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Comparison of total curative effect between total hip arthroplasty and hip arthrodesis in treating coxotuberculosis

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Abstract. – OBJECTIVE: The purpose of this study was to investigate the clinical effect of total hip arthroplasty (THA) and hip arthrodesis (HA) in treating coxotuberculosis.

PATIENTS AND METHODS: 40 patients with coxotuberculosis treated in the Orthopedic Department in our hospital from February 2011 to February 2016 were retrospectively analyzed. Comparison of total curative effect between THA and HA in treating coxotuberculosis was analyzed. The operation time, intraoperative blood loss, postoperative drainage volume, visual analogue scale (VAS) score, Harris hip function score (HHS), erythrocyte sedimentation rate (ESR), C reactive protein, postoperative hip pain time (PHPT), postoperative start walking time(PSWT), postoperative start weight bearing time(PSWBT) and postoperative complications were observed and compared.

RESULTS: All patients successfully underwent successful THA or HA without major complications. The operation time, intraoperative blood loss and postoperative drainage volume in patients who underwent HA were better than those of patients who underwent THA ($p<0.001$, $p=0.010$, $p<0.001$, respectively). During the postoperative evaluation, VAS, HHS, ESR, CRP in patients who underwent THA were better than those of patients who underwent HA, and the differences were statistically significant. About the recovery, PHPT, PSWT, PSWBT in patients who underwent THA were shorter than those in patients who underwent HA ($p=0.021$, $p=0.044$, $p<0.001$, respectively). There was no fracture, infection, dislocation, neurological or vascular complications in THA group. No patient had subsidence, loosening or heterotopic ossification. 1 patient in HA group had a fracture of the steel plate, and 1 patient had delayed union in HA group.

CONCLUSIONS: THA is an effective treatment for advanced tuberculous arthritis. THA is superior to HA in the treatment of coxotuberculosis.

Key Words
Coxotuberculosis, Total hip arthroplasty, Hip arthrodesis, Efficacy.

Introduction

Coxotuberculosis is the most common form of joint tuberculosis in the extremities, which accounts for 10-15% of tuberculosis[1,2]. Common cartilage and bone extensive destruction, joint deformation, narrowing or tonic ankylosis caused by pain and joint dysfunction are often seen in late stage of coxotuberculosis. The disease is diagnosed when a large amount of bone destruction has already existed, for which surgical treatment is the usual option, mainly are resection arthroplasty, arthrodesis and arthroplasty[3-5].

Resection arthroplasty or arthrodesis can reduce pain and control infection, but the recovery of hip function is not satisfied. Resection arthroplasty can make the hip unstable, accompanied by limb shortening and abnormalities[6,7]. Arthrodesis is the traditional treatment for the disease. Although gait arthrodesis relieves joint pain, it has instability and poor function, often accompanied by the disadvantages of non-union, joint pain, slow joint and abnormal gait[8]. Although patients lost the activity of the hip after hip arthroplasty, there are not many restrictions in self-help and participation in daily activities. Some patients can even continue to work, which greatly improves the patient's life. Therefore, arthrodesis is one of the effective methods for the treatment of advanced total hip arthroplasty. However, the timing of THA for coxotuberculosis remains controversial. It is currently considered that THA is suggested to be applied in patients with advanced coxotuberculosis or in the quiescent phase[9-12].

Therefore, the aim of this study was to investigate the clinical effect of THA and HA in treating coxotuberculosis.

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Patients and Methods

Patients and Clinical Data

A total of 40 patients with coxotuberculosis treated in the Orthopedic Department in our hospital from February 2011 to February 2016 were retrospectively analyzed. This study was approved by the Ethics Committee of The General Hospital of the PLA Rocket Force. Signed written informed consents were obtained from all participants before the study. There were 22 males and 18 females, with an average disease duration of 4.2 years (6 months to 11 years). The average shortage length of affected limbs was 2.6 cm (1-5 cm) in 40 patients. All cases were followed up for 6-18 months. Patients were admitted in our hospital for disability or severe limb pain. Patients were divided into three groups: hip arthrodesis group (HA) (n=18) and total hip arthroplasty group (THA) (n=22). Relevant preoperative examinations, including ECG, three routine tests, blood biochemistry and other tests were performed to correctly assess the patient's surgical tolerance. Imaging examination and preoperative hip puncture were carried out to confirm the diagnosis. All 40 patients in this study were in the late stage of coxotuberculosis. Clinical features included hip pain, swelling, hip flexion deformity, limited internal and external rotation, and severe functional limitations. All of the patients clearly had the typical imaging features of tuberculous arthritis by magnetic resonance imaging. The main manifestations were swelling of surrounding tissues, narrowing of joint space, severe destruction of articular surface and adjacent bone, alteration of worm-eaten samples and formation of sequestrum[13]. The pelvis and thigh sinuses were not included in this study.

Operation Data

All patients underwent preoperative antithrombotic (anti-TB) therapy (streptomycin, rifampin, isoniazid, ethambutol) for 4 weeks until swelling, pain relief, sinus secretion reduction, erythrocyte sedimentation rate (ESR), and CRP decreased to normal range (ESR < 60 mm/h, CRP < 35 mg/L).

Patients in HA group underwent total hip arthroplasty by lateral approach. During the operation, the cartilage surface of the femoral head and acetabulum as well as sclerosis bone were removed, and the articular capsule and all necrotic tissue were completely removed. Hip joint was in flexion when the middle hip joint was fixed (male was 1°-20°, female was 25°-30°, abduction was 5°-10°, extorsion was 5°-15°). Acetabulum was ensured in good contact with the femoral head. Intraoperative X-ray was performed to determine the location of Kirschner wire (1) or the steel plate to ensure they were in an appropriate location and in good contact with the bone. 4 weeks after operation, quadriceps constriction and straight leg raising training were performed. After 4 to 6 weeks, part of the patients had the ability to walk under load, and they could walk completely under load after 8 to 12 weeks.

Patients in the THA group underwent total hip arthroplasty under general anesthesia by lateral approach. Caseous necrosis, fibrosis, hyperosteogeny, osteoporosis were observed, and necrosis of bone tissues and soft tissues were completely removed. Types of biological femoral stems of all patients were selected according to the shape of the marrow cavity shape. The appropriate femoral head was chosen after assessment. Prosthesis femoral head was reset in the artificial acetabulum to test the activities of the hip and its stability. A ceramic-on-polyethylene bearing was used in 11 patients, ceramic-on-ceramic in 6, and metal-on-polyethylene in 5.

All patients were extubated 24-48 h postoperatively, and subcutaneously injected 2500 U of low molecular weight heparin to prevent postoperative deep venous thrombosis. All patients underwent hip biopsy. All patients received antithrombotic therapy (streptomycin, rifampin, isoniazid, ethambutol) postoperatively for one year.

Evaluation

The assessment included operative time, intraoperative blood loss, postoperative drainage, VAS score (0-10; 0 = no pain), HHS score (0-100; 100 = the best function), ESR (normal, < 20 mm/h), C-reactive protein (normal, <10 mg/L) and postoperative complications.

Statistical Analysis

Statistical analysis of this study was performed using statistical product and service solutions (SPSS) 22.0 statistical analysis software (IBM, Armonk, NY, USA). Percentage data between the two groups were analyzed by the x^2-test, and two independent samples by *t*-test. All the measurement indicators were described as mean ± standard deviation. $p<0.05$ indicated that the difference was statistically significant (*$p<0.05$, **$p<0.01$, ***$p<0.001$).

Results

General Data

In this study, 40 patients with coxotuberculosis were retrospectively analyzed in the Orthopedic Department in our hospital from February 2011 to February 2016. Among them, 18 patients underwent HA, including 10 males and 8 females, with an average age of 46.8 years (34-72 years). 22 patients underwent THA, including 12 males and 10 females, with an average age of 44.6 years (24-68 years). The general data was shown in Table I.

Operation Data

The operation time was 157.3 ± 12.63 min in THA group and 130.6 ± 16.35 min in HA group, and the difference was statistically significant (p<0.001). The intraoperative blood loss in THA group was also more than that in HA group (p=0.010). The THA group also had more postoperative drainage volume than the HA group (544.6 ± 26.36 mL, 423.6 ± 30.53 mL, p<0.001) (Figure 1).

Clinical Data

The levels of CRP and ESR in THA group were better than those in HA group. VAS and HHS were improved in all patients after operation. However, the improvement of VAS and HHS in THA group was better than HA group. Specific data were illustrated in Figure 2.

Recovery Data

The postoperative hip pain time (PHPT), postoperative start walking time (PSWT) and postoperative start weight bearing time (PSWBT) in patients who underwent THA were shorter than those who underwent HA (p=0.021, p=0.044, p<0.001, respectively). Specific data were illustrated in Figure 3.

Table I. Clinical data.

	THA	HA	p
Age (y)	24-68	34-72	0.11
Gender			0.95
Male	12	10	
Female	10	8	
Course of disease			0.27
<4 years	18	12	
≥4 years	4	6	
Painful hip	19	15	0.79
Shortage length of affected limb			
<3 cm	14	8	0.22
≥3 cm	6	6	0.68

Adverse Events and Prognosis

No sign of recurrent tuberculosis was shown in all patients. *Mycobacterium tuberculosis* was positive in 8 patients in HA group and 11 in THA group. There were no periprosthetic fractures, infections, dislocations, neurological or vascular complications in the THA group. No patient had subsidence, loosening or heterotopic ossification. 1 patient in the HA group had a fracture of the steel plate, 1 patient presented delayed union, and no patient had hip varus.

Discussion

The early manifestations of coxotuberculosis are pain and cartilage injury around the hip joint. Coxotuberculosis in the late stage will cause the proliferation of fibrous tissues around the joint proliferation, leading to the fibrous ankylosis or osseous ankylosis. All these changes lead to hip pain, flexion, adduction deformity, dysfunction, and even the formation of sinus, long-term pus,

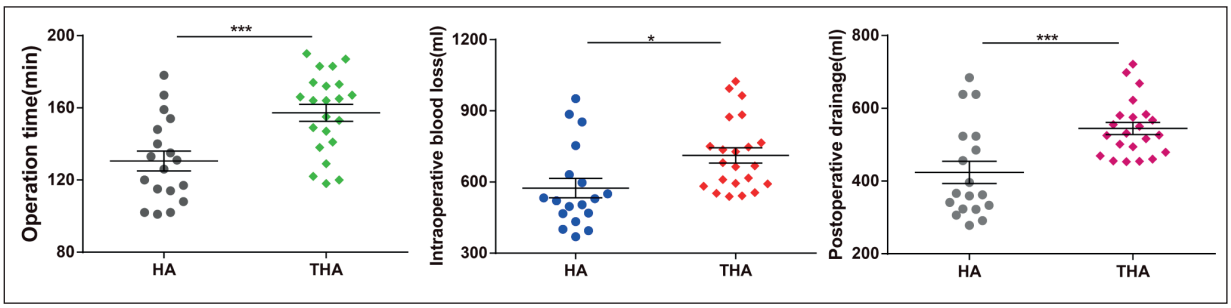

Figure 1. Operation data in HA group was better than that in THA group.

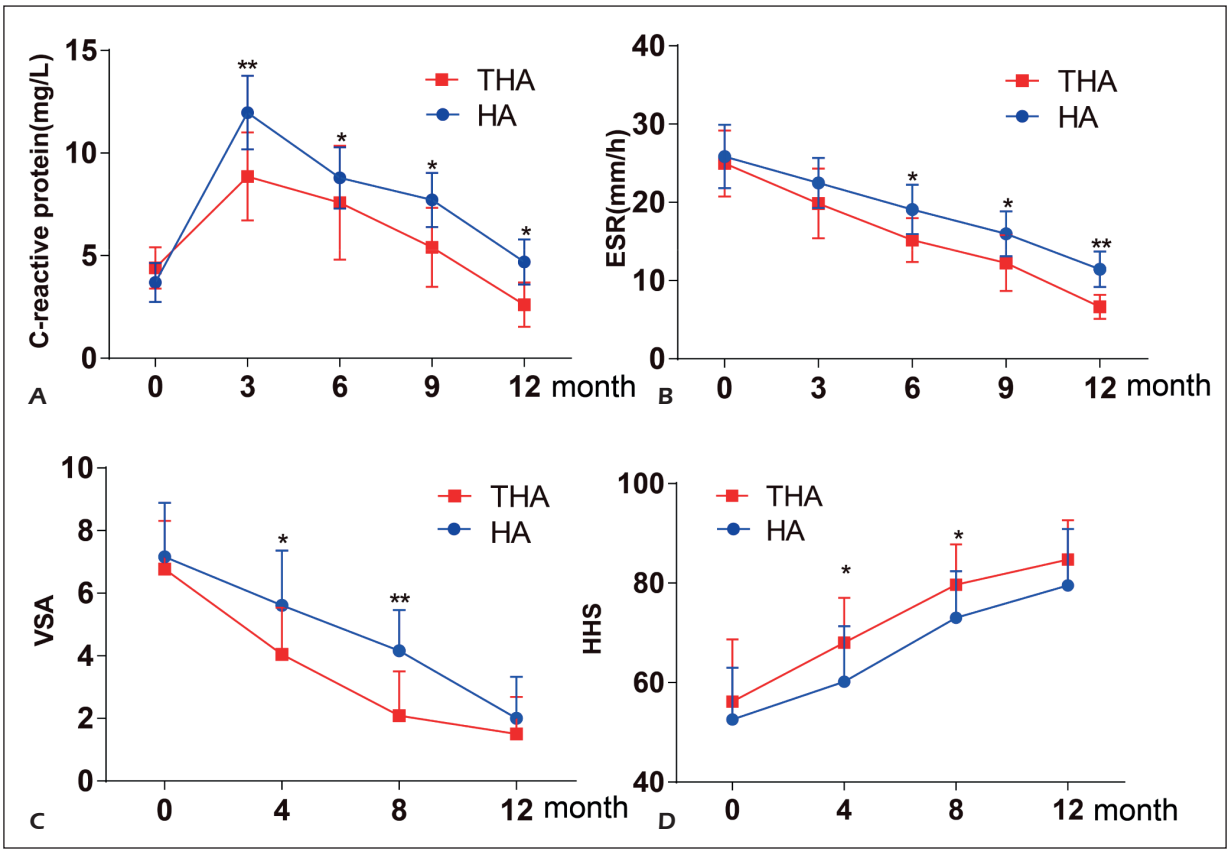

Figure 2. Comparison of clinical effects between two groups. **A**, The serum CRP levels were more quickly decreased in THA group. **B**, The ESR in THA group had the more descending rate than that in HA group. **C-D**, VAS's and HHS's change in patients who underwent THA were faster than those in patients who underwent HA.

seriously affecting the life quality and ability of patients[14,15]. Currently, the main treatments for coxotuberculosis are resection arthroplasty, arthrodesis and arthroplasty. Hip fusion methods include plaster fixation, Kirschner wire fixation, plate fixation and external stent fixation. Ozdemir et al[16] reported that 32 patients with advanced coxotuberculosis underwent hip arthrodesis with internal fixation, and bone fusion was achieved 5 months after surgery. Although hip arthroplasty may provide satisfactory outcomes, infection control may not be sufficient for functional recovery of the lower extremities[1,17]. For most patients, joint replacement after arthrodesis is a better

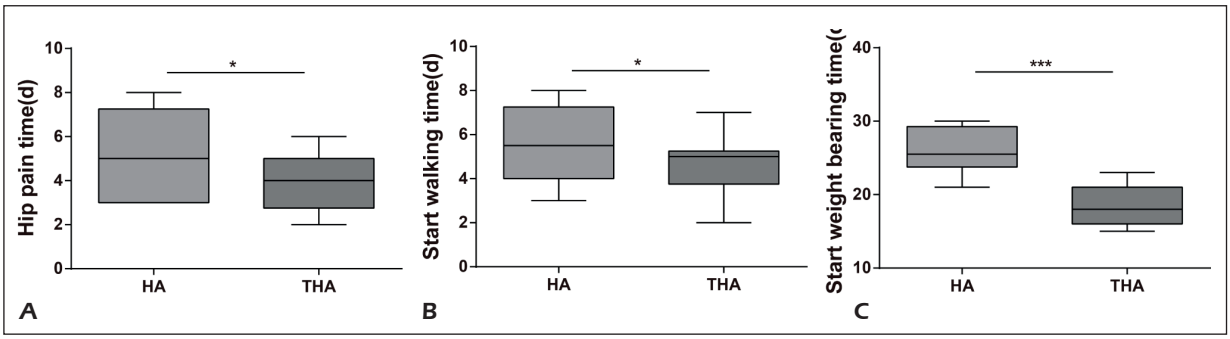

Figure 3. Comparison of recovery between two groups. **A**, The postoperative hip pain time was shorter in THA group than that of HA group. **B**, The patients in THA group started walking earlier than the patients in HA group after operation.B, The patients in THA group started weight bearing earlier than the patients in HA group after operation.

option for functional improvement[18-20]. However, THA application in coxotuberculosis patients is still controversial[21,22].

This research compared the clinical effect of HA and THA in the treatment of coxotuberculosis. The study demonstrated that the operation time, intraoperative blood loss, postoperative drainage volume in HA group, were better than those in the THA group (Figure 1). Indicators for evaluating clinical effects, such as VAS and HHS, and clinical indicators CRP, ESR were better in THA group than those in HA group. Recovery data in THA group was better than that in HA group (Figure 3). It was considered THA is superior to HA in the diagnosis and treatment of coxotuberculosis. In the adverse events and prognosis, all patients underwent surgical treatment. The prognosis of THA was good with no obvious complication occurred. 1 patient in HA group had a fracture of the steel plate, and 1 patient had delayed union.

All patients had no pulmonary tuberculosis after surgery. Our results revealed that THA and HA do not increase the risk of reactivation of pulmonary tuberculosis. Studies [23, 24] have shown that the minimal adherence of *mycobacterium tuberculosis* to metal surfaces could lead to the reformation of localized lesions. However, the mechanism of this reactivation is not fully understood. No recurrence of lesions in THA group was observed after formal anti-TB treatment.

In summary, the diagnosis and treatment effect of THA in the treatment of coxotuberculosis was better than HA. That being said, our research has several limitations. First, only 40 patients were included, with a relatively short follow-up period. Our results can be used as a short-term evaluation of THA for the treatment of advanced coxotuberculosis. Second, this was a retrospective study, and the level of evidence was low. Despite these limitations, our findings suggested that THA is an effective treatment for advanced tuberculous arthritis.

Conclusions

Our study confirmed that THA is an effective treatment for advanced tuberculous arthritis.

Conflict of Interests:

The authors declared no conflict of interest.

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