Outcome of dual mobility total hip arthroplasty in patients who are at high risk for dislocation

Basavaraj S. Kyavater, Rafeeq M. D.*, Sathish Kumar, Hemanth P. Hallinalli

Department of Orthopedics, Sagar Hospital DSI, Bangalore, Karnataka, India

Received: 03 March 2021
Revised: 20 March 2021
Accepted: 22 March 2021

*Correspondence:
Dr. Rafeeq M. D.,
E-mail: rafeeqmd1006@gmail.com

ABSTRACT

Background: Dislocation after total hip arthroplasty (THA) remains a major concern, because it is reported to range from 1% to 5%. The concept of dual mobility articulation was developed in 1970 by Bousquet to decrease dislocation risk. Several studies have looked at the outcome of dual mobility articulation in primary THA and in revision THA.

Methods: This is a prospective study of 33 patients undergoing dual mobility THA during 24 months period from October 2017 to September 2019. Patients undergoing total hip replacement (THR) to have dual mobility cup (DMC) were those at high risk of dislocation. Patients were followed up for a mean period of 18 months.

Results: 33 patients (mean age 67 years) underwent DMC THA. 27 patients underwent primary hip replacement. The follow-up of our cases has ranged from 13 months to 3 years with a mean follow-up of 18 months. none of the patients had hip dislocation.

Conclusions: The DMC is an effective solution for the management of high-risk cases undergoing total hip replacement to reduce the incidence of postoperative instability.

Keywords: THA, DMC, Polyethylene, Intra-prosthetic dislocation

INTRODUCTION

Dislocation after total hip arthroplasty (THA) remains a concern, because its frequency is reported to range from 1% to 5%. The concept of dual mobility articulation was developed in 1970 by Bousquet to increase the range of motion and to decrease dislocation risk. It combined a small head to decrease wear (low friction arthroplasty principles stated by Charnley) and a large head to increase stability (MacKee and Farrar). Several studies have looked at the outcome of dual mobility articulation in primary total hip replacement (THR) and in revision THR.

METHODS

This is a prospective observational study of 33 patients undergoing dual mobility THA conducted in the department of orthopedics, Sagar hospitals DSI, Bangalore and all the patients admitted during the study period of 24 months from October 2017 to September 2019 were considered for the study sample by time-based sampling technique. The clearance from hospital ethical committee was obtained before starting the study.

The inclusion criteria for a patient undergoing total hip replacement (THR) to have DMC (dual mobility cup) were those at high risk of dislocation. These included patients who were either more than 60 years, had poor soft tissue coverage around the hip, non-compliant, neuromuscular diseases, cognitive dysfunction, elderly with femoral neck fracture, failed hip surgeries, and those who require revision THR irrespective of the cause.

Patients were admitted and examined according to protocol both clinically and radiologically, and functional
outcome was assessed by modified Harris hip score both preoperatively and postoperatively.

Surgery was performed by Moore’s approach to hip using dual mobility acetabular cup and femoral stem. 21 cases underwent uncemented THA and 12 cases cemented THA.

Post operatively limb is kept in abduction with abduction pillow. Static quadriceps exercises, knee and ankle exercises done, and patients were ambulated from first postoperative day itself. DVT prophylaxis with injection enoxheparin 40 mg sc OD for 3 days and oral anticoagulants (Ecospirin 150 mg OD) continued for 1 month. Patients were advised not to squat/sit cross legged/not to cross the lower limb across the midline and not to use Indian toilets.

The sutures were removed at two weeks after surgery. Patients were followed up with X-rays and modified Harris hip score immediate postoperatively, one, three months, and one year after surgery and yearly thereafter.

RESULTS

Out of 33 cases, 22 were male and 11 females (Figure 4). The age of the patient ranged from 55 years to 94 years with a mean age of 67 years.

27 patients underwent primary hip replacement (femoral neck fracture 18, osteoarthritis 9) and 6 patients underwent revision surgery/complex THR (failed DHS 1, failed hemiarthroplasty 2, revision THA 2, failed osteosynthesis 1).

The follow-up of our cases has ranged from 13 months to 3 years with a mean follow-up of 18 months.

Mean preoperative Harris hip score was 34.3, ranging from 30 to 54. This score improved to 81.44 (76-85) immediate post-operative and 91 (86-97) at latest follow up. (p<0.05, Mann-whitney U test) (excellent-90 to 100 score, good-80 to 90, fair-70 to 79 points, poor-below 70).

In our study 87.88% (29) of the cases had no complications.

12.12% (4) of cases had complications which included superficial infection (2 cases, 6.06%) which resolved 3 weeks postoperatively, Vancouver type A periprosthetic femur fracture involving lesser trochanter (1 case, 3.03%) and pulmonary thromboembolism (1 case, 3.03%) (Figure 5).
At the latest follow-up none of the patients had hip dislocation, X-rays taken during follow-up have not shown any evidence of loosening around the acetabulum.

DISCUSSION

In our series, the DMC has been used for selective cases of hip replacement, who are at high risk for postoperative instability. The indication of DMC included patients who were either more than 60 years, were non-compliant with a history of substance abuse, who had a history of prior hip surgery, had a compromised soft tissue envelope around the hip, and who were elderly and had sustained a femoral neck fracture.

Our early results with these implants have shown a 100% survivorship at a mean follow-up of 18 months without implant loosening, studies have showed 93 to 99% survivorship of DMC implants at 10 years and 80% survivorship at 22 years.31,32

We have had no dislocations till latest follow-up. Studies have shown a dislocation rate of 0-3.6% in primary THR and 5-30% in complex THR because of the bone loss, compromised muscles, and soft tissues around the hips. The use of DMC in complex THR has shown the dislocation rate to range from 1 to 10% at eight-year follow-up.21-30

The use of DMC for THR in the case of a femoral neck fracture has shown a dislocation rate of 1.4%.31 A comparison of dislocation rates has been done for conventional hip replacement and DMC replacement; there was a postoperative dislocation incidence of 14.3% in a conventional total hip and no dislocation was observed in the dual mobility group.32 We had 18 patients with femoral neck fracture in our study, all underwent DMC THA and no postoperative dislocation occurred.

Intra-prosthetic dislocation (IPD) is peculiar to the DMC. It occurs between the smaller head and polyliner due to a “bottle opener” effect and it results in excessive metallosis and failure of the DMC. The head lies asymmetrically in the cup and might be mistaken for polywear. The dislocated liner has been described as a bubble sign and is pathognomic of IPD. In younger patients, these cups should be used with caution as they are high demand cases and have high chances of polyethylene wear and higher incidence of IPD.33 Boyer et al in a series of 240 hips followed for 9 years and 11 months reported a 4.1% incidence of IPD. In our mean follow-up of 18 months, we have not encountered this complication.32

One case (3.03%) had Vancouver type A periprosthetic femur fracture (un-displaced) involving lesser trochanter during procedure, which united without intervention. Our results are comparable with Berry (5.4% of periprosthetic femur fractures) two cases (6.06%) had superficial infection, culture was negative and wound healed completely in weeks postoperatively. One case (3.03%) had pulmonary thromboembolism.34

Limitations

Limitations of the study were like-small sample size, short duration of study and long-term follow-up is needed to assess complications like IPD and polyethylene wear rates and implant survivorship.

CONCLUSION

Instability remains a significant issue after THA in patients who are at high risk for dislocation. The DMC is an effective solution for the management of high-risk cases undergoing total hip replacement to reduce the incidence of postoperative instability. Its use in younger, high demand patients should be used with caution in view of complications like intra-prosthetic dislocation and accelerated wear.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Berry DJ, Von Knoch M, 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;87:2456-63.
2. Phillips CB, Barrett JA, Losina E, Mahomed NN, Lingard EA, Guadagnoli E et al. Incidence rates of dislocation, pulmonary embolism, and deep infection during the first six months after elective total hip replacement. J Bone Joint Surg Am. 2003;85:20-6.
3. Singh JA. Epidemiology of knee and hip arthroplasty: a systematic review. Open Orthop J. 2011;5:80-5.
4. Sanchez-Sotelo J, Berry DJ. Epidemiology of instability after total hip replacement. Orthop Clin North Am. 2001;32:543-52.
5. Charnley J. The long-term results of low-friction arthroplasty of the hip performed as a primary intervention. J Bone Joint Surg Br, 1972;54(1):61-76.
6. Mckee GK, Watson-Farrar J. Replacement of arthritic hips by the Mckee-Farrar prosthesis. J Bone Joint Surg Br 1966;48(2):245-59.
7. Philippot R, Adam P, Rechhaus M. Prevention of dislocation in total hip revision surgery using a dual mobility design. Orthop Traumatol Surg Res. 2009;95(6):407-13.
8. Guyen O, Chen QS, Bejui-Hugnes J, Berry DJ, An KN. Unconstrained tripolar hip implants: effect on hip stability. Clin Orthop Relat Res. 2007;455:202-8.
9. Boyer B, Philippot R, Geringer J, Farizon F. Primary total hip arthroplasty with dual mobility socket to prevent dislocation: a 22-year follow-up of 240 hips. Int Orthop. 2012;36(3):511-8.
10. Hamadouche M, Amoukl H, Bouxin B. Is a cementless dual mobility socket in primary THR a reasonable option? Clin Orthop Relat Res. 2012;470(11):3048-53.
11. Bouchet R, Mercier N, Saragaglia D. Posterior approach and dislocation rate: a 213 total hip replacements case-control study comparing the dual mobility cup with a conventional 28-mm metal head/polyethylene prosthesis. Orthop Traumatol Surg Res. 2011;97(1):2-7.

12. Combes A, Migaud H, Girard J, Duhamel A, Fessy MH. Low rate of dislocation of dual mobility cups in primary total hip arthroplasty. Clin Orthop Relat Res. 2013;471(12):3891-900.

13. Philippot R, Farizon F, Camilleri JP. Survival of cementless dual mobility socket with a mean 17 years follow-up. Rev Chir Orthop Reparatrice Appar Mot. 2008;94(8):e23-7.

14. Tarasevicius S, Robertsson O, Dobaz-inskas P, Wingstrand H. A comparison of outcomes and dislocation rates using dual articulation cups and THA for intracapsular femoral neck fractures. Hip Int. 2013;23(1):22-6.

15. Leiber-Wackenbeim F, Brunsch-weikr B, Ehlinger M,Gabron A, Mertl P. Treatment of recurrent THR dislocation using of a cementless dual mobility cup: a 59 cases series with a mean 8 years follow-up. Orthop Traumatol Surg Res. 2011;97(1):8-13.

16. Massin P, Besniers L. Acetabular revision using a press fit dual mobility cup. Orthop Traumatol Surg Res. 2010;96(1):9-13.

17. Hamadouche M, Biau DJ, Huten D, Musset T, Gauher F. The use of a cemented dual mobility socket to treat recurrent dislocation. Clin Orthol Relat Res. 2010;468(12):3248-54.

18. Wegryn J, Pibarat V, Jacquel A, Carret JP, Beju-Hugues J, Guyen O. Acetabular reconstruction using a Kerboull cross-plate, structural allograft and cemented dual-mobility cup in revision THA at a minimum 5-year follow-up. J Arthroplasty. 2014;29(2):432-7.

19. Langlais FL, Ropars M, Gaucher F, Musset T, Chaix O. Dual mobility cementsed cups have low dislocations rates in THA revisions. Clin Orthop Relat Res. 2008;466(2):389-95.

20. Prudhon JL, Steffani F, Ferreira A, Verdier R, Aslanian T, Caton J. Cementless dual-mobility cup in total hip arthroplasty revision. Int Orthop. 2014;38(12):2463-8.

21. Guyen O, Chen QS, Beju-Hugnes J, Berry DJ, An KN. Unconstrained tripolar hip implants: effect on hip stability. Clin Orthop Relat Res. 2007;455:202-8.

22. Boyer B, Philippot R, Geringer J, Farizon F. Primary total hip arthroplasty with dual mobility socket to prevent dislocation: a 22-year follow-up of 240 hips. Int Orthop. 2012;36(3):511-8.

23. Bouchet R, Mercier N, Saragaglia D. Posterior approach and dislocation rate: a 213 total hip replacements case-control study comparing the dual mobility cup with a conventional 28-mm metal head/polyethylene prosthesis. Orthop Traumatol Surg Res. 2011;97(1):2-7.

24. Farizon F, de Lavison R, Azoulai JJ, Bousquet G. Results with a cementless alumina-coated cup with dual mobility. A twelve-year follow-up studies. Int Orthop. 1998;22:219-24.

25. Philippot R, Adam P, Rechhaus M. Prevention of dislocation in total hip revision surgery using a dual mobility design. Orthop Traumatol Surg Res. 2009;95(6):407-13.

26. Prudhon JL. Dual-mobility cup and cemented femoral component: 6-year follow-up results. Hip Int. 2011;21(6):713-7.

27. Massin P, Besniers L. Acetabular revision using a press fit dual mobility cup. Orthop Traumatol Surg Res. 2010;96(1):9-13.

28. Hamadouche M, Biau DJ, Huten D, Musset T, Gauher F. The use of a cemented dual mobility socket to treat recurrent dislocation. Clin Orthop Relat Res. 2010;468(12):3248-54.

29. Prudhon JL, Steffani F, Ferreira A, Verdier R, Aslanian T, Caton J. Cementless dual-mobility cup in total hip arthroplasty revision. Int Orthop. 2014;38(12):2463-8.

30. Guyen O, Pibarat V, Vaz G, Chevillotte C, Béjui-Hugues J. Use of a dual mobility socket to manage total hip arthroplasty instability. Clin Orthol Relat Res. 2009;467:465-72.

31. Combes A, Migaud H, Girard J, Duhamel A, Fessy MH. Low rate of dislocation of dual mobility cups in primary total hip arthroplasty. Clin Orthop Relat Res. 2013;471(12):3891-900.

32. Boyer B, Philippot R, Geringer J, Farizon F. Primary total hip arthroplasty with dual mobility socket to prevent dislocation: a 22-year follow-up of 240 hips. Int Orthop. 2012;36(3):511-8.

33. Mohammed R, Cauddle P. Severe metallosis owing to intraprosthetic dislocation in a failed dual-mobility cup primary total hip arthroplasty. J Arthroplasty. 2012;27(3):439-8.

34. Berry DJ. Epidemiology-Hip and knee. Orthopedic clinics of North America. 1999;30(2):183-90.

Cite this article as: Kyavater BS, Rafeeq MD, Kumar S, Hallinalli HP. Outcome of dual mobility total hip arthroplasty in patients who are at high risk for dislocation. Int J Res Orthop 2021;7:xxx-xx.