CDH prostheses were used in seven hip of five patients. Positioning is very important in a child with JRA, who may have growth disturbances, deformities, contractures, impaired skeletal shape and quality.

Both component cemented prostheses were used in 62.2% of patients, only femoral side cemented, hybrid prostheses were preferred in 37.8% patients, no patient had all components uncemented prostheses in the present study. Uncemented prostheses were not performed in the early years of this series due to awareness of the late

results of these implants. The uncemented prostheses were formerly not imported to our country due to reason "inadequate request", it was an other reason. The circumstances of certain amount of bone stock were considered for uncemented prostheses for the convenience of uncemented prostheses to each case. The present series contains the results of cases performed by a single surgeon, despite to variety of the used implants. Therefore the survival analysis for every implant type could not be calculated.

The operation technique and deciding on implant type have importance in JRA in preoperative planning and follow-up period. The difficulty in follow-up of big series in developing countries, where massive public migration occur are wellknown handicaps. Our study contain patients operated and followed by a single surgeon with medical support of Rheumatology and Rehabilitation clinics of the same hospital. The long mean follow-up period of 135 months ensured reliable clinical assesment of cases.

The numbers of patients in studies reporting THA outcomes are limited and pathologies were multifarious. Rahimtoola et al. reported 41 THAs in 27 small-proportioned patients (the mean height and weight were 157 cm and 53.5 kg), but 18 of 27 patients were with JRA.<sup>[18]</sup> Recently few reports of applications of uncemented THA being published.<sup>[2,18,19]</sup> Lehtimäki et al.<sup>[13]</sup> reported 92% survival in patients who had a Charnley type prosthesis in their expansive study on the results of 186 hips followed for 10 years. Chmell et al.<sup>[10]</sup> noted 67% survival of femoral and acetabular components at a minimum of 10 years.

Radiographic loosening of only cemented hips were found 43% at five-year follow-up.<sup>[16]</sup> In two different studies separately aseptic loosening were reported in 42% and 57% of patients, respectively.<sup>[2,12]</sup> Lehtimäki et al.<sup>[13]</sup> yielded excellent results with uncemented acetabular components in 174 cases, with 97% in situ at a mean follow-up of 7.4 years. The results of hybrid THA outcomes were assessed only in one study.<sup>[21]</sup> The authors yielded better results with uncemented acetabular cups and they advised to prefer to use these type of implants.<sup>[21]</sup> In our study revision were needed in three patients, cemented acetabular cup revision in one and uncemented acetabular cup revision in two patients. Considering of all THA operations revision rate were calculated as 13.5 %.

In summary, even though THA operation is performed at young ages, it considerably improves quality of life of patients with JRA having hip joint involvement and has a comparable implant survival.

## References

1. White PH. Growth abnormalities in children with juvenile rheumatoid arthritis. *Clin Orthop Relat Res* 1990;(259): 46-50.
2. Witt JD, Swann M, Ansell BM. Total hip replacement for juvenile chronic arthritis. *J Bone Joint Surg [Br]* 1991;73: 770-3.
3. Maric Z, Haynes RJ. Total hip arthroplasty in juvenile rheumatoid arthritis. *Clin Orthop Relat Res* 1993;(290):197-9.
4. Scott RD, Sarokhan AJ, Dalziel R. Total hip and total knee arthroplasty in juvenile rheumatoid arthritis. *Clin Orthop Relat Res* 1984;(182):90-8.
5. Harris WH. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg [Am]* 1969;51:737-55.
6. DeLee JG, Charnley J. Radiological demarcation of cemented sockets in total hip replacement. *Clin Orthop Relat Res* 1976;(121):20-32.
7. Gruen TA, McNeice GM, Amstutz HC. "Modes of failure" of cemented stem-type femoral components: a radiographic analysis of loosening. *Clin Orthop Relat Res* 1979;(141):17-27.
8. Brooker AF, Bowerman JW, Robinson RA, Riley LH Jr. Ectopic ossification following total hip replacement. Incidence and a method of classification. *J Bone Joint Surg [Am]* 1973;55:1629-32.
9. Barrack RL, Mulroy RD Jr, Harris WH. Improved cementing techniques and femoral component loosening in young patients with hip arthroplasty. A 12-year radiographic review. *J Bone Joint Surg [Br]* 1992;74:385-9.
10. Chmell MJ, Scott RD, Thomas WH, Sledge CB. Total hip arthroplasty with cement for juvenile rheumatoid arthritis. Results at a minimum of ten years in patients less than thirty years old. *J Bone Joint Surg [Am]* 1997;79:44-52.
11. Lachiewicz PF, McCaskill B, Inglis A, Ranawat CS, Rosenstein BD. Total hip arthroplasty in juvenile rheumatoid arthritis. Two to eleven-year results. *J Bone Joint Surg [Am]* 1986;68:502-8.
12. Learmonth ID, Heywood AW, Kaye J, Dall D. Radiological loosening after cemented hip replacement for juvenile chronic arthritis. *J Bone Joint Surg [Br]* 1989;71:209-12.
13. Lehtimäki MY, Lehto MU, Kautiainen H, Savolainen HA, Hämäläinen MM. Survivorship of the Charnley total hip arthroplasty in juvenile chronic arthritis. A follow-up of 186 cases for 22 years. *J Bone Joint Surg [Br]* 1997;79:792-5.
14. Ruddlesdin C, Ansell BM, Arden GP, Swann M. Total hip replacement in children with juvenile chronic arthritis. *J*

- Bone Joint Surg [Br] 1986;68:218-22.
15. Torchia ME, Klassen RA, Bianco AJ. Total hip arthroplasty with cement in patients less than twenty years old. Long-term results. *J Bone Joint Surg [Am]* 1996;78:995-1003.
  16. Callaghan JJ, Albright JC, Goetz DD, Olejniczak JP, Johnston RC. Charnley total hip arthroplasty with cement. Minimum twenty-five-year follow-up. *J Bone Joint Surg [Am]* 2000;82:487-97.
  17. Dorr LD, Kane TJ 3rd, Conaty JP. Long-term results of cemented total hip arthroplasty in patients 45 years old or younger. A 16-year follow-up study. *J Arthroplasty* 1994; 9:453-6.
  18. Rahimtoola ZO, Finger S, Imrie S, Goodman SB. Outcome of total hip arthroplasty in small-proportioned patients. *J Arthroplasty* 2000;15:27-34.
  19. Woolson ST, Harris WH. Complex total hip replacement for dysplastic or hypoplastic hips using miniature or microminiature components. *J Bone Joint Surg [Am]* 1983;65:1099-108.
  20. Cracchiolo A 3rd, Severt R, Moreland J. Uncemented total hip arthroplasty in rheumatoid arthritis diseases. A two- to six-year follow-up study. *Clin Orthop Relat Res* 1992;(277):166-74.
  21. Thomason HC 3rd, Lachiewicz PF. The influence of technique on fixation of primary total hip arthroplasty in patients with rheumatoid arthritis. *J Arthroplasty* 2001;16:628-34.
  22. Harris WH. Results of uncemented cups: a critical appraisal at 15 years. *Clin Orthop Relat Res* 2003;(417):121-5.
  23. Aldinger PR, Thomsen M, Mau H, Ewerbeck V, Breusch SJ. Cementless Spotorno tapered titanium stems: excellent 10-15-year survival in 141 young patients. *Acta Orthop Scand* 2003;74:253-8.