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Review Article

Surgical outcome of total hip arthroplasty in bony ankylosed hips in ankylosing spondylosis — Systematic review

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ABSTRACT

Introduction: Incidence of bony ankylosis in hip joint with AS is approximately 40%. Bony ankylosis of hips joints comes with very unique management challenges. There is no specific review article in the literature only for total hip replacement in bony ankylosed hips. We run a literature review to evaluate surgical outcomes and postoperative complications of Total Hip Arthroplasty in Bony ankylosing hip joints.
Materials and Methods: Total five studies, which satisfied inclusion criteria, selected for this review process. Outcome measures like HHS, VAS, ROM and complications were noted and compared.
Results: Total number of hips included in this study were 220 in 136 patients. Average patient age was 35.74 years. The mean post-operative Harris Hip Score was 84.9 which was improved from pre-operative HHS 31.1. All studies reported an improvement in hip Range of motion (ROM). Complications were heterotopic ossification, femur fracture, nerve injury, infection, dislocation. Heterotopic ossification (HO) occurred in total 25 hips in 4 studies except Kanniyan et al study.
Conclusion: This literature review put forward that total hip arthroplasty of bony ankylosed hips in AS brings improvements in functional outcome measures such as Harris Hip Score, range of motion and ambulatory status.

1. Introduction

Ankylosing spondylitis (AS) is an Autoimmune disease which is progressive and affecting mainly axial joints.[1,2] Hip involvement in AS is approximately between 19 and 36%[2–6]. Incidence of bony ankylosis in hip joint with AS is approximately 40%.[6]

Bony ankylosis of hips joints comes with very unique management challenges. Symptomatically patients are facing problems due to posture and deformity rather pain.[6] Surgeons are facing challenges in approach and dissection due to preoperative heterotopic ossification and Muscle Contractures[1] furthermore prothesis component placement due to bony ankylosis is also technically difficult.[6] Post operative complications like complete reankylosis, unpredictable range of motion can occur in these patients.[6–8]

There is no specific review article in the literature only for total hip replacement in bony ankylosed hips. There are more challenges and complications for bony ankylosing hip joint than early-stage ankylosing hip joints.[2–6] We run a literature review to evaluate surgical outcomes and postoperative complications of Total Hip Arthroplasty in Bony ankylosing hip joints.

2. Materials and Methods

2.1. Search strategy

MEDLINE, EMBASE, PUBMED, SCOPUS and Cochrane library databases were searched to select appropriate studies

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in the available literature describing surgical outcomes and post operative complications of Total Hip Arthroplasty in patients with bony fused hip joints. Keywords used for the search were "total hip arthroplasty" OR "total hip replacement" AND "bony ankylosis" or "bony fusion" and "ankylosing spondylitis". After the initial search, the references of papers were reviewed to identify additional studies that were not found in the initial search.

2.2. Eligibility criteria

The inclusion criteria were that studies describing intra-operative complications, post-operative complications and outcome measures such as a Harris Hip Score (HHS), Visual Analog Score in patients with Ankylosing Spondylitis with bony ankylosis undergoing total hip arthroplasty (THA) and Researches describing results of THA due to other causes of joint fusion were excluded. Individual case reports were excluded.

2.3. Data extraction

Data extracted included: Number of patients, number of hips, mean follow-up time, mean pre- and postoperative Harris Hip Score (HHS), mean pre- and postoperative VAS, pre- and postoperative range of motion (ROM), the number of revisions, and any complication, which included heterotopic ossification, femur fracture, nerve injury, infection, dislocation or aseptic loosening.

3. Results

3.1. Search results

After initial search, 4 studies were selected. Following a subsequent search in the references, 1 additional study was identified. Exclusion of 3 abstracts were done for not being in the English language as shown in Figure 1.

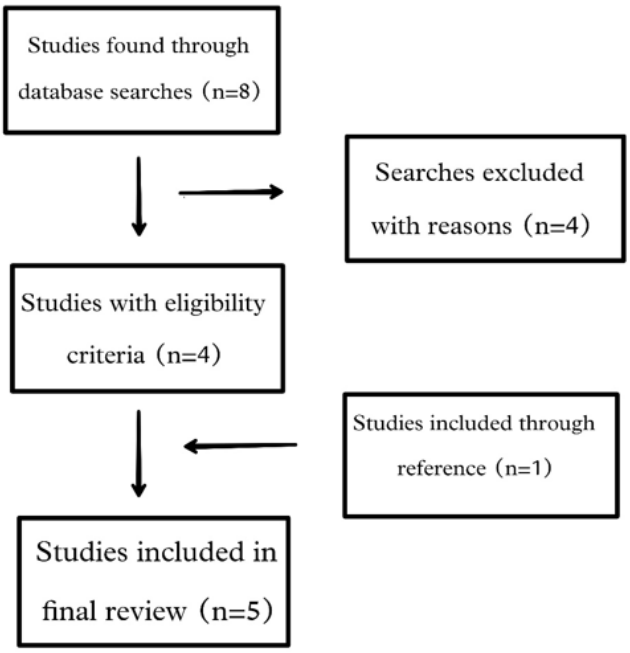

Fig. 1: PRISMA flow chart describing search strategy

3.2. Cohort characteristics

Total number of hips included in this study were 220 in 136 patients. Average patient age was 35.74 years. The patients were followed up on average for 5.8 years.

3.3. Functional outcome

All studies reported an improvement in hip function, hip Range of motion (ROM) as shown in Table 1. The mean post-operative Harris Hip Score was 84.9 which was improved from pre-operative HHS 31.1. Four papers measured post operative range of motion improvement. Bhan et al[6] reported mean postoperative range of motion was 156.2° as compared to zero degrees preoperatively. Guo et al[9] reported an improvement in passive ROM from 0° to 215°. In study of Han et al,[1] they studied bilateral total hip replacement for bony ankylosis and observed flexion-extension ROM hip improved from 0 to 142.3. Flexion increased from 0° to 84° postoperatively in Bangjian et al study. Two authors also measured VAS score. In study of Kanniyan et al, mean preoperative VAS got better from 6.9 to 1.5.[10] VAS reduced from 7.42 to 2.42 in Han et al[1] study.

3.4. Radiological evaluation

In the study of Han et al, Postoperative X-ray showed that the femoral prosthesis was at everted or neutral position and there was no collapse the femoral component in postoperative x-ray.[1] In the study of Bhan et al,[6] Ten acetabular cups were positioned vertical, 2 horizontal in post operative radiographs. Sixty two (67%) femoral stems were neutral position, eighteen (20%) prosthesis were in varus, and twelve (13%) were in valgus. Radiographic examination of Guo et al study manifested that all implants had bony in-growth and stability was good.[9]

3.5. Complications

Han et al[1] reported one femoral nerve injury and one femoral condyle fracture. Bhan et al reported intraoperative complications like excessive reaming of acetabulum (2 hips), fracture of the greater trochanter (1 hip), and fracture of femoral calcar (2 hips) & postoperative complications like superficial wound infection (7 hips), anterior dislocation (4 hips), and sciatic nerve palsy (1 hip). Guo et al reported three complications included proximal femur fracture (1 hip), Sciatic nerve (1 hip), Posterior hip dislocation (1 hip). In the study of Bangjian et al,[11]

Table 1: Summary of study results and complications.

Author (year)	Number of hips (Number of patient)	Mean age of patient (years)	Mean follow-up (years)	Pre operative Harris Hip Score	Post operative Harris Hip Score	Meanrangeof motionpost-op (degrees)	Heterotrophic ossification	Dislocation	Femur fracture	Nerve injury
Bhan et.al. (2008)	92 (54)	25.5	8.5	49.5	82.6	156.2	13%	4.3 %	3.26 %	1.08%
Hong-Zhang Guo (2019)	31 (26)	31.5	3.8	19.0	87.1	215.0	12.9%	3.22%	3.22%	3.22%
Lei Han (2021)	38 (19)	49.2	6.8	21.8	80.3	142.3	7.89 %	2.63%	2.63%	2.63 %
Kanniyan K (2020)	35 (25)	36	-	50	88.4	-	0	0	0	0
He Bangjian (2012)	24 (12)	36.5	4.2	15.21	86.25	Flexion 84.4	12.5%	0	8.32%	4.16 %

complications like a femur fracture (two hips), femoral nerve palsy (one hip) occurred. Complications in Kanniyan et al study[10] were two cases of superficial surgical site infection & one case of gluteus medius tendon rupture.

3.6. Heterotopic ossification

Heterotopic ossification (HO) occurred in total 25 hips in 4 studies. Kanniyan et al reported no case of heterotopic ossification.

4. Discussion

There are lots of systemic review and review articles on total hip arthroplasty in Ankylosing spondylosis but there is no such review article for bony fused hips in AS. Cases with bony fused hips needs THA in the absence of pain for better ambulation.[6] The major challenges performing THA in bony fused hips involve approach, implants, positioning of components, intra operative & post operative complications.

4.1. Approach

Anterolateral approach gives adequate visualisation of joint capsule but complications like injury the superior gluteal nerve and loss of hip abduction can occur.[12] The posterior approach is safe for abductor mechanism. Osteotomy can be performed at the site through this approach.[9] Many studies have concluded that anterior based approaches have less dislocation rate than posterior approach.[13–15] Anterolateral incision was used by Li et al. with combination of anterior-posterior Approach. They conclude exposure of ankylosed hips were very good and no damage to abduction function.[16]

Guo et al used three approaches in their study, the Smith-Peterson approach in 6 hips, Hardinge Approach in 2 hips, and Moore approach in 23 hips. Other four studies preferred posterior approach but Kanniyan et al and Bhan et al used two skin incision anterior & posterior in some patients with external rotator deformity.

Intra-operative considerations

Femoral head and neck exposure of THA is difficult in AS patient due to presence of flexion and rotation deformity. If surgeon performed neck osteotomy, it could damage greater trochanter or posterior wall of acetabulum.[11,17] To tackle these problems, several authors suggested different solutions. Bangjian et al proposed a two-step neck osteotomy technique.[11] Dissection anteriorly to hip abductors or neck cutting under C- arm guidance are the other options.[6]

Joint line identification is another challenge in bony ankylosis THA. Intraoperative use of image intensifier, looking for incomplete ossifying cartilage or foveal tissue are the options to identify joint line.[17,18]

4.2. Selection of hip prosthesis

AS patients have severe osteoporosis due to non-ambulatory status & metabolic disorders of the bone. Cementless prostheses have good elasticity modulus, osseointegration and less difficulty for revision.[19] Kumar A et al published a study with 154 cemented THA in AS with good functional outcome.[20] In the study of Guo et al,[9] they used biotype prosthesis in all patients. Prosthesis fixation was good and there were no prosthesis sinking and loosening. Bhan et al[6] preferred cementless implants as they are more prone to biologic ingrowth. Bangjian et al[11] recommended using extensively coated stems with distal fixation for solid fixation. Kanniyan et al[10] preferred uncemented implants in their study.

Ambulatory status

Total hip replacement in ankylosing spondylitis gives newfound mobility, ability to sit & walk comfortably which ultimately boost the confidence of patients.[21] Fu Y et al did THR in 14 patients with non-functional bony ankylosis. Out of 14, 12 patients were walking without support.[22]

In the study of Bhan et al, percentage of patients walking without support was 90%; 9% patients were using cane occasionally.[6] In the study of Han et al,[1] 15 patients could walk unassisted & rest 4 patients could walk with a one crutch. The gaits returned to normal after surgery in Guo et al study except for 2 patients who slightly swung when they walk.

4.3. Revision

Revision rate is a true marker of the success of arthroplasty.[17] Heterotopic ossification was associated with Acetabular component loosening. Rate of femoral stem loosening was more in Dorr's type C femurs.[23] Only Bhan et al[6] reported any revisions in their series. Aseptic loosening causes revision of 13 hips. Out of 13, acetabular component revision occurred in 2 hips, nine hip's femoral component were revised, and 2 hips had revision of both the components.[6]

4.4. Heterotopic ossification (HO)

There are very high chances of heterotopic ossification formation and subsequent reankylosis after hip arthroplasty in AS patient varying from 40% to 76%[6,17,24,25]. In the study of Han et al, HO was identified in 6 hips. According to Brooker classification, there were 4 hips in grade I and 2 hips in grade II.[1] Bhan et al reported heterotopic ossification cases in 12 hips. Brooker grade I was observed in eight hips, grade II in three, and grade III in one.[6] Gou et al study reported 4 cases of Heterotopic ossification occurred, and all were Brooker classification grade II.[9] In the study of Bangjian et al,[11] three hips (12.5%) had heterotopic ossification in postoperative period. Post-operative prophylactic Indomethacin therapy should be

considered to prevent HO formation.[17,26]

5. Conclusion

This literature review put forward that total hip arthroplasty is a very efficacious management for bony fused hips in AS. THA brings improvements in functional outcome measures such as Harris Hip Score, range of motion and ambulatory status. It is also associated with complications such as intra-operative fracture, dislocation, nerve injury, infection and heterotrophic ossification. Total hip arthroplasty is more technical demanding in bony fused hips.

6. Conflict of Interest

None.

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References

1. Han L, Quan R, Pei Z, Cao G, Hu Y, Liu J, et al. Mid-term results of bilateral synchronous total hip arthroplasty for bony ankylosis in patients with ankylosing spondylitis. *J Orthop Surg Res*. 2021;16(1):104. doi:10.1186/s13018-021-02258-z.
2. Putnis SE, Wartemberg GK, Khan WS, Agarwal S. A Literature Review of Total Hip Arthroplasty in Patients with Ankylosing Spondylitis: Perioperative Considerations and Outcome. *Open Orthop J*. 2015;9:483–8. doi:10.2174/1874325001509010483.
3. Joshi AB, Markovic L, Hardinge K, Murphy JC. Total hip arthroplasty in ankylosing spondylitis: an analysis of 181 hips. *J Arthroplasty*. 2002;17(4):427–33.
4. Vander Cruyssen B. Hip involvement in ankylosing spondylitis: epidemiology and risk factors associated with hip replacement surgery. *Rheumatology (Oxford)*. 2010;49(1):73–81. doi:10.1093/rheumatology/kep174.
5. Calin A, Elswood J. The relationship between spinal, pelvic and hip involvement in ankylosing spondylitis: one disease process or several? *Br J Rheumatol*. 1988;27(5):393–5. doi:10.1093/rheumatology/27.5.393.
6. Bhan S, Eachempati KK, Malhotra R. Primary cementless total hip arthroplasty for bony ankylosis in patients with ankylosing spondylitis. *J Arthroplasty*. 2008;23(6):859–66. doi:10.1016/j.arth.2007.07.014.
7. Sundaram NA, Murphy JCM. Heterotopic bone formation following total hip arthroplasty in ankylosing spondylitis. *Clin Orthop*. 1986;(207):223–6.
8. Hardinge K, Williams D, Etienne A. Conversion of fused hips to low friction arthroplasty. *J Bone Joint Surg Br*. 1977;59-B(4):385–92. doi:10.1302/0301-620X.59B4.925046.
9. Guo HZ, Yang CX, Tang ZP. The effects of total hip arthroplasty in treating hip bony fusion in young and middle-aged patients with ankylosing spondylitis. *J Orthop Surg Res*. 2019;14(1):253. doi:10.1186/s13018-019-1288-5.
10. Kanniyan K, Patil S, Kumar PSA. Does the Femoral Head Size Influence Outcomes After Uncemented Total Hip Arthroplasty for Fused Hips? A Prospective Study in Ankylosing Spondylitis. *Indian J Orthop*. 2020;54(6):831–9. doi:10.1007/s43465-020-00210-7.
11. Bangjian H, Peijian T, Ju L. Bilateral synchronous total hip arthroplasty for ankylosed hips. *Int Orthop*. 2011;36(4):697–701. doi:10.1007/s00264-011-1313-8.
12. Sloan AG, Jones HW, Porter ML. Surgical Approaches for Total Hip Arthroplasty. *Orthopaedics Trauma*. 2010;24(6):455–62.
13. Moretti VM, Post ZD. Surgical Approaches for Total Hip Arthroplasty. *Indian J Orthop*. 2017;51(4):368–76. doi:10.4103/ortho.IJOrtho_317_16.
14. Sheth D, Cafri G, Inacio MC, Paxton EW, Namba RS. Anterior and anterolateral approaches for THA are associated with lower dislocation risk without higher revision risk. *Clin Orthop Relat Res*. 2015;473(11):3401–8. doi:10.1007/s11999-015-4230-0.
15. Berry DJ, Knoch MV, Schleck CD, Harmsen WS. Effect of femoral head diameter and operative approach on risk of dislocation after primary total hip arthroplasty. *J Bone Joint Surg Am*. 2005;87(11):2456–63. doi:10.2106/JBJS.D.02860.
16. Li J, Wang Z, Li M, Wu Y, Xu W, Wang Z, et al. Total hip arthroplasty using a combined anterior and posterior approach via a lateral incision in patients with ankylosed hips. *Can J Surg*. 2013;56(5):332–40.
17. Lin D, Charalambous A, Hanna SA. Bilateral total hip arthroplasty in ankylosing spondylitis: a systematic review. *EFORT Open Rev*. 2019;4(7):476–81. doi:10.1302/2058-5241.4.180047.
18. Feng DX, Zhang K, Zhang YM, Nian YW, Zhang J, Kang XM, et al. Bilaterally primary cementless total hip arthroplasty for severe hip ankylosis with ankylosing spondylitis. *Orthop Surg*. 2016;8(3):352–9. doi:10.1111/os.12254.
19. Ye C, Liu R, Sun C, Lin J, Li H, Re H, et al. Cementless bilateral synchronous total hip arthroplasty in ankylosing spondylitis with hip ankylosis. *Int Orthopaedics*. 2014;38(12):2473–6.
20. Kumar A, Nagai H, Oakley J, Luu B, Hussain MM, Gaba R, et al. Short to long term outcomes of 154 cemented total hip arthroplasties in ankylosing spondylitis. *J Clin Orthop Trauma*. 2020;14:34–9. doi:10.1016/j.jcot.2020.09.029.
21. Wang W, Huang G, Huang T, Wu R. Bilaterally primary cementless total hip arthroplasty in patients with ankylosing spondylitis. *BMC Musculoskelet Disord*. 2014;15:344. doi:10.1186/1471-2474-15-344.
22. Fu Y, Yu B, Asihaerjiang-Maimaitiyiming, Cao L, Aili-Rehei. Total hip arthroplasty for non-functional bony ankylosed hip in young and middle-aged patients. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi*. 2014;28(9):1058–61.
23. Saglam Y, Ozturk I, Cakmak MF, Ozdemir M, Yazicioglu O. Total hip arthroplasty in patients with ankylosing spondylitis: Midterm radiologic and functional results. *Acta Orthop Traumatol Turc*. 2016;50(4):443–7. doi:10.1016/j.aott.2016.06.010.
24. Kilgus DJ, Namba RS, Gorek JE, 3rd AC, Amstutz HC. Total hip replacement for patients who have ankylosing spondylitis: the importance of formation of heterotopic bone and of the durability of fixation of cemented components. *J Bone Joint Surg Am*. 1990;72(6):834–9.
25. Sundaram NA, Murphy JCM. Heterotopic bone formation following total hip arthroplasty in ankylosing spondylitis. *Clin Orthop*. 1986;(207):223–6.
26. Wang W, Huang G, Huang T, Wu R. Bilaterally primary cementless total hip arthroplasty in patients with ankylosing spondylitis. *BMC Musculoskelet Disord*. 2014;15:344. doi:10.1186/1471-2474-15-344.

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