Review article

Total hip replacement in tuberculosis of hip: A systematic review

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ABSTRACT

Total hip replacement (THR) in patients with tuberculous arthritis of the hip is controversial. The timing of surgery, type of prosthesis, reactivation of the disease, high complication rates and the long-term survival of the reconstruction are the major concerns. There is little information regarding this concern in the literature. We conducted a systematic review of published studies on Total Hip Replacement in patients with Tuberculosis of the hip. A search of Pubmed and Google Scholar database articles published between January 2000 and July 2017 was performed. Thirteen articles were identified, comprising 226 patients. The mean follow-up was 5.48 years. Antituberculosis treatment was given for at least 2 weeks pre-operatively and continued post-operatively for between six and 18 months after THR. Three patients had reactivation of infection. At the final follow-up, the mean Harris hip score was 89.98. Total Hip Replacement in tuberculosis of hip is safe and efficient way to save the joint function. The most important factors to achieve success include the accurate diagnosis, efficient pre- and postoperative anti-tuberculosis therapy, thorough debridement, two stage procedure for patients with sinus(es).

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1. Introduction

Tuberculosis (TB) of the hip joint accounts for about 10–15% of all patients of osteoarticular TB^{1,2} and is the second most common site of osteoarticular involvement after the spine.³ It results in severe cartilage and bone destruction causing pain, deformity, shortening and instability, if early diagnosis and treatment was missed,⁴ and its treatment can be confronted with great challenges.

The treatment of patients with advanced tuberculous arthritis of the hip is controversial. The surgical options are excision arthroplasty, arthrodesis and Total Hip Replacement (THR). Excision arthroplasty offers a painless and mobile hip at a cost of instability with shortening and an abnormal gait.^{5,6} In addition, the conversion to THR after excision arthroplasty is complex and may be less satisfactory.⁷ An arthrodesis offers a stable, painless and immobile joint with poor function, back pain and abnormal gait.⁸ The operation is often complicated with non-union. Also, it is no longer popular in the Asia-Pacific region because of the customary need for squatting.¹

THR provides a painless stable joint with a normal gait. However, timing of surgery, type of prosthesis, duration and

regime of peri-operative antitubercular chemotherapy (ATT), reactivation of the disease, high complication rates and the long-term survival of the reconstruction remain major concerns with THR.

Some consider THR to be contraindicated because of risk of reactivation of infection¹ whereas others recommend a long interval between the treatment of the active infection and THA⁹ which varied from 10 to 20 years.^{10–12} The purpose of this study was to review the literature in order to assess the outcome of THR in patients with tuberculosis of hip.

2. Material and methods

A search of PubMed and Google Scholar database was performed with the key words, “arthroplasty; replacement; hip; tuberculosis”. We could trace about 77 papers on this subject. We included the articles which were published from January 2000 to July 2017 in which total hip arthroplasty was done for active or healed tuberculosis of the hip. Case reports; review articles and periprosthetic tuberculous infections and studies in which other joints involved were excluded from the study. Thirteen articles were selected for the review.

The selected articles were reviewed to extract the information of different studies on demographic data like number of patients, mean age, male: female ratio. The biochemical values- Erythrocyte Sedimentation Rate and C-Reactive Protein (ESR and CRP), duration

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of antitubercular treatment (ATT), surgical management, outcome regarding post-operative ESR and CRP, duration and regime of post-operative ATT, Harris Hip Score and any complications including reactivation of tuberculosis were evaluated.

3. Results

The results were summarised in Table 1. There were total 226 patients included in these thirteen articles. Mean age at the time of total hip arthroplasty was 49.7 years. Twenty-four patients have associated pulmonary lesions and eight patients have sinus around

the affected hip. Two out of thirteen studies have a total of 91 patients with healed tuberculosis of hip. Majority of patients received atleast 2 weeks of ATT preoperatively. All patients received first line drugs only. The drugs used pre-operatively were Isoniazid, Rifampicin, Pyrazinamide and Ethambutol (HRZE) in 123 patients; HRES (HRE + Streptomycin) in six patients; HR in 26 patients. Thirty-six patients received ATT in post-operative period only, status of ATT unknown in remaining 35 patients. 165 patients had uncemented, 41 patients had cemented and eight had hybrid prosthesis. It was not mentioned about the type of prosthesis used in the remaining 12 patients. In all the cases,

Table 1
Demographic variables and results of the different studies.

Study	n	Mean Age (yrs)	Type of disease	Preop ESR/CRP	Sinus	ATT drugs used	Duration ATT (preop)	Prosthesis Used	Duration ATT (post op)	Follow Up (years)	Harris Hip Score (Preop/Follow Up)	Complications	ESR/CRP Normal by
Yoon et al. ¹³	3	36.6	Active	92.6/4		HRZE	2 weeks	Uncemented	1 year	3.2	–/97		2.6
Yoon et al. ¹⁴	7	46.4	Active			HRZE	Immediate	Uncemented	1 year	4.8	37/94.9		4/3
Netval et al. ¹⁵	26	65	Healed			HR		Uncemented 6 Cemented 15 Hybrid 5	3–5 months			Nil	
Ozturkmen et al. ¹⁶	9	43.4	Active	High/High		HRZE	2 weeks	Uncemented	1 year	5.6	–/94.8	1 Heterotopic ossification	4/3
Sidhu et al. ¹⁷	23	52	Active	69/10.8	0	HRZE	3 months	Cemented	18 months	4.7	38/91	1 dislocation reduced by CR 1 Heterotopic Ossification	12
Wang et al. ¹⁸	6	33.8	Active	ESR 72.5	2	HRES	2 weeks	Uncemented 4 Cemented 2	1 year	4.08	26.8/94.2		6
Neogi et al. ¹⁹	12	45	Active		1	HRZE	5 weeks	Uncemented 10 Hybrid 2	1 year	3.41	38/88	1 reactivation and superadded S aureus infection (non-compliant to ATT) Resection arthroplasty done	5.6
Wang et al. ²⁰	8	48	Active	High(4) Normal (4)		HRZE	2 weeks	Uncemented	6 months	3.83	35/91		7/3
Shen et al. ²¹	14		Active			–	2 weeks	Uncemented	6 months	4.08	36/87	1 reactivation 7 months later Resection arthroplasty done	
Bi et al. ²²	12	46.3	Active	62.4/33.6	1	–				3.4	36.83/88	1 reactivation 4 months later Cured after Revision	
Zeng et al. ²³	32	49.4	Active	High (11)		HRZE	2 weeks	Uncemented	1 year	4.1	42.2/85.4		3/4
Kumar et al. ²⁴	65	48	HEALED	Normal	0	HRZE	1 week	Uncemented	6 months	8.3	27/91		
Li et al. ²⁵	9	50	Active		4	–	1st stage: 2 weeks	Uncemented 7 Cemented 1 Hybrid 1	1st stage: 3 months 2nd stage: 6–9 months	3.3	35/91.5	1 DVT treated by antithrombotics	3.3/1.6
Total (13)	226	49.7	91 patients healed	High in 7 studies Normal in 1 study	8 patients have sinus		2 weeks to 1 year	UnCemented 165 Cemented 41 Hybrid 8 UnKnown 12	6 months–18 months	5.48 Yrs	–/89.98	3 reactivation 2 Hetrotopic Ossification 1 dislocation 1 DVT	5.8/5.5

(ESR- Erythrocyte Sedimentation Rate; CRP- C Reactive Protein; ATT- Antitubercular therapy; H- Isoniazid; R- Rifampicin; Z- Pyrazinamide; E- Ethambutol; S- Streptomycin).

the diagnosis was confirmed by histopathological examination on intraoperative samples except for healed cases where the cultures and histopathological examinations were negative. Post operatively, all the patients have ATT continued for 6–18 months. Mean follow up period was 5.48 years. Postoperative mean Harris Hip Score was 89.98. There were reactivation of tuberculosis in 3 patients, which were managed by prolonging the duration of ATT and resection arthroplasty was performed in 2 patients. Two patients have heterotopic ossification and one had hip dislocation, which was reduced by closed means. ESR and CRP were returned to normal levels after a mean duration of 5.8 and 5.5 months post operatively respectively.

4. Discussion

The treatment of patients with advanced tuberculous arthritis of the hip is controversial. For THR in patients with tuberculous arthritis of the hip, a long period of quiescence (immediate to 10 years) has been recommended.^{9,14} Kim et al.⁹ in 1987, described a series of 44 THRs in 38 patients with tuberculous arthritis of hip within three months to 45 years of the disease. No patient has received ATT in the pre and post-operative periods. Reactivation was reported in six patients in whom it was controlled by chemotherapy and debridement. In 2001, Yoon et al.¹³ reported successful THR in three patients with active tuberculous arthritis who underwent surgery between three and six months of the onset of the disease, with all patients receiving chemotherapy pre- and post-operatively. None had reactivation.

Most authors suggest that patients with sinus drainage are not qualified for one stage joint arthroplasty.^{3,14,20,26,27} The presence of sinus usually indicates pyogenic superinfections from *Staphylococcus aureus* or other pathogens and may increase the difficulties of thorough debridement. In our review, Wang Y et al.¹⁸ reported 2 patients with sinus drainage; under careful surgical debridement and regular anti-tuberculosis therapy treatment with no reactivation occurred. Neogi DS et al.¹⁹ reported one patient with preoperative sinus had reactivation and superimposed infection with *S. aureus*. This patient was noncompliant with ATT. In a study by Li et al.²⁵ in 2016, there were four patients with sinus tracts to the thigh or pelvis, and two of them had superinfection detected by bacterial culture preoperatively. The two stage arthroplasty was performed in these four patients. Two patients with superinfection were also treated by intravenous culture-specific antibiotics for a minimum of 6 weeks after the first operation. None of them had reactivation of TB and pyogenic infection. According to Öztürkmen et al.¹⁶ the patients with infected sinus extending into the pelvis or thigh are not suitable for one-stage THR because of the risk of reactivation due to the incomplete curettage and debridement.

If the drained sinus cannot be completely excised or if superinfections from pyogenic pathogens occurred preoperatively, two-stage total joint arthroplasty is recommended to avoid a high risk of reactivation. In patients with sinus drainage, total resection of the sinus with efficient ATT is essential for obtaining a good outcome.

Another major concern is the risk of reactivation of disease following surgery.^{10,28,29} In patients undergoing THR for tuberculous arthritis, the recommended period of quiescence before THR varies from immediate to 10 years.^{14,16,17,19,30,31} However, reactivation has been reported even in cases operated even after a quiescent period of 37–40 years.¹¹ The biological characteristic of *M. tuberculosis* is different from *S. aureus* or other pyogenic organisms. *M. tuberculosis* is a slow grower, divides every 15 to 20 h, which is extremely slow as compared to *Staphylococcus aureus*, which divides approximately every 20 min. Periprosthetic infections are mainly caused by common biofilm-forming bacterial

pathogens. Comparing the adherence and biofilm properties of *M. tuberculosis* and *S. epidermidis*, Ha et al.³² confirmed that *M. tuberculosis* rarely adheres to the metal surfaces and has little or no biofilm formation.³³ Rifampicin, which was used in ATT is well known for its intracellular action and its ability to enter the biofilm.³⁴

Metal implants have been used for patients with spinal tuberculosis and have had good results with no reactivation.^{35,36} These reasons could become the fundamental considerations to ensure the feasibility of 1-stage joint arthroplasty surgery for the treatment of active joint tuberculosis.

Both cemented and cementless implants have been used successfully for patients with post-tubercular arthritis. The reactivation rates for both cemented and cementless THRs in patients with quiescent tuberculosis are similar,^{9,14} which indicates thermal reaction from cement is irrelevant to reactivation. If the patient receives efficient perioperative anti-tuberculosis therapy treatment and thorough debridement, the choice of either a cemented or cementless prosthesis is not a critical factor for the clinical outcome. Both cemented and cementless total hip arthroplasty have excellent short and mid-term follow-up results. However, long-term follow-up studies are still needed to prove this conclusion.

In this review, uncemented prosthesis was used in 165 patients, cemented in 41 patients and hybrid in eight. One patient with uncemented implant had reactivation for which resection arthroplasty was performed. One patient with hybrid prosthesis had reactivation and superadded infection who was non compliant to ATT.

The treatment of reactivation remains controversial. Johnson et al.¹¹ recommended the removal of the prosthesis for control of reactivation whereas McCullough³⁷ treated recurrent draining sinus with chemotherapy alone without the removal of prosthesis. In this review, three patients had reactivation of disease. Resection arthroplasty was performed in two patients and one patient was cured after revision of the components.

The reactivation of infection can be prevented by an effective complete curettage and debridement of the infected tissues.¹⁴ Yoon et al.^{13,14} emphasized the role of complete debridement. Complete curettage of the infected tissue and postoperative chemotherapy with a minimum one-year duration are very important in preventing reactivation.

The management of a reactivated infection or unsuspected active tuberculosis before joint arthroplasty is challenging. Efficient and prolonged anti-tuberculosis therapy alone³⁸ or with thorough debridement has the ability to save the prosthesis.³⁹ If these attempts fail, prosthesis removal will be the only choice to control the infection.

5. Conclusion

THR in tuberculosis of hip is safe and efficient way to save the joint function. The factors to achieve success include the accurate diagnosis, efficient pre- and postoperative anti-tuberculosis therapy, thorough debridement, two stage procedure for patients with sinus(es). Careful reaming, slow careful dislocation, thoroughly debriding and completely curetting inflamed soft tissues and the necrotic bone, using screws in the acetabular shell are few crucial steps to guarantee the success of surgery.

Conflict of interest

None to declare.

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