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Original Article

# Constrained liner use of developing dislocation after total hip arthroplasty: Short-term results

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**Abstract**

**Aim:** Today total hip arthroplasty is one of the surgical procedures with the most satisfying data. In spite of all these good outcomes, difficult and upsetting complications for patient and surgeon may be encountered after total hip arthroplasty. Constrained liner were developed to reduce the risk for primary total hip arthroplasty patients with cognitive function disorder before surgery and patients with re-dislocation risks. The aim of this retrospective study is to present the clinical outcomes of freedom constrained lıner systems in patients developing dislocation after total hip arthroplasty.

**Material and Methods:** The aim of our study was to present clinical outcomes of fifteen consecutive surgical procedures with freedom anti-luxation revision system (Biomet, Warsaw, IN, USA) from March 2014 to December 2018. Patients were assessed with Harris hip score, Oxford score and Charnley score and early period complications and satisfaction outcomes were evaluated.

**Results:** Only one of the fifteen patients developed complications of intraoperative femur shaft fracture. According to postoperative data of early period outcomes, postoperative Harris hip score and Oxford scores were observed to have significant amelioration. No deep or superficial wound site complications developed. Neurovascular injury complications were not observed in patients.

**Conclusion:** In conclusion, patients with hip arthroplasty procedure with the constrained implant used in our study obtained satisfactory results.

**Keywords**: Total Hip Arthroplasty; Dislocation; Anti-Luxation System.

## INTRODUCTION

Currently total hip arthroplasty is one of the orthopedic and traumatology surgical procedures with highest satisfaction data globally1. In the moderate and long term after total hip arthroplasty (THA) osteoarthritis patients have easing of pain, increased opening of joint movement and increased quality of life. The aim of total hip arthroplasty is to ensure optimum surface contact and muscular functions in a multiaxial joint between the femur and pelvis. In spite of these good results, after total hip replacement, difficult and upsetting complications for patient and surgeon may be encountered. The complication rate for THA varies from 2-10% and includes aseptic loosening (36.5%), polyethylene wear with or without osteolysis (19.3%), infection (15.3%) and THA dislocation (17.7%) periprosthetic fracture (4.8%), and other miscellaneous etiologies in the remaining (4.8%) (2). According to estimations by an international observation agency, it is expected that the global rate of hip arthroplasty will increase by 170% by the year 2030. These results show that dislocation and later revision hip arthroplasty rates will increase (3,4). Dislocation following total hip arthroplasty is one of the most common complications with incidence varying from 1 to 7% (5,6). Generally it causes patients to be readmitted to hospital resulting in reoperation procedures, functional disorder, dissatisfaction and increased health costs7-10. A study by Khatod et al. found the dislocation rate 1 year after hip arthroplasty was 1.7% (11). Some other studies have identified dislocation rates of 3% in the period after hip arthroplasty. Globally, arthroplasty reports state there is an increase in the amount of dislocation revision surgery after the THA procedure. Many factors are stated to cause dislocation in the period after the THA procedure (12). These include age, alcohol use, cerebral dysfunction, femur neck length, rheumatoid arthritis, femoral component fixation, soft tissue factors, small femur head use, surgical approach and inappropriate acetabular component

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position. One of the main causes of revision surgery is shown to be dislocation (13,14). Currently, approximately 8 to 12% of the annually performed hip surgeries are revision procedures; of these, 11 to 24% are performed to treat THA dislocation15. Scottish National Arthroplasty Registry records show that for 12314 patients operated from 1996 to 2004 this rate was 1.9% (12). There are publications showing 28% rates of dislocation after revision surgery (2). With the aim of salvaging failed hip arthroplasty and preventing dislocation and re-dislocation, a variety of constrained implants have been produced16.Constrained implants were developed to reduce the risk for primary total hip arthroplasty patients with risk of dislocation due to preoperative cognitive function disorder and patients at risk of redislocation (16). The freedom constrained liner anti-luxation system (Biomet, Warsaw, IN, USA) is one of the surgical treatment choices for treatment of patients developing dislocation after total hip arthroplasty and hip arthroplasty of patients with dislocation risk.

## MATERIAL and METHODS

### Patients and Methods

This implant was inserted in 15 patients operated at our hospital from March 2014 to December 2018 by a single surgeon. They were chosen from among patients developing dislocation after total hip prosthesis, patients with re-dislocation developing after bipolar endoprosthesis surgery and patients with hip instability. The study is a retrospective cohort study. All surgical approaches were posterior surgical incision in lateral decubitus position. All 15 patients had constrained liner freedom anti-luxation system (Biomet, Warsaw, IN, USA) exceed model acetabular shell, metal head and Arcos model femoral stem inserted. All implants were hydroxyl apatite (HA) uncemented constrained systems. Because of anteversion conformity all patients had extended femoral osteotomy performed to remove the femoral stem. Because we couldn't provide femoral and acetabular component consistency with older femoral stems. Following surgery, osteotomy lines were wrapped with cable and repaired. The duration between surgery and revision surgery was nearly 22 months (1-88). Constrained liner system implantation decision made if hip dislocation developed two or more times and also hip instability still being after reduction. All patients were assessed clinically and radiologically. Inclusion criteria were patients with recurrent dislocation and risk of hip instability, no development of any infection, and no rheumatologic disease. All patients had femoral head, acetabular component and femoral stem removed. Patients' medical records were assessed with using the results of the Oxford (17), Harris hip scoring system (18) and Charnley (19) scoring system at the time just after hip reduction application and also after constrained liner surgery. The study was a retrospective cohort study. Preoperative and postoperative scores were measured to assess patients. All surviving patients were reviewed in the clinic or reached by telephone. Electronic records and patient case notes were used to provide additional information figure 1 and 2.

## RESULTS

No patient developed re-dislocation. The mean age of 15 patients was 74.3 years (range: 65-85). Of patients, 9 were female and 6 were male. Mean follow-up duration was 22 months (1-88). All 15 patients had freedom anti-luxation system(Biomet, Warsaw, IN, USA) exceed model acetabular shell, metal head and Arcos model femoral stem inserted. One patient developed osteoporotic femur fracture complication during surgery. During preparing of the femoral canal fracture developed in the distal femoral shaftregion. It was wrapped with cable and the prosthesis insertion procedure was completed. Postoperatively, patients were observed to have significant amelioration in Oxford and Harris hip scoring system results. There was no significant improvement for the Charnley scoring system. No patient had re-dislocation or required revision surgery. No deep or superficial wound infection. Neurovascular injury complications were not observed in patients table 1.

### Statistical analysis

Statistical analysis was performed using IBM SPSS for Windows version 21 (IBM Corp, released 2012). Data were tested for normality and presented accordingly.

**Figure1.** Anterior-posterior x-ray image of 74-year old female patient with constrained THP at 14-month follow-up

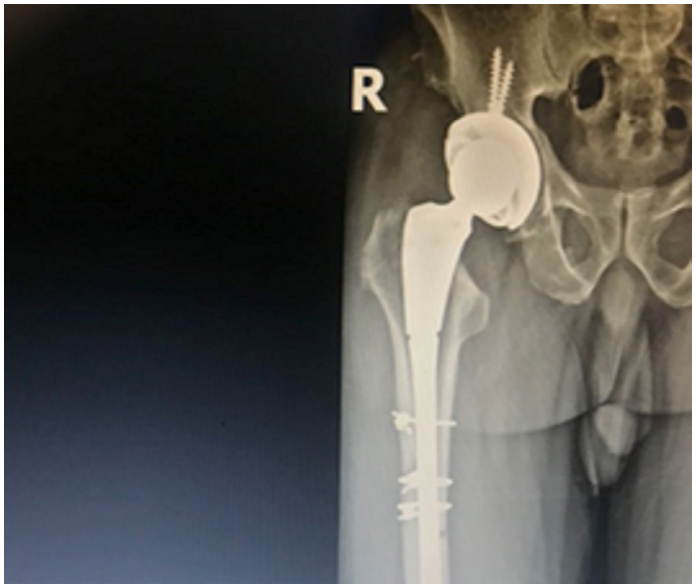


**Figure 2.** Anterior-posterior x-ray image of 68-year old female patient with constrained THP at 16-month follow-up

**Table 1. Median (n, IQR, range) pre- and postoperative scores**

| Score (possible score range) | Preop (n=15) | Latest (n=15) | p value |
|---|---|---|---|
| OXFORD | 12 (4-20) | 33.7 (25-49) | p< 0.0002 |
| HHS pain | 8 (6-19) | 49 (31-55) | p< 0.0004 |
| HHS function | 11 (2-20) | 24 (20-36) | p< 0.0003 |
| Charnleypain | 2 (0-6) | 6 (0-6) | p< 0.0001 |
| Charnleyfunction | 1 (0-4) | 1 (0-6) | p< 0.012 |
| Charnley ROM | 2 (0-4) | 4 (0-6) | p< 0.0002 |

HHS = Harris Hip Score; ROM = range of motion

## DISCUSSION

Constrained liner used of revision surgery is a life-saving type of salvage procedure for patients developing recurrent hip dislocation after total hip arthroplasty. There are very few studies in the literature related to constrained revision surgery. Dislocation after THA is one of the most important problems that can develop after orthopedic surgery. Re-dislocation rates are observed at 6-20% after primary and revision surgery and there is momentum to find various surgical solutions20,21.

Fackler et al. reported patient results for a total of 73 dislocations in 34 patients. The study reported serious medical and neurological injury. They mentioned single hip dislocation in 22% of patients, with multiple dislocations in 75% of cases22,23. Since constrained liner began use for treatment of patients with mechanically unstable total hip prosthesis, it was observed that the load on the liner was excessive. The excessive load on constrained liner may cause failure of reconstruction. These problems may be divided into 4 groups; failure of pelvic fixation, liner decomposition, biomaterial decomposition and femoral head dislocation24,25,26. Khan et al. in a study to assess recurrent dislocation or instability rates in revision surgery found limited loosening rates of 8.4 to 14% in patients who underwent revision arthroplasty (27). A limitation of our retrospective cohort study is that there is no control group. We did not have a defined list of indications for using a constrained liner. Some of our revision patients had complex acetabular and femoral reconstructions and various medical comorbidities. Some of the general complications (i.e. infection) were not related to the use of the constrained liners. Increasing amounts of constrained liner have potential failure like impingement, and range of motion limitations. These failures cause increased load between the joint faces of the femoral head and acetabular components. As a result, loosening and failure may be observed in patients. Additionally, this type of constrained liner is a successful choice for treatment of patients susceptible to hip dislocation; and is even accepted as a life-saving salvage procedure. Yang et al. investigated the use of constrained liner and identification of indications included comprehensive acetabular bone loss, inability to repair the large trochanter or unmonitored patients with cognitive problems. Many studies have been published related to the use of different constrained liner and various complications. Shrader et al. obtained successful results for 108 patients in a 110-patient series with constrained implants used for hip instability (28). Callaghan et al. reported 84% success rate for tripolar constrained liner hip revision29. Our study does not include long-term outcomes which may beconsidered a limitation. However, as most patients with these implants used have other complex comorbidities patients are lost with advancing time so it may not be possible to determine long-term outcomes in many cases. As a result, it is mainly impossible to obtain long-term outcomes. In our study, no insufficiency or failure was observed in any patient. No mechanical instability was observed in any patient. Impingement may cause high forces on the surface of the implant leading to femoral head decomposition, polyethylene liner breakage and breakage of the locking mechanism. However, these and similar complications were not observed in our cases. Of course, the use of this implant may cause limitations in hip range of motion in patients.

## CONCLUSION

In conclusion, the constrained liner used in our study provided satisfactory success rates for patients with hip arthroplasty procedure. This data is similar to data in the literature. With well-chosen patients and accurate indications, the salvage procedure using constrained liner provides satisfaction for patients in the early period.

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