유소년기 대퇴골두 무혈성 골괴사 후유증 환자군에서 시행한 알루미나-알루미나 고관절 전치환술의 결과

2015년

이 승 준

의학석사 학위논문

유소년기 대퇴골두 무혈성 골괴사 (Legg-Calve-Perthes disease) 후유증 환자군에서 시행한 알루미나 -알루미나 고관절 전치환술의 결과:

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Alumina-Alumina Total Hip Arthroplasty for sequelae of Legg-Calve-Perthes Disease:

A Comparative Study with Adult-onset Osteonecrosis

2015년 8월

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이 논문을 의학석사학위논문으로 제출함

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이승준의 석사학위논문을 인준함

2015년 7월

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Abstract

Alumina−Alumina Total Hip Arthroplasty for sequelae of Legg−Calve−Perthes Disease:

A Comparative Study with Adult−onset Osteonecrosis

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Total hip arthroplasty for Legg−Calve−Perthes disease (LCPD) needs specific concerns for deformity, leg length discrepancy (LLD), and relatively young age. To date, there was no study for Alumina−Alumina (Al−Al) THA for LCPD, even excellent long−term outcome has been documented, and no comparative study of THA for LCPD with that for adult−onset osteonecrosis of femoral head (ONFH), in which THA is necessitated in relatively young age and excellent long−term outcome has been proven after Al−Al THA.

The aims of this retrospective study are to evaluate the clinical and radiological outcome and restoration of LLD after Al−Al THA for LCPD sequelae, to evaluate the occurrence of complication and to compare the result of THA for LCPD sequelae with that of THA for adult ONFH, by means of propensity scoring matching.

Between 1997 and 2007, 41 Al–Al THA were performed in 37 patients with LCPD with minimum 5 years of follow–up. Mean age at THA was 43.6 years. Using the propensity score matching, 41 THAs in 37 patients were identified from 339 hips in 256 patients with THA for ONFH. Implant survival, Harris hip score (HHS), LLD change, and perioperative complication were compared between the two groups.

There was no revision during follow–up period without osteolysis or loosening. HHS increased from 70.9±12.9 points to 97.4±5.4 points ($p<0.001$). LLD decreased from 2.0±1.2cm to 0.2±0.9cm. ($p<0.001$) Fourteen intraoperative femoral cracks occurred in LCPD group. Both groups showed no difference in implant survival and postoperative complication rate, however, LCPD group showed higher rate of intraoperative femoral fracture than ONFH group.

Although high rate of intraoperative femoral crack was observed, outcomes of Al–Al THA for LCPD were comparable to those for ONFH. As with ONFH, Al–Al THA may be a reliable treatment option for LCPD sequelae.

Keywords: Total Hip Arthroplasty, Legg–Calve–Perthes Disease, LCP, Alumina, Osteonecrosis, Propensity Score Matching

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Introduction

Legg–Calve–Perthes disease (LCPD) is the idiopathic juvenile–onset osteonecrosis of femoral head (ONFH) [9]. LCPD leads to anatomical deformity around hip joint with leg length discrepancy (LLD) [4]. Moreover, previous operation might further deteriorate anatomical deformity [6, 7]. Deformity of femoral head might result in remodeling of acetabulum or deterioration of congruency of hip joint [18]. Though hip joint with LCPD sequelae remains pain–free until young adult period, eventually, secondary osteoarthritis may occur in middle age, and necessitate joint replacement in severe cases [20]. Hence, total hip arthroplasty (THA) for sequelae of LCPD needs specific concerns for anatomical deformity and LLD [10]. With regard to anatomical deformity of proximal femur, use of modular or custom–made anatomical stem, or concurrent femoral osteotomy was recommended for THA for LCPD sequelae [2, 6]. Also, the relatively young age at THA raises the concern about longevity of THA [10].

Alumina–Alumina (Al–Al) THA has excellent clinical and radiological results, even in long term follow–up [12, 21]. Due to longevity of bearing surface by extreme low wear rate, Al–Al THA has been performed for patients with relatively young age [5, 11, 23]. ONFH is a well–known hip pathology that necessitates joint replacement procedure at relatively young ages and, in Korea, ONFH is most frequent hip disease which necessitates hip replacement. [17]. Literatures have reported favorable outcomes of Al-Al THA for relative young patients with ONFH [5, 11]. Patients with LCPD sequelae necessitate THA at relatively young ages as with patients with ONFH, however, there has been no study on Al-Al THA for LCPD sequelae. Also, there are no comparative studies of THA for LCPD (juvenile-onset ONFH) with THA for adult-onset ONFH.

The aims of this retrospective study are to evaluate the clinical and radiological outcome and restoration of LLD after Al-Al THA for LCPD sequelae, to evaluate the occurrence of complication and to compare the result of THA for LCPD sequelae with that of THA for adult ONFH, by means of propensity scoring matching.

Materials and Methods

Study Design

From November 1997 to December 2008, 56 consecutive cementless THAs were performed for 52 patients with LCPD sequelae in our institution. During the same period, 339 cementless Al-Al THAs were performed for 256 patients with adult ONFH. We performed one-to-one matching for both LCPD group and ONFH group by propensity score matching. We retrospectively reviewed medical records and radiological data of patients in both groups.

Study subjects and demographics

For LCPD, THA with other type of bearing surface and patients with follow-up with < 5 years were excluded. In 5 patients with age over 70 years, metal-on-polyethylene bearings were used. In 10 THAs with 10 patients, follow-up did not reach 5 years and these were excluded from the current study. Eventually, 41 hips in 37 patients with LCPD sequelae were included.

To compare the result of THA for LCPD sequelae with that for ONFH, we performed one-to-one propensity score matching based on age, gender and period of follow-up. After matching, 41 THAs in 37 patients with ONFH were included.

There were 22 male and 19 female patients in the LCPD group. Mean age of patients at THA was 43.8±12.7 (18.9~66.3) years. Mean follow-up was 10.4±3.3 (5.2~16.0) years. In 4 patients, both hips showed sequelae of LCPD and THA was performed for both hips. Thirty hips had history of symptom in the childhood period. In eleven hips, patients had no history of pain in the childhood period, however, radiograph shows compatible findings with sequelae of LCPD.

There were 22 male and 19 female patients in the ONFH group with mean age of 41.3±12.5 (19.8~66.7) years after propensity score matching. Etiology of ONFH was alcohol in 9 patients, steroid in 15 patients, post-traumatic in 5 patients with previous femoral neck fracture and idiopathic in 12 patients. Four patients had history of multiple drilling. Table 1 shows demographic feature and comparative feature of LCPD and ONFH before and after propensity score matching.

Description of treatment

In LCPD group, all THAs were performed in lateral position. In 4 patients, trochanteric osteotomy was performed to facilitate dislocation of deformed head and exposure of acetabulum. In 19 cases, hip joint was approached with direct lateral approach, and in the remaining 18 cases, posterolateral approach was performed. Neck osteotomy was performed after dislocation of femoral head. In cases with remarkable LLD with coxa breva deformity, neck cutting was performed at the level of middle of femoral head, more proximally than in usual cases of THA, for restoration of LLD. Then, acetabulum was exposed. Usually, acetabulum with LCPD sequelae was dysplastic and shallow. From small to large

Table 1. Demographic feature of patients total hip arthroplasty (THA) for the sequelae of Legg-Calve-Perthes disease (LCPD) and adult-onset osteonecrosis of femoral head (ONFH) before and after propensity score matching (PSM)

Demographics	LCPD	ONFH before PSM	p-value	ONFH after PSM	p-value
Number of patients	37	256		37	
Number of hips	41	339		41	
Mean age at THA (years)	43.8±12.7	45.2±12.6	0.50	41.3±12.5	0.38
Gender (Male : Female)	22:19	246:93	0.012	22:19	1.0
Mean follow-up (years)	10.4±3.3	7.2±4.8	<0.001	10.8±3.3	0.54

diameter, acetabular reaming was performed. After reaming, cementless cup was fixed followed by preparation of proximal femur. In 3 cases, cortical window was made on purpose for removal of remnant screw from previous femoral osteotomy, for removal of remnant wire from previous trochanteric transfer, and for removal of broken reamer during proximal femoral preparation, respectively. In cases with intraoperative femoral fracture, 16 gauge wire or circlage band were applied for fixation of fracture. Cementless monolithic wedge stem was inserted and reduction was conducted after insertion of head and liner. Osteotomized trochanter was reattached to proximal femur by wire. During THA, Plasmacup® with BiContact® stem (Aesculap AG, Tuttlingen, Germany) was implanted for 37 hips. There were 2 patients with Coren® CP Cup with Coren® SB stem (Corentec, Seoul, Korea), 1 patient with Secur-fit™ HA PSL cup with Secur-fit™ HA stem (Osteonics, Allendale, NJ, USA) and 1 patient with Trilogy® cup (Zimmer, Warshaw, IN, USA) with BiContact® stem. All stems were monolithic wedged-shaped stems. No modular or custom-made stems were implanted. Mean size of cup was 50.2±4.0mm (44~62 mm). As for bearing surface, heads and liners made of BIOLOX® Forte Alumina (CeramTec AG, Plochingen, Germany) were implanted in all cases. In 38 cases, 28mm alumina heads were used and in 3 cases, 32mm alumina heads were used.

THAs for adult-onset ONFH were performed with similar method as THAs for LCPD sequelae. No trochanteric osteotomy was necessary for ONFH. Also, neck osteotomy was performed at around 1cm proximal to lesser trochanter. In THAs for ONFH, Plasmacup® with BiContact® stem was implanted for 38 hips. There were 3 patients with Coren® CP Cup with Coren® SB stem. Mean size of cup was 50.2±3.4 mm (44~58 mm). BIOLOX® Forte Alumina head and liner were implanted as bearing surface. In 38 cases, 28mm alumina heads were used and in 3 cases, 32mm alumina heads were used.

Postoperatively, weight bearing was started and increased gradually with crutch for 3 months. Patients were followed at postoperative 6 weeks, 3, 6 months and 1 year. After postoperative 1 year, patient was followed up annually.

Outcome measurements

Clinical evaluation was performed using Harris Hip Score (HHS). In addition, patients were questioned on clinical symptom of pain, limping or noise. Neurological examination of lower extremity was performed and occurrence of complication was recorded.

In preoperative radiograph, LLD was measured by comparing vertical distance of each side from inter-teardrop line to summit of lesser trochanter. Acetabular index (AI) was measured by angle between inter-teardrop line and line connecting inferior aspect of teardrop and lateral margin of acetabular roof. The acetabular medial wall bony thickness was measured as the shortest distance between the ilioischial line and the bony margin of the medial acetabulum. (Figure 1)

In postoperative radiograph, LLD was measured by the same method as preoperative. Postoperatively, cup inclination and coverage of acetabular component were measured. The level of neck cutting was measured by distance from upper border of lesser trochanter to level of osteotomy in medial femoral cortex. Furthermore, presence of osteolysis, loosening or subsidence of stem was evaluated [8, 13, 15]. (Figure 2)

Statistical analysis

Statistical analysis was performed with SPSS version 20.0. (IBM, New York, NY, USA) Propensity score was calculated by age, gender and follow-up period and one-to-one matching was performed with SPSS macro [1]. Paired t-test was performed to compare preoperative and postoperative LLD and HHS. Also, AI and medial acetabular wall thickness of THA side and contralateral side was compared with paired t-test. Student t-test was performed to compare continuous variables of LCPD group and ONFH group. Pearson's chi-square test and Fisher's exact test was performed to compare the clinical symptom and the occurrence of complication of both groups. P-values < 0.05 were considered significant.

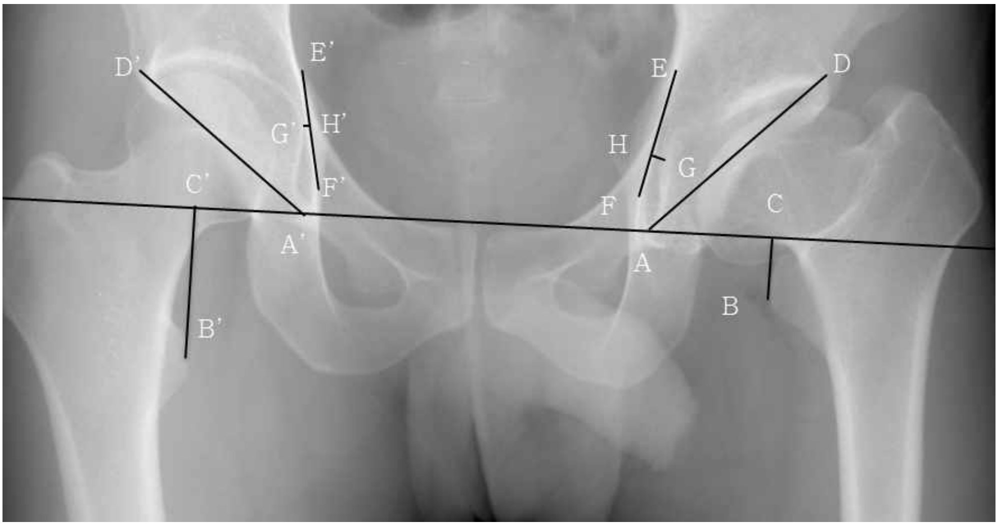

Figure 1. Preoperative radiograph with a patient with Legg–Calve–Perthes disease sequelae. Leg length discrepancy ($\overline{B'C'}$ –$\overline{BC}$) was measured by comparing vertical distance ($\overline{BC}$) from inter–teardrop line($\overline{AA'}$) to summit of lesser trochanter (B). Acetabular index (∠DAC) was measured by angle between inter–teardrop line ($\overline{AA'}$) and line connecting teardrop (A) and lateral lip of acetabulum (D). Medial wall thickness ($\overline{GH}$) was measured by shortest distance from ilioischial line to medial wall of acetabulum.

(A: teardrop. $\overline{AA'}$: inter–teardrop line. B: summit of lesser trochanter. C: cross–point of inter–teardrop line and perpendicular line to inter–teardrop line passing the summit of lesser trochanter. D: lateral lip of acetabulum. $\overline{EF}$: ilioischial line, $\overline{GH}$: shortest distance from ilioischial line to medial wall of acetabulum)

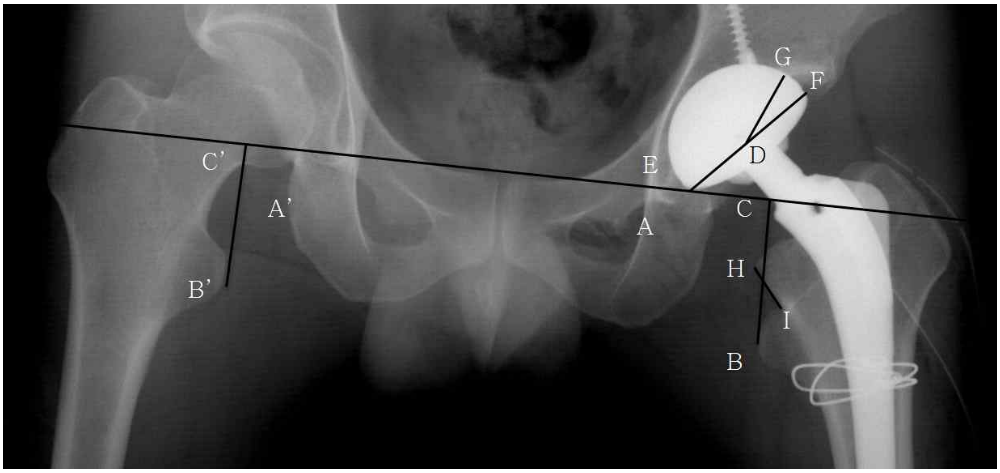

Figure 2. Postoperative radiograph with a patient with Legg−Calve−Perthes disease sequelae. Leg length discrepancy ($\overline{B'C'}$ −$\overline{BC}$) was measured by same method as preoperative method. Cup inclination (∠FEC) was measured by angle between inter−teardrop line ($\overline{AA'}$) and line connecting lateral openings of cup ($\overline{EF}$). Cup coverage ($\frac{\angle EDF}{\angle EDG} \times 100(\%)$) was measured by percentage of angle of cup in contact with host bone (∠EDG). Neck cutting level ($\overline{HI}$) was measured by distance from base of lesser trochanter in femoral cortex (I) to osteotomy level in femoral cortex (H).

(A: teardrop. $\overline{AA'}$: inter−teardrop line. B: summit of lesser trochanter. C: cross−point of inter−teardrop line and perpendicular line to inter−teardrop line passing the summit of lesser trochanter. D: rotation center of cup. E,F: lateral openings of cup. G: lateral lip of acetabulum ∠EDG: angle of cup in contact with host bone. ∠FDG: angle of cup without contact with host bone. H: osteotomy level in femoral cortex I: base of lesser trochanter in femoral cortex)

Results

In LCPD group, HHS was significantly improved from 66.7±17.4 points to 96.8±6.8 points. ($p<0.001$) Two patients complained of occasional mild pain. One patient complained of residual limping. Two patients complained of occasional clunking sound. No patient complained of squeaking. LLD was significantly improved from 2.0±1.2 cm to 0.2±0.9 cm. ($p<0.001$)

In preoperative radiograph, AI of affected side was 42.0±4.6° and AI of contralateral side was 38.7±4.7° . Affected side was significantly more dysplastic than contralateral side. ($p<0.001$) Medial wall thickness was 9.0±6.6mm in affected side and 3.8±5.0mm in contralateral side. Medial wall was significantly thicker in affected side. ($p<0.001$)

In postoperative radiograph, mean cup coverage 92.9±6.6%, and mean inclination of cup was 38.9±11.9° (27.6° ~55.4°). Neck cutting was performed at 15.2±7.3mm above upper margin of lesser trochanter.

There was no revision during the follow-up period. All stems and cups were securely fixed in the last follow-up. There was no osteolysis around implant or no loosening of implant.

During operation, 14 intraoperative femoral fractures occurred. In 11 cases, fracture was treated with wiring during operation. In the remaining 3 cases, femoral fractures were diagnosed with immediate postoperative radiograph. Two femoral fractures were treated with additional wiring, and 1 femoral fracture was treated conservatively with delayed weight bearing. Radiological union was achieved at mean 6 months after THA in all hips. All stems were securely fixed, but 1 stem subsided by 9mm during union of fracture. Subsided stem showed no further subsidence after union.

A peroneal nerve palsy occurred in 1 patient. During THA, his limb was lengthened by 1.7cm. Motor power was fully recovered at 3 months after THA, but mild sensory deficit remained without discomfort in daily activity. One patient had deep vein thrombosis that was treated with intravenous heparin following oral warfarin. No further embolic event occurred until final follow-up.

In ONFH group, HHS was significantly improved from 47.9±18.4 to 96.6±4.6. Three patients complained of mild occasional pain. Three patients complained of occasional clunking sound. Squeaking was absent in all patients. Preoperatively, affected limbs were 0.5±0.8 cm shorter, however, affected limb was 0.1±0.4cm longer than the contralateral side after THA and LLD was significantly improved. ($p=0.01$) Preoperative and postoperative radiologic feature of ONFH group is in table 2. There was no significant difference in AI and medial wall thickness in both sides. ($p=0.92$, 0.24)

There was no revision during follow-up without osteolysis or no loosening. Six intraoperative femoral fractures occurred. A great trochanter avulsion fracture and 4 proximal femoral fractures were diagnosed during operation and treated with wiring. One femoral fracture was diagnosed by immediate postoperative x-ray and treated conservatively with delayed weight bearing. All fractures were united eventually without sign of loosening of implant.

Postoperatively, 2 periprosthetic femoral fractures occurred during follow-up. One patient with Vancouver type B1 fracture was treated with open reduction and internal fixation. During operation, stem was securely fixed and retained. In another patient, avulsion fracture of greater trochanter occurred and union of fracture was achieved after 3 months without operation.

One patient showed posterior dislocation in immediate postoperative radiograph. Closed reduction was performed at the post-anesthesia care unit. No additional dislocation occurred up to recent follow-up. Otherwise, there was no complication.

Table 2 shows comparative results of THA in LCPD group and ONFH group. Preoperative HHS was significantly lower in ONFH group, however, postoperative HHS showed no difference. Rate of occasional pain or noise showed no differences. AI of LCPD group was significantly larger than that of ONFH group. ($p<0.001$), and medial wall was significantly thicker in LCPD group ($p<0.001$). Contralateral side showed no significant difference in AI and medial wall thickness. Preoperative LLD was more significant in LCPD group ($p<0.001$) but postoperative LLD showed no significant difference. ($p=0.078$) Neck cutting, mean inclination and cup coverage angle showed no significant difference. Intraoperative femoral fracture was significantly more frequent in

LCPD group ($p=0.04$). Postoperative complication rates showed no significant difference, but overall complication rate including intraoperative events was significantly higher in LCPD group ($p=0.027$).

Table 2. Comparative results of total hip arthroplasty (THA) for the sequelae of Legg−Calve−Perthes disease (LCPD) group and osteonecrosis of femoral head (ONFH) group

	LCPD	ONFH	p−value
Clinical Symptom			
Occasional mild pain	2	3	1.00
Clunking sound	2	3	1.00
Harris Hip Score			
Preoperative	66.7±17.4	47.9±18.4	0.002
Postoperative	96.8±6.8	96.6±4.6	0.877
Preoperative Radiograph			
Acetabular Index (AI)	42.0±4.6˚	37.8±3.7˚	<0.001
Contralateral (CL) AI	38.7±4.7˚	37.6±4.2˚	0.68
Medial wall thickness	9.0±6.6mm	1.4±2.6mm	<0.001
CL Medial wall thickness	3.8±5.0mm	1.1±2.3mm	0.14
Postoperative Radiograph			
Inclination	38.9±11.9˚	37.8±5.3˚	0.41
Cup Coverage	92.9±6.6%	93.4±9.0%	0.82
Neck Cutting Level	15.2±7.3mm	12.9±4.1mm	0.09
Leg Length Discrepancy (LLD)			
Preoperative LLD	2.0±1.2cm	0.5±0.8cm	<0.001
Postoperative LLD	0.2±0.9cm	0.1±0.4cm	0.078
LLD change	1.7±0.9cm	0.6±0.6cm	<0.001
Complication			
Intraoperative fracture	14	6	0.04
Postoperative complication	2	3	1.00
Overall complications	16	9	0.027

Discussion

Legg–Calve–Perthes disease is a childhood hip disease that may result in secondary osteoarthritis at relative young ages [20]. However, there have been few studies on THA for LCPD. Recently, 3 studies with case series were reported [2, 3, 19]. In these studies, favorable results with good implant survival were reported and relatively higher rate of neurologic complication was revealed with limb lengthening during THA. Also, the most common complication was intraoperative periprosthetic fracture, and relationship with previous anatomical deformity or previous operative procedure was suggested [3, 19]. However, to our knowledge, there is no study on Al–Al THA or no comparative study for LCPD. Al–Al THA showed excellent results in young patients and ONFH is one of the most frequent hip diseases that necessitate joint replacement at a relatively young age [12, 17]. Furthermore, good results of Al–Al THAs for ONFH were already reported in previous studies [5, 11]. Unlike LCPD sequelae, anatomical deformity of femur or acetabulum in patients with ONFH is not severe, except for femoral head collapse. Also, LLD is not severe in patients with ONFH. By comparing results of THA for ONFH and those for LCPD sequelae, effect of anatomical deformity and LLD on the results of THA could be identified. In our study, using ONFH as the comparative group, we demonstrated excellent results of THA for LCPD sequelae. in spite of anatomical deformity and LLD in LCPD sequelae.

However, we observed a higher rate of intraoperative femoral fractures of Al-Al THA for LCPD.

Our study has several limitations. First, number of hips and patients were relatively small. However, LCPD is relatively rare hip disease condition which necessitates THA. To overcome size limitation of our study, multi-center study would be necessory in future. Second, we performed the comparative study retrospectively, not prospectively. However, by means of propensity score matching, we minimized the selection bias. LCPD and ONFH had different demographic feature in gender and length of follow-up, however, after propensity score matching, variables were matched and difference in demographic feature become statically non-significant. In future, prospective comparative study would be necessory to support findings of our study.

Due to extremely low wear rate, Al-Al THA was recommended for patients with younger age [23]. Al-Al THA for younger patients showed excellent long term outcome for various types of disease [5, 23]. Similarly, the current study showed excellent results of Al-Al THA using cementless monolithic wedge stems for LCPD sequelae, which were comparable to those for adult-onset ONFH. Usually, acetabulum of LCPD sequelae is flat and dysplastic [10]. However, medial wall is usually thick enough for cup placement [10]. Though patients with LCPD sequelae show anatomical deformity around the hip joint, deformity is not severe enough to impair THA, even with monolithic wedge stems.

LLD was successfully restored with THA in LCPD group except for 1 neurologic complication. Since ceramic head has fewer options in neck length than the metal head, there have been concerns about adjustment of LLD in Al-Al THA [22]. In the current study, preoperative LLD of LCPD sequelae was significantly more severe than that of ONFH, however, postoperative LLD showed no significant difference. Though LCPD sequelae are frequently accompanied by coxa breva deformity, we tried to preserve femoral neck as much as possible. Sometimes neck osteotomy was performed at the middle of deformed femoral head. Despite the limited choice of neck length, LLD could be restored successfully by understanding the anatomy of deformity and applying proper surgical technique.

Rate of neurological complication was reported as 3~6% in previous study on THA for LCPD sequelae during lengthening of extremity [2, 3, 19]. Present study showed one sciatic nerve palsy out of 41 cases (2.4%). Limb lengthening during THA and anatomical deformity was suggested as reason for neurologic complication [2, 3, 19]. Neurological complication is inevitable complication during THA with LLD correction. Care should be taken during THA for preventing neurologic complication. Adjustment of amount of lengthening and attention to direct injury to sciatic or femoral nerve should be considered during THA with LLD correction.

Intraoperative periprosthetic fracture was frequent during THA in the LCPD group. In the current study, BiContact® stem was implanted for majority of patients. Relatively higher rate (13%) of intraoperative fracture with BiContact® stem was previously reported and relationship with stem design is suggested [21]. In the current study, we observed similar rate of fracture in ONFH group (14.6%). However, rate of intraoperative femoral fracture was significantly higher in LCPD group. Anatomical deformity of LCPD sequelae might result in higher rate of intraoperative fracture during insertion of cementless monolithic wedge stem [3]. Also, in LCPD group, amount of preoperative LLD was significantly more severe than in ONFH group. During Al-Al THA, which has fewer options in neck length, larger-sized stem might be necessary for restoration of LLD. Intraoperative crack seemed to occur more frequently while attempting implantation of up-sized stem. However, long-term results showed excellent implant survival without osteolysis or loosening. Also, after union of fracture, patients with intraoperative femoral fractures did not complain about severe discomfort. Postoperative HHS was similarly excellent in both ONFH and LCPD group despite of higher intraoperative femoral fracture rate in LCPD group. Intraoperative fracture seems to have less influence on the final long-term result of THA in LCPD sequelae.

Despite the excellent long-term results, wedge-shaped stem with bulky proximal design seemed unsuitable for femur with anatomical deformity due to risk of intraoperative femoral fracture. For minimizing risk of fracture during insertion of cementless wedge stem, stems with minimized shoulder part and narrow proximal dimension are recommended. Also, regarding correction of LLD, stem with various neck options could be beneficial.

Conclusion

Outcomes of Al-Al THA using cementless monolithic wedge stems for sequelae of LCPD were clinically and radiologically comparable to those for ONFH. LLD was restored after THA without troublesome neurologic complication in both groups. Despite the higher rate of intraoperative femoral crack in the LCPD group, fracture union was achieved in all hips without stem loosening. As with ONFH, Al-Al THA may be a reliable treatment option for the patients with LCPD sequelae.

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국문초록

유소년기 대퇴골두 무혈성 골괴사 (Legg-Calve-Perthes disease) 후유증 환자군에서 시행한 알루미나 -알루미나 고관절 전치환술의 결과: 성인 대퇴골두 무혈성 골괴사 환자군과의 비교 연구

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Legg-Calve-Perthes씨 병(LCP)은 유소년기에 발생하는 대퇴골두 무혈성 골괴로서 근위대퇴골 및 비구에 후유증을 초래하여 중년의 비교적 젊은 나이에 이차성 골관절염으로 인한 고관절 전치환술(THA)을 요할 수 있다. 이러한 LCP 후유증에 대한 THA 시에는 고관절의 해부학적 변형, 하지부동 및 비교적 젊은 환자의 나이에 대한 고려가 필요하다. 젊은 환자군에서 시행된 알루미나-알루미나(Al-Al) THA는 우수한 결과가 보고되어 왔다. 현재까지 몇몇 연구에서 LCP 후유증에 대한 THA에 대한 보고가 있었으나, Al-Al THA에 대한 보고는 없는 상태이다. 저자들은 본 후향적 연구를 통하여 Al-Al THA의 임상적 및 방사선학적 결과를 확인하고자 하였다. 또한, 우리는 이미 기존의 연구들에서 우수한 결과가 증명되어 있는 성인 대퇴골두 무혈성 골괴사 환자군에서 시행된 Al-Al THA와 그 결과를 비교해 보고자 한다.

1997년부터 2007년까지 본 병원에서 LCP 후유증 환자에서 시행된 Al-Al THA 중에서 5년 이상 추시가 가능하였던 37명의 환자, 41례를 대상으로 하였다. 수술 시 평균 연령은 43.6세(18.9~63.6세)였으며 평

균 추시 기간은 10.4년(5.2~16.2년)이었다. 하지부동 교정을 위하여 하지부동이 심한 경우는 대퇴 경부 절골술을 대퇴골두의 중간부위에서 시행하였으며, 얕은 비구를 확공하기 위해서는 작은 크기의 확공기를 이용하여 비구를 깊게 하였다. 비교 연구를 위하여 동시기에 256명의 성인 대퇴골두 무혈성 골괴사 환자에서 시행된 339례의 Al-Al THA 중 수술시 연령, 성별, 추시 기간을 바탕으로 경향점수(propensity score)를 계산한 후 이를 이용한 matching을 시행하여 대조군으로 37명의 환자 41례를 선정하였다. 양 군에서 대부분의 경우 Aesuculap사의 Plasma® 컵과 BiContact® 스템이 사용되었으며 관절면으로는 CeramTec사의 Biolox® Forte 알루미나 골두와 라이너가 사용되었다. Harris 고관절 점수(HHS), 하지부동의 변화, 삽입물의 고정 상태, 재수술 여부, 수술 전후의 합병증 등을 확인하고 이를 두 군 간에 비교하였다.

LCP 후유증 환자 군에서는 추시 기간 동안 재치환술은 시행되지 않았으며 대퇴 스템 및 컵의 해리나 주변부의 골용해 소견은 관찰되지 않았다. HHS는 70.9점에서 97.4점으로 통계적으로 유의하게 상승하였으며, 33례의 편측 환자 군에서 하지부동은 2.0cm에서 0.2cm으로 통계적으로 유의하게 호전 되었다. 14례에서 대퇴 스템 삽입 중 대퇴골 골절이 발생하였으며 강선을 이용하여 고정하거나 비수술적 치료를 시행하였다. 1례에서 골절 유합 중 9mm의 대퇴 스템 침강이 관찰되었으나 골절 유합 후 침강이 진행되거나 해리가 발생하지는 않았다. 1례에서 비골신경 마비가 발생하였고 운동신경은 완전 회복 되었으나 감각신경마비는 남았다. 1례에서 심부정맥혈전증이 발행하였다. 성인 대퇴골두 무혈성 골괴사 환자군 역시 추시 기간 동안 재치환술은 시행되지 않았으며 대퇴 스템 및 컵의 해리나 주변부의 골용해 소견은 관찰되지 않았다. HHS는 44.9점에서 96.6점으로 통계적으로 유의하게 상승하였으며, 편측 환자 군에서 하지부동은 0.5cm에서 0.1cm으로 통계적으로 유의하게 호전 되었다. 6례에서 수술 중 대퇴골 골절이, 2례에서 수술 후 대퇴 스템 주변부 골절이 발생하였다. 수술 후 탈구가 1례 있었다. 양 군간에 삽입물의 수명 및 수술 후 합병증 발생 정도는 통계적으로 유의한 차이가 없었으나 LCP 군에서 수술 중 대퇴골 골절의 발생이 유의하게 높았다.

LCP 환자군에서 시행된 알루미나-알루미나 고관절 전치환술은 대퇴골두 무혈성 골괴사 환자군과 큰 차이가 없는 임상적 및 방사선학적 결과를 보였다. LCP 군에서 수술 중 대퇴골 골절 발생율이 유의하게 높았으나, 모든 환자에서 대퇴 스템의 해리 없이 골유합을 얻을 수 있었다. 대퇴골두 무혈성 골괴사 환자에서와 마찬가지로, 알루미나-알루미나 고관절 전치환술은 LCP 후유증 환자에게도 좋은 치료 방법이라 여겨진다.

주요어 : 고관절 전치환술, Legg-Calve-Perthes씨 병, 세라믹, 대퇴골두 무혈성 괴사, 경향점수