

**RESEARCH ARTICLE**

# A Midterm Analysis of Outcomes of Septic Arthritis of Hip Treated With Two Stage Cement Spacer and Total Hip Arthroplasty

Anmol Sharma, MS; Sandeep Gupta, MS; Anisha Sethi, MD; Jagseer Singh, MBBS

Research performed at Fortis Hospital, Mohali, Punjab, India

Received: 17 August 2022

Accepted: 18 August 2024

**Abstract**

**Objectives:** Septic arthritis of the hip, if not managed early and adequately, leads to degenerative arthritis with pain and debility. Various treatment options have been recommended, but no guidelines for the same have been established. Aim of the study is to evaluate the efficacy of our protocol for timing of staging using serological markers, rate of periprosthetic joint infection, midterm implant survivorship and functional outcomes.

**Methods:** Thirteen patients, aged 25 years and above, suffering from degenerative hip arthritis secondary to septic hip, were treated with 2 stage total hip replacement according to our protocol and serological markers were assessed for the timing of stages and follow up of infection control. Outcome of success of two stage total hip arthroplasty was assessed using modified Delphi criteria.

**Results:** Both acetabulum and femur head were involved in all cases. Two patients had history of a previous hip surgery. Most common micro-organism detected in intraoperative cultures was Staphylococcus aureus. Mean Harris Hip Score at final follow up was 82.33. Final outcome was deemed to be excellent in 84.6 % and good in 15.4 % cases.

**Conclusion:** Septic arthritis of the hip leading to end stage degenerative joint disease can be effectively managed with two stage total hip arthroplasty with good to excellent clinical and functional results.

**Level of evidence:** IV

**Keywords:** Arthritis, Arthroplasty, Cement, Hip, Septic, Spacer

**Introduction**

Septic arthritis of the hip in adults is a relatively rare but potentially disastrous condition resulting in long term morbidity to the patient if not managed urgently and adequately.<sup>1</sup> Being a deep joint, adequate debridement and complete removal of infective material is not achieved usually, which leads to persistence of active or subclinical infection. This gradually results in articular damage followed by degenerative joint disease with pain and functional debility.<sup>2</sup> Earlier, radical debridement and resection (Girdlestone arthroplasty) was recommended for such condition which although resulted in relief of pain and infection, but resulted in limb shortening and unsatisfactory functional outcome.<sup>3</sup> Although total hip

arthroplasty (THA) has been found to deliver good functional and clinical results in such adult patients with articular damage due to septic arthritis, no specific guidelines for staging of the procedure have been standardized.<sup>4</sup> A two-stage procedure has been reported in the recent literature, the first stage of which includes radical debridement and insertion of an antibiotic loaded cement spacer supplemented with systemic antibiotics followed by spacer removal and insertion of a total hip prosthesis as the second stage, when infection settles.<sup>5,6</sup>

We present a midterm outcome analysis of patients treated with 2 stage THA following destruction of the hip joint secondary to septic arthritis (SA). Aim of the study is

**Corresponding Author:** Anmol Sharma, Fortis Hospital, Mohali, Punjab, India

**Email:** Anmolsharma13@gmail.com



THE ONLINE VERSION OF THIS ARTICLE  
ABJS.MUMS.AC.IR



to evaluate the efficacy of our protocol for timing of staging using serological markers, rate of periprosthetic joint infection (PJI), midterm implant survivorship and functional outcomes.

### Materials and Methods

This was a prospective interventional study that included 13 patients aged 25 years and above, presenting to our institution from 2013 to 2019 with destructive arthropathy of the hip secondary to septic arthritis and treated with two stage total hip arthroplasty. The study was conducted after approval from the ethical committee of our institution and an informed written consent was taken from all patients for participation in the study and for publishing of data in a scientific journal in compliance with the ethical standards in the 1964 Declaration of Helsinki for all papers. Patients with a primary SA, secondary to a hip procedure or tuberculosis hip were all included in the study. Cases of PJI or sequel of old healed septic arthritis were excluded from the study.

The diagnosis of SA was made based on one or a combination of the following parameters: clinical signs of infection (fever, non weight bearing on the affected side, erythema, pus discharging sinus communicating with the joint), elevated total leukocyte counts (TLC), serum C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) levels, growth of a bacteria on joint aspiration or X rays suggestive of periarticular bone resorption and joint space narrowing.<sup>7</sup> Relevant history, demographic data and clinical findings were recorded in a tabulated manner in all patients. A pre-operative MRI of the hip was done in all patients to evaluate the extent of soft tissue and bony extent of involvement of the disease (especially the femoral side of the hip) and plan the debridement accordingly.

A standardized protocol for two stage THA was formulated. Preoperative baseline CRP and ESR levels were recorded. All surgeries were performed by a single surgeon using the modified Gibson's approach to the hip. During the first stage, resection of the damaged femoral head preserving as much neck as possible with thorough debridement of all infected and dead tissue with total synovectomy was done. A total of 5 to 7 tissue samples were taken around the hip (synovium, deep tissue around acetabulum and femur, bone from acetabulum and femoral side) and sent for extended culture in an enriched medium. Based on the pre-operative MRI and intra-operative clinical judgement, any unhealthy looking bone on the femoral and acetabular side was removed using acetabular reamers and Charnely's curette (on femoral side) till bleeding cancellous bone was noted. In case where femoral side was uninvolved, canal was not opened for the fear of spreading infection distally. A note of any bone defects and cup size was made at this point. Wound was washed thoroughly with hydrogen peroxide, 3 litres of Normal saline (NS) mixed with 90 ml of 10% betadine followed by 3 litres plain NS using pulse lavage. The wound was packed with betadine soaked sponges and temporary closure was done using continuous running skin sutures and covered with a sterile dressing. The limb was repainted and draped, packed sponges removed, wound washed again with 1 litre NS using a new pulse lavage. A cement spacer was made using 40 gm high viscosity bone cement (Palacos® R, Heraeus Medical GmbH, Germany) mixed with 4gm Vancomycin and 4 gm ceftazidime and inserted in the cup. In none of the cases, was the femoral shaft involved, so

the femoral canal was not opened after the neck cut to maintain its virginity. Wound was closed meticulously layerwise for easy approach in the 2<sup>nd</sup> stage and better stability of the spacer. Patient was allowed toe touch weight bearing as per tolerance and encouraged to do quadriceps strengthening exercises and active ankle and toe mobilization. DVT pump was applied and chemical thromboprophylaxis using low molecular weight heparin for 6 weeks was started on the day of surgery itself. The patients were put on at least 2 weeks of systemic antibiotics based on culture sensitivity reports and after consulting with the infectious disease specialist of our institution followed by 4 weeks of oral antibiotics. Weekly CRP and ESR levels monitoring was done till 6 weeks or till levels were normalized. The decision to do the second stage was taken based on clinical and lab markers of healed infection. Antibiotics were stopped at least 2 weeks before the 2<sup>nd</sup> stage. During the 2<sup>nd</sup> stage, final decision to a THA or a repeat cement spacer was made based on intra-operative healthy looking tissue, negative tissue leukocyte esterase test and fluid from hip showing less than 5 neutrophils per high power field in 5 fields on microscopy. Samples for tissue culture were again taken, cement spacer removed and final prosthesis was inserted after thorough debridement and irrigation. If a cemented prosthesis was used, then an antibiotic cement containing 1 gm Vancomycin per 40 gm cement was used. Otherwise, 1 gm Vancomycin powder was smeared on the tissues around the hip after closure of the joint capsule. Post-operatively, patient was put on systemic antibiotics till a negative culture report was obtained or till suture removal. Serial CRP and ESR levels monitoring was done every week to look for resurgence of infection till 3 weeks and then every month till 3 months.

Clinical outcome was measured using Harris Hip Score at 1 month, 3 months, 6 months, 1 year and at final follow up.<sup>8</sup> Outcome of success of 2 stage THA was assessed using modified Delphi criteria: (1) healed wound without drainage, fistula, or pain, with no recurrence of infection; (2) no occurrence of septic joint infection-related mortality; or (3) no additional spacer exchanges and subsequent surgical intervention for infection after spacer implantation.<sup>9</sup> Radiological assessment was done by getting X rays done at 6 weeks, 3 months, 6 months, 1 year and then annually till final follow up to see for any evidence of loosening, malposition, subsidence, limb length discrepancy or heterotopic ossification.

### Results

Mean age of the patients was 41.5 years (range 25 – 65 years). All except one patient were males. Mean duration of septic arthritis before the first stage was 5.1 months (2-12 months). Both acetabulum and femur head were involved in all cases indicating severe OA (Grade 3 Tonnis/Advanced KL). Two patients had history of a previous hip surgery. Most common micro-organism detected in intraoperative cultures was *Staphylococcus aureus* in 8 out of 13 cases (61.5 %). Mean waiting period for the 2<sup>nd</sup> stage was 9.38 weeks (8-12 weeks). Only one patient required repeat debridement and spacer change before the final stage THR. Mean follow up duration was 4 years (1.5 to 6 years). Mean Harris Hip Score at final follow up was 82.33 (72-89). Average limb length discrepancy at final follow up was 2 mm. No complications such as loosening,

malposition, subsidence, draining sinus, deep or superficial infection or heterotopic ossification was noted in any case till final follow up. Final outcome was deemed to be excellent in 11 (84.6 %) and good in 2 (15.4 %) cases [Table 1].

### Discussion

Appropriate management of evolutive septic arthritis of the hip has been a topic of debate since long. Resection arthroplasty has been historically believed to resolve the problem but some studies have shown dismal results after the same due to problems like limb length discrepancy, abductor weakness and piston effect.<sup>10</sup> It is now considered

as a salvage procedure for elderly patients after a failed hip replacement with poor bone stock.<sup>11</sup> Arthrodesis of the hip is rarely done nowadays due to gross restriction of activities and possibility of a total hip replacement after infection control. THR after evolutive or quiescent septic arthritis was historically believed to be a contra-indication but with the advancement of knowledge and better surgical techniques, one stage or two stage THR has evolved as an effective management of septic arthritis of the hip. One stage THR has been fraught with higher risks of PJI and is probably better suited only for quiescent septic arthritis.<sup>12</sup> In such cases, two stage THR is believed to give better outcome with decreased risk of recurrence of infection.<sup>13</sup>

Table 1. showing demographics and results

S.NO	AGE	SEX	DURATION OF SEPTIC ARTHRITIS (in months)	MICRO-organism DETECTED	PREVIOUS SURGERY	THR-CEMENTED/ UNCEMENTED	WAITING PERIOD FOR 2ND STAGE (in weeks)	HHS AT FINAL FOLLOW UP	FINAL FOLLOW UP DURATION (in years)	RE-INFECTION after final stage	REPEAT SPACER CHANGE	OTHER COMPLICATION
1	26	m	6	staph aureus	none	uncemented	8	83	3	no	no	None
2	44	m	2.5	staph aureus	none	hybrid	10	82	2.5	no	no	none
3	29	m	4	staph aureus	none	uncemented	8	89	2.5	no	no	none
4	45	m	7	staph aureus	none	hybrid	8	87	5	no	no	none
5	25	m	6	MSSA	none	uncemented	10	81	5	no	no	none
6	54	m	12	MSSA	CCS for # Neck femur	uncemented long stem	8	80	5	no	no	none
7	32	m	2.5	PSEUDOMONAS	none	hybrid	10	81	3	no	no	none
8	35	m	2	staph aureus	none	uncemented	12	79	4	no	2 times	none
9	56	m	4	staph aureus	none	hybrid	8	86	....	no	no	none
10	42	m	6	M.tb	none	uncemented	10	87	6	no	no	none
11	61	m	5	M.tb	none	hybrid	10	83	6	no	no	None
12	65	m	4	M.tb	none	hybrid	10	81	4.5	no	no	None
13	26	f	6	staph aureus	acetabulum plating	hybrid	10	72	1.5	no	no	none

HHS- Harris Hip Score, MSSA-Methicillin Sensitive Staphylococcus aureus, M.tb – Mycobacterium tuberculosis, CCS – Cancellous cannulated screw

Antibiotic cement spacers are effective in eradicating the local infection and hip arthroplasty in the 2<sup>nd</sup> stage relieves pain and restores function. But, before the final stage, it must be ascertained that the infection has been completely eradicated using serological markers (normal ESR, CRP and TLC in 3 consecutive samples in an antibiotic free interval of at least 2 weeks) and no clinical and radiological signs suggestive of infection and when in doubt, a negative joint fluid culture must be considered.<sup>14</sup> The success rate after 1<sup>st</sup> stage is reported around 90% and after the final implant it is

close to 100%.<sup>5,6,15</sup> This was in correlation to our results. Different type of antibiotic cement spacers have been described viz, articulating, non-articulating and cement beads. Cement spacers performed better than cement beads as they maintain length, achieve better muscle tension and thus allow better mobilization. Articulating spacers incorporating the femoral side also are thus better suited for cases with infection involving the femoral canal also and cases with acetabular and femur head involvement alone can be managed with an acetabular handmade antibiotic spacer

alone. Articulating spacers are associated with mechanical complications such as dislocations and femoral fracture in the interim period and unnecessary breaching of the uninvolved femoral canal in cases with proximal infection alone.<sup>16</sup> Two stage surgery is also associated with higher mortality (10 to 15%) as compared to single stage exchange or Girdlestone resection especially in debilitated, immunocompromised, morbid obesity, diabetic patients or those on corticosteroid therapy.<sup>17-21</sup>

There are some limitations in our study. First is a small sample which can make extrapolation to the general population difficult. But other studies with a similar study design are also faced with the same limitation due to relative rarity of this surgery. Another limitation is the lack of a control group for comparison. Since, the problem mentioned can be best treated with the above mentioned technique in our opinion, so a control group could not be established. Instead, observations in other studies can be utilized as a control for this study.

### Conclusion

Septic arthritis of the hip leading to end stage degenerative joint disease can be effectively managed with two stage THA with good to excellent clinical and functional results. Patients with specific underlying morbidities should be counselled regarding higher rate of complications and a single stage exchange or Girdlestone resection can be considered in such select patients.

### Acknowledgement

N/A

### Authors Contribution:

Anmol Sharma and Sandeep Gupta were responsible for the

conception and design of the study.

Data acquisition was done by Anmol Sharma, Sandeep Gupta and Jagseer Singh.

Data Analysis and Interpretation was done Anisha Sethi, Jagseer Singh and Sandeep Gupta.

Drafting of the article was done by Anmol Sharma, Anisha Sethi and Jagseer Singh.

Critical revision was done by Sandeep Gupta, Anisha Sethi and Anmol Sharma.

**Declaration of Conflict of Interest:** The author(s) do NOT have any potential conflicts of interest for this manuscript.

**Declaration of Funding:** The author(s) received NO financial support for the preparation, research, authorship, and publication of this manuscript.<sup>1</sup>

**Declaration of Ethical Approval for Study:** Ethical approval taken from the Institutional ethical committee on 18/10/2021 vide no. FHM/EIC/2021/132

**Declaration of Informed Consent:** The authors declare that there is NO information (names, initials, hospital identification numbers, or photographs) in the submitted manuscript that can be used to identify patients.

Anmol Sharma MS<sup>1</sup>

Sandeep Gupta MS<sup>1</sup>

Anisha Sethi MD<sup>2</sup>

Jagseer Singh MBBS<sup>1</sup>

1 Fortis Hospital, Mohali, Punjab, India

2 Max Superspecialty Hospital, Mohali, Punjab, India

### References

1. Matthews PC, Dean BJ, Medagoda K, et al. Native hip joint septic arthritis in 20 adults: delayed presentation beyond three weeks predicts need for excision arthroplasty. *J Infect*. 2008; 57(3):185-190. doi:10.1016/j.jinf.2008.07.001.
2. Mathews CJ, Weston VC, Jones A, Field M, Coakley G. Bacterial septic arthritis in adults. *Lancet*. 2010; 375(9717):846-855. doi:10.1016/S0140-6736(09)61595-6.
3. Charlton WP, Hozack WJ, Teloken MA, Rao R, Bissett GA. Complications associated with reimplantation after girdlestone arthroplasty. *Clin Orthop Relat Res*. 2003 ;(407):119-126. doi:10.1097/00003086-200302000-00019.
4. Chen CE, Wang JW, Juhn RJ. Total hip arthroplasty for primary septic arthritis of the hip in adults. *Int Orthop*. 2008; 32(5):573-580. doi:10.1007/s00264-007-0366-1.
5. Anagnostakos K, Duchow L, Koch K. Two-stage protocol and spacer implantation in the treatment of destructive septic arthritis of the hip joint. *Arch Orthop Trauma Surg*. 2016; 136(7):899-906. doi:10.1007/s00402-016-2455-3.
6. Fleck EE, Spangehl MJ, Rapuri VR, Beauchamp CP. An articulating antibiotic spacer controls infection and improves pain and function in a degenerative septic hip. *Clin Orthop Relat Res*. 2011; 469(11):3055-3064. doi:10.1007/s11999-011-1903-1.
7. Carpenter CR, Schuur JD, Everett WW, Pines JM. Evidence-based diagnostics: adult septic arthritis. *Acad Emerg Med*. 2011; 18(8):781-796. doi:10.1111/j.1553-2712.2011.01121.x.
8. 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(4):737-755.
9. Diaz-Ledezma C, Higuera CA, Parvizi J. Success after treatment of periprosthetic joint infection: a Delphi-based international multidisciplinary consensus. *Clin Orthop Relat Res*. 2013; 471(7):2374-2382. doi:10.1007/s11999-013-2866-1.
10. Grauer JD, Amstutz HC, O'Carroll PF, Dorey FJ. Resection arthroplasty of the hip. *J Bone Joint Surg Am*. 1989; 71(5):669-678.
11. Marchetti PG, Toni A, Baldini N, et al. Clinical evaluation of 104 hip resection arthroplasties after removal of a total hip prosthesis. *J Arthroplasty*. 1987; 2(1):37-41.

- doi:10.1016/s0883-5403(87)80029-3.
12. Seo JG, Moon YW, Park SH, Han KY, Kim SM. Primary total knee arthroplasty in infection sequelae about the native knee. *J Arthroplasty*. 2014; 29(12):2271-2275. doi:10.1016/j.arth.2014.01.013.
  13. El-Ganzoury I, Eid AS. Two-stage arthroplasty using doi:10.1302/2058-5241.6.200082.
  15. Huang TW, Huang KC, Lee PC, Tai CL, Hsieh PH. Encouraging outcomes of staged, uncemented arthroplasty with short-term antibiotic therapy for treatment of recalcitrant septic arthritis of the native hip. *J Trauma*. 2010; 68(4):965-969. doi:10.1097/TA.0b013e3181af6e70.
  16. Russo A, Cavagnaro L, Chiarlone F, Clemente A, Romagnoli S, Burastero G. Clinical outcomes and survivorship of two-stage total hip or knee arthroplasty in septic arthritis: a retrospective analysis with a minimum five-year follow-up. *Int Orthop*. 2021; 45(7):1683-1691. doi:10.1007/s00264-021-05013-5.
  17. Barton CB, Wang DL, An Q, Brown TS, Callaghan JJ, Otero JE. Two-Stage Exchange Arthroplasty for Periprosthetic Joint Infection Following Total Hip or Knee Arthroplasty Is Associated With High Attrition Rate and Mortality. *J Arthroplasty*. 2020; 35(5):1384-1389. doi:10.1016/j.arth.2019.12.005.
  - functional temporary prosthesis to treat infected arthroplasty and septic arthritis of the hip. *J Orthop*. 2014; 12(Suppl 1):S86-S93. doi:10.1016/j.jor.2014.04.006.
  14. D'Angelo F, Monestier L, Zagra L. Active septic arthritis of the hip in adults: what's new in the treatment? A systematic review. *EFORT Open Rev*. 2021; 6(3):164-172.
  18. Burastero G, Alessio-Mazzola M, Cavagnaro L, et al. Conservative two-stage revision with primary components of infected total hip arthroplasty: An analysis of survival, clinical and radiographic outcomes. *PLoS One*. 2020; 15(10):e0239981. Published 2020 Oct 1. doi:10.1371/journal.pone.0239981.
  19. Alessio-Mazzola M, Repetto I, Russo A, et al. Permanent Spacers Are a Reliable Solution for Peri-prosthetic Shoulder Infection: A Systematic Review. *HSS J*. 2020; 16(3):272-279. doi:10.1007/s11420-020-09755-7.
  20. Guntin J, Serino J, Rossi D, Boniello A., Gusho C., Della Valle C. Hypoalbuminemia Increases Mortality after Two-Stage Revision Total Joint Arthroplasty. *Arch Bone Jt Surg*. 2023; 11(3): 173-179. doi: 10.22038/abjs.2022.65148.3123.
  21. Shahi A, Parvizi J. Prevention of Periprosthetic Joint Infection. *Arch Bone Jt Surg*. 2015; 3(2): 72-81. doi: 10.22038/abjs.2015.3938.