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TROCHANTERIC NON-UNION TREATED WITH HOOK-PLATE AND CABLE SYSTEM ALONG WITH TOTAL HIP REPLACEMENT

Orthopaedics

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ABSTRACT

INTRODUCTION: Trochanteric fracture fixations sometime fail due to various reasons like implant failure or osteoporosis. Treatment in such a situations is difficult as the surgeon faces multiple challenges like bad bone stock, cartilage damage in the femoral head due to screw cut out, weak musculature and need for early mobilization considering the age and comorbidities of such patients. The purpose of the study is to evaluate the outcome of Trochanteric fixation along with a distal loading stem for hip replacement.

MATERIALS AND METHODS: We conducted a prospective study to follow-up 12 patients who have undergone trochanteric fixation with locking plates with cables and screws for trochanteric fixation failures with osteochondral damage in the hip joint from the previous fixation device.

RESULTS: The patients were assessed with Harris hip scores which improved from 42 preop to 94 postop ($p < 0.001$). No patient had significant pain or abductor lurch postoperatively ($p < 0.001$). Active abduction increased from 0 deg preop to 28 degree postoperatively ($p < 0.001$). Though bony union was not complete in 3 out of 12 patients fibrous union allowed the patients to be ambulant without symptoms.

CONCLUSION: Trochanteric hook plate gives sufficient fixation strength for trochanteric fixations along with a distal loading stem in total hip replacement in patients where trochanteric fixation failure has occurred and the fixation device has caused and osteochondral damage to the acetabulum.

KEYWORDS

Trochanteric Hook Plate, Revision Hip Arthroplasty, Fixation Failure, Trochanteric Fracture, Non-union.

INTRODUCTION

Trochanteric fracture fixations can fail in the elderly population due to various reasons like osteoporosis, bad implant choice, inadequate protection, screw cut-out for intramedullary fixation or plate devices [1,2]. It is important to obtain anatomical union of the greater trochanter to maintain abductor function. The requirement for a stable trochanteric fixation is important with the increasing number of primary and revision hip arthroplasties performed every year [3,4]. Non-union poses an additional problem due to lack of biology for the healing response required.

Forces are exerted on the trochanter in different directions and it is necessary that trochanteric fixation resists all of them until bony union. Forces more than body weight are exerted on the trochanter during activities like climbing stairs. Contraction of the gluteus medius and minimus produce a rotational force [5]

Non-union of the trochanter has been a difficult problem to address even from the time of trans-trochanteric approach used for hip arthroplasty [6,7,8].

Trochanteric fixation options have progressed over the years with the first generation cables grip with and H-shaped device designed by Dall and Miles[5]. The reported non-union rates for this fixation was 37.5% and cable breakage (32.5%), cable fraying and fragmentation were significant problems (48.5%) [9,10]. The second-generation cable plate system which used transversely oriented cables [11]. Trochanteric union and patient function were significantly better in this system and cable breakage was less. Our study aims at prospectively analyzing the functional and radiological outcomes at an average follow-up of 2.5 years using an anatomically conforming cable plate system for treatment of trochanteric non-union with osteoarthritis of the hip joint in failed trochanteric fixation using intra-medullary and extramedullary fixation devices with a head screw.

PATIENTS AND METHODS

We followed up 12 patients who had undergone trochanteric fixation with hook plate and cables with distal loading femoral stems between 2008 and 2015 (4 males and 8 females, Mean age 68 years, range 54 to 79 years). The Hook plate is available in 3 lengths, the longest one 26 cm long with option for 5 cables which pass through the plate and is crimped onto itself after wrapping around the femoral shaft. 4- 6 cables were used according the fracture pattern.

The inclusion criteria were trochanteric fixation failure with cartilage loss in the acetabulum. One patient who was initially included in the study was lost to follow-up and was later excluded. The mean follow-up time was 36.92 months (range 24 to 48 months). Clinical assessment was done with Harris Hip scores (HHS), pain as measured on Visual analog scale and restoration of abductor function. Radiographs were taken preoperatively and serially at 6 weeks, 3 months, 6 months, 1 year and yearly thereafter. Radiographic evaluation was done using the Hamadouche et al criteria [12]. Bone healing and consolidation was assessed by the gap seen between the trochanter fragment and rest of the proximal femur. (Fig. 1). The prosthesis was assess for stem integration, cup positions and any sign of migration of the stem or areas of lucency.

SURGICAL TECHNIQUE

All the hips were accessed through posterior approach. Acetabulum was prepared and uncemented acetabular cup was implanted. Femoral canal was prepared to receive a distal loading stem. The hip was reduced after trial stem insertion (Stryker Restoration distal loading stem). The trochanteric pieces were reduced anatomically and the length of the Hook plate (Zimmer inc.) required was ascertained (Fig. 2). The plate length was chosen depending on the site and amount of bone loss. The removed femoral head was broken into chips and used to fill any bone defects. The plate was impacted into its place in such a way that the hooks held the trochanter tip in position. Pre-contouring of the plate conformed it over the trochanteric region and shaft of the femur. Cables were passed through the holes in hook plate, and then onto itself after winding around the femur so as to grip the plate adequately onto the femur. Tensioner was used to give adequate tension on the cables before crimping it with the cable locking screw (Fig. 3). 5-6 cables were used on an average to get adequate fixation strength and stability. The cables were rechecked after tensioning all the cables as some might loosen by the time all the cables are tightened. Re-tensioning was done as required.

Postoperatively all the patients were mobilized partial-weight bearing for 2 weeks and progressed to full weight bearing as tolerated over a period of 6 weeks. Standard antibiotic and thromboprophylaxis were followed in the postoperative period. Active abduction was prevented for 6-8 weeks. Xrays were obtained at 3 weeks, 6 weeks, 3 months, 6 months and thereafter yearly (Fig. 4).

Statistical analysis was performed using SPSS (version 20.0, IBM Armonk, NY). Paired T test showed a statistically significant improvement in Harris hip and pain cores with p value < 0.001.

RESULTS

Harris hip score improved from 42 (range 12 – 68) pre-operatively to 94 (range 65 – 100) post-operatively (P <0.001). The mean pain score improved from 6.4 (range 3.5-10) to 2.2 (range 0-6.5, P <0.001) post-operatively. 4 patients had mild limp and one had moderate limp. The function of the abductor muscles were restored in 11 patients.

9 patients had good bony union (no gap between the trochanteric fragment and bone bed), 2 had fair union and one had fibrous union. The abductor function was fairly restored in the patient with a gap between the bone fragments. There was no association demonstrated between the non-union and other variables like age, duration since injury, generalized health of the patient, and implant construct. The time to union was 16.1 weeks (range 8 – 60 weeks). There was no case of implant failure like cable breakage or loosening of the hook plate.

Trochanteric pain was present in 2 patients – one with prominent implant and one unexplained. Either did not require revision or implant removal as the pain was not significant to affect daily life.

DISCUSSION

A stable construct is required for treating trochanteric non-unions in elderly patients when there is implant cut-out or loosening after treatment of comminuted trochanteric fractures. Trochanteric non-union is a significant problem affecting the limb and life of the patient. Studies by Barrack et al in cable fixation of trochanteric non-union show a non-union rate of 14.6% and cable breakage of 19% [11]. The problems of trochanteric non-union are abductor pain, bursitis, limp due to the weakness and increased dislocation rate [13]. While treating trochanteric non-union we require a rigid fixation of the osteoporotic bone which is often just a shell. A locking plate with cables passing through screw holes is the best currently available construct to hold the weak bone fragments together, at the same time neutralizing the pull of the abductor mechanism. There is the need to stabilize the trochanter against proximal migration and neutralize the anterior pull of the abductors [14].

Our study analyses only complex trochanteric non-unions associated with acetabular damage due to previous trochanteric fixation device. The cable grip system used by Koyama et al [15] analysed 62 hips and reported a non-union rate of 30.6% and cable breakage of 29%. Hamadouche et al reported [12] trochanteric union rate of 71% (51 out of 72 hips) with trochanteric claw plate. Significant improvement in function was achieved only in the group with documented osseous union.

Non-union is associated with osteoporotic bone, increased tension in trochanteric reattachment site, cement in trochanteric bed, early post-operative mobility, multiple operations and patient non-compliance[16,17]. It is important to get adequate apposition of the trochanteric fragments for good union. If appropriate union does not occur, eventual fatigue failure of the fixation device does occur. Our series showed good healing rate when the trochanter was reattached with trochanteric hook plate with cables and unicortical screws. The results are similar to those of Haddad et al [18].

Full recovery of the hip function cannot be assured even after osseous union of the attached trochanter as abductor weakness persists for a long time. Limp and need for a walking aid were present in as small percentage of patients. The functional scores improved significantly in follow-up with Harris hip score rated as excellent to good in 48%. Pain relief was excellent in 75% according to WOMAC.

CONCLUSION

Trochanteric hook plate gives sufficient fixation strength for trochanteric fixations along with a distal loading stem in total hip replacement in patients where trochanteric fixation failure has occurred and the fixation device has caused and osteochondral damage to the acetabulum

Fig.1

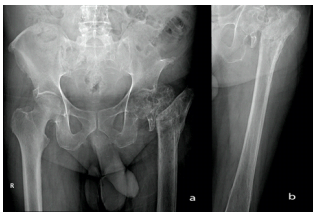


Fig.2

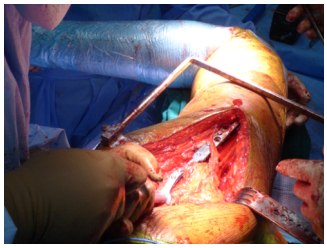


Fig.3

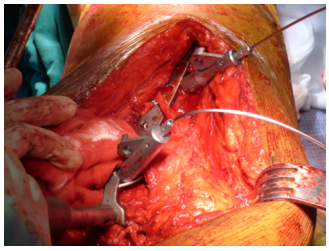
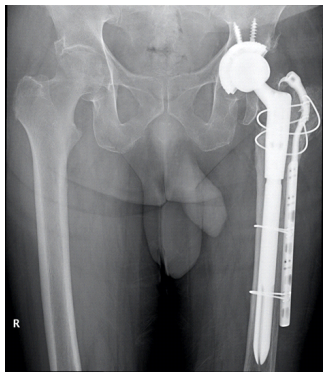


Fig.4



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