

Total hip arthroplasty for tuberculosis: a case series

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Background: The purpose of this study is to investigate the optimal surgical options for different kinds of advanced hip tuberculosis, which are still controversial.

Methods: We reviewed seven advanced hip tuberculosis patients received operations from November 2014 to September 2018. All patients received anti-tubercular chemotherapy at least 2 weeks preoperatively and twelve months postoperatively. One active case with sinus tract of seven patients underwent three-stage operations including two debridements/cement spacer implantations and one total hip arthroplasty, while the other six cases received one = stage arthroplasty surgery. All patients are followed up based on Harris score, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and X-ray.

Results: The mean follow-up time was 41.6 months, while no reactivation was detected. The average Harris score increased from 40.0 preoperatively to 89.4 at the final follow-up. ESR of 3 active hip tubercular cases decreased from 143.7 mm/L at diagnosis time to 6.7 mm/L at the final follow-up. CRP of 3 active hip tubercular cases decreased from 80.01 mg/L (range, 37.34–136.92 mg/L) at diagnosis time to 1.91 mg/L (range, 1.05–2.57 mg/L) at the final follow-up. The ESR and CRP of all patients had returned to normal level at the final follow-up. No prosthesis dislocation, loosening and neurovascular injury was found.

Conclusions: THA is an effective and safe option for hip tuberculosis. The essentials for good outcome include early diagnosis, regular perioperative anti-tubercular chemotherapy, radical debridement of inflamed tissue and necrotic bone, staged-operation if necessary.

Keywords: Total hip arthroplasty; hip tuberculosis; anti-tubercular chemotherapy; reactivation

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Introduction

Tuberculosis (TB) is a significant global medical problem. It is one of the top 10 causes of mortality worldwide and the chief cause of death from a single infectious pathogen. Globally, an estimated 10 million people (range, 9.0–11.1 million) contracted TB in 2018, with an estimated 1.2 million (range, 1.1–1.3 million) TB deaths among HIV-negative people (1). TB of the hip accounts for approximately 10–15% of osteoarthritic TB (2,3), and

is second only to the spine for tuberculous involvement sites (4). With a timely diagnosis and regular treatment using first-line antibiotics, most TB patients can be cured. However, without early diagnosis, advanced stage TB can lead to joint destruction, and management of the disease can become technically demanding (5-8).

Besides the pre- and post-operative anti-tubercular therapy (ATT), the surgical options for advanced tubercular hip include resection arthroplasty, arthrodesis, and total hip

Case	Gender	Age (at diagnosis)	Туре	Co-morbidities	Pre-op ESR	Pre-op CRP	Mixed- infection
1	Male	57	Active	Sinus tract/obsolete pulmonary tuberculosis/ pneumothorax	116	136.92	S. aureus
2	Female	45	Quiescence for 2 years	Lumbar tuberculosis	25	5.69	Negative
3	Male	22	Active	Healed sinus tract	94	37.34	Negative
4	Male	26	Active	Arrhythmia	221	65.77	Negative
5	Male	23	Quiescence for 7 years	None	16	3.67	Negative
6	Male	47	Quiescence for 12 years	Hypertension	5	5.41	Negative
7	Female	20	Quiescence for 1 year	None	9	7.83	Negative

Table 1 Demographic characteristics of seven hip tuberculosis patients

ESR, erythrocyte sedimentation rate; CRP, C-reactive protein.

replacement (THR). Resection arthroplasty and arthrodesis can provide pain relief and infection control, and adversely abnormal gait, difficulty of conversion to THR. However, resection arthroplasty can result in instability and leg length discrepancy (9-11), and arthrodesis can lead to hip immobility, adjacent joint degeneration, lower back pain, and probable non-union (12).

The demands for quality of life among patients are increasing, especially since many patients are relatively young and have several decades of active life remaining. Thus, they require a painless, stable, and functional hip joint. However, THR for TB of the hip still involves many controversial issues related to infection reactivation, surgical timing, perioperative ATT regime, long-term survival of prosthesis, etc. The purpose of our research was to investigate the feasibility and outcome of different treatment options through a review of the clinical data of seven patients between November 2014 and September 2018. We hope that our study provides some insight into the clinical treatment of TB of the hip.

We present the following article in accordance with the AME Case Series reporting checklist (available at http://dx.doi.org/10.21037/apm-20-2544).

Methods

Seven patients with TB of the hip were treated with total hip arthroplasty (THA) in the Orthopaedic Department of Guizhou Provincial People's Hospital from November 2014 to September 2018. Of these, five were men and two were women, with a mean age of 34.3 years (range, 20–75 years).

Three patients were in the active phase and four patients were in quiescence. Two patients suffered right hip infection, while the remaining five patients had left hip infection. One patient was accompanied with obsolete pulmonary TB and pneumothorax, and one patient had lumbar TB. One patient had sinus tract drainage and tested positive for mixed infection of Staphylococcus aureus, while another patient had three healed sinus tracts (*Table 1*).

All patients received anti-tubercular chemotherapy [isoniazid (300 mg/d), rifampicin (450 mg/d), ethambutol (750 mg/d), and pyrazinamide (750 mg/d)] preoperatively for an average of 3.4 weeks (range, 2–6 weeks), and postoperatively for an average of 16.7 months (range, 12– 18 months). Inflammatory indicators, including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), had decreased significantly before surgery in all active patients (*Table 2*).

The patient with sinus tract and mixed infection received three-stage surgery. The first stage surgery involved radical debridement, sinus tract resection, and implantation of a vancomycin-loaded cement spacer, while the second stage surgery involved cement spacer replacement and was conducted 2 months after the first surgery due to spacer breakage resulting from poor compliance. Final implantation of the hip prosthesis was completed 6 months later (*Figure 1*). The remaining six patients received one-stage surgery involving thorough debridement and prosthesis implantation. All patients were allowed weightbearing 1 day after THA (*Figure 2*). All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised

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Table 2 Treatments	and r	esults	of seven	hip	tuberculosis	patients

ATT	period	Surger (Follow-	Depativation	Harris score		Last-FU	Last-FU
Pre-op (weeks)	Post-op (months)	Surgery	up (m)	Reactivation	Pre-op	Post-op	ESR	CRP
6HRZE	6HRZE12HRE	Sinus resection, debridement, spacer/ debridement, spacer/ debridement, THA	71	Negative	15	80	8	2.57
2HRZE	3HRZE9HRE	Debridement, THA	25	Negative	47	90	6	4.86
6HRZE	3HRZE15HRE	Debridement, THA	34	Negative	31	87	10	1.05
4HRZE	3HRZE15HRE	Debridement, THA	44	Negative	38	85	2	2.1
2HRZE	3HRZE9HRE	Debridement, THA	51	Negative	42	91	15	3.46
2HRZE	3HRZE12HRE	Debridement, THA	37	Negative	49	95	7	4.33
2HRZE	3HRZE9HRE	Debridement, THA	29	Negative	58	98	13	4.07

ATT, anti-tubercular therapy; FU, follow-up; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; THA, total hip arthroplasty. HRZE: H, isoniazid; R, rifampicin; Z, pyrazinamide; E, ethambutol. HRE: H, isoniazid; R, rifampicin; E, ethambutol.

in 2013). The study was approved by institutional ethics committee of Guizhou provincial people's hospital (No.EC-20201026-1017) and informed consent was taken from all the patients.

Results

The mean follow-up time was 41.6 months (range, 25–71 months), and no reactivation was detected. The average Harris score increased from 40.0 (range, 15–58) preoperatively to 89.4 (range, 8–98) at the final follow-up. The ESR of the three active TB of the hip cases decreased from 143.7 mm/L (range, 94–221 mm/L) at the time of diagnosis to 6.7 mm/L (range, 2–10 mm/L) at the final follow-up. The CRP of the three active TB of the hip cases decreased from 80.01 mg/L (range, 37.34–136.92 mg/L) at the time of diagnosis to 1.91 mg/L (range, 1.05–2.57 mg/L) at the final follow-up. The ESR and CRP of all patients had returned to a normal level at the final follow-up. No prosthesis dislocation, loosening, or neurovascular injury was observed (*Table 2*).

Discussion

Staged surgery is the gold standard treatment for severe infectious destruction of the skeletal and joint systems. First stage surgery involves radical debridement and curettage of inflammatory and necrotic tissue, with or without implantation of an antibiotic-loaded cement spacer. Second stage surgery is carried out after the infection is under control, and involves once more debridement and implantation of the metal prosthesis. The necessity of staged surgery results from adherence to the metal surface as well as the biofilm-forming characteristics of common bacteria. Bacteria coated with biofilm have strong resistance to antibiotics and host immune attack, which can ultimately lead to serious surgical failure (13). Some authors have suggested that staged surgery with anti-TB chemotherapy could minimize the reactivation of TB. Li *et al.* (6) held the view that it is difficult to achieve thorough debridement of advanced hip infection diffused to the thigh or pelvis, and recommended two-staged surgery.

In contrast to common pyogenic pathogens, TB bacilli have unique biological characteristics, including that they are slow-growing, they do not adhere to metal surfaces, and have scarce biofilm-formation (13-15). Encouraged by the success of one-staged surgery with metal implantation for active spinal TB (16,17), an increasing number of surgeons have applied one-staged surgery for the treatment of TB of the hip, with satisfactory results (8,15,18,19).

However, in addition to the anti-TB chemotherapy, the quiescence before THA reported by different authors varied from immediately to 20 years (8,18-21). There have also been some cases of reactivation reported after a very long time of quiescence. Johnson *et al.* (22) encountered two patients who had TB of the hip in childhood and had no manifestation of infection for 42 and 37 years, respectively. Reactivation of TB emerged 1 year after THA



Figure 1 A 57 years old man was diagnosed active hip tuberculosis with sinus tract drainage. Preoperative X-ray (A), CT scan (B) and MRI (C) showed joint destruction and cold abscess. (D) Postoperative radiograph of first-stage surgery (sinus tract resection, radical debridement and implantation of vancomycin-loaded cement spacer). (E) Two months postoperatively, spacer breakage occurred due to poor compliance. (F) The patient received second-stage surgery (debridement and replacement of cement spacer). (G,H) Eight months postoperatively, the final metal prosthesis was implanted. (I) Seventy months postoperatively, the final follow-up radiograph showed good position and growth-up of prosthesis.

for two ankylosing hips. These two patients were treated in childhood with conservative immobilization only (i.e., without anti-TB chemotherapy). In our retrospective cases, the quiescence before THA was not taken into consideration when deciding the surgical timing. Also, the standard firstline anti-TB chemotherapy, including isoniazid, rifampicin, pyrazinamide, and ethambutol, was applied for every patient for between 2 and 6 weeks preoperatively and between 12 and 18 months postoperatively.

Many authors hold the opinion that sinus tract drainage is contraindicated in one-staged surgery for treating TB of the hip (6,15,23). Sinus tract drainage is often accompanied by mixed infection with other common pyogenic pathogens including multi-drug resistant super-bacteria. Li *et al.* (6) reported a series of four TB of the hip cases with sinus tract; they selected two-staged surgery with regular anti-TB chemotherapy, and ultimately achieved a satisfactory result. In our study, we chose three-staged treatment for cases with sinus tract, with anti-TB chemotherapy and intravenous administration of sensitive antibiotics.

Conclusions

THA is an effective and safe option for TB of the hip.



Figure 2 A 45-year-old woman suffered left hip tuberculosis. (A,B) The X-ray showed affected left hip. (C,D) After anti-tubercular chemotherapy for six months. (E) The patient received total hip arthroplasty. (F) The follow-up X-ray two months postoperatively. (G) The follow-up X-ray 26 months postoperatively.

The essentials for good surgical outcomes include early diagnosis, regular perioperative anti-TB chemotherapy, radical debridement of inflamed tissue and necrotic bone, as well as staged-surgery if necessary.

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Footnote

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