ORIGINAL RESEARCH PAPER

Volume-8 | Issue-6 | June-2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

SUBTROCHANTERIC OSTEOTOMY FOR REVISION TOTAL HIP ARTHROPLASTY: AN IMPROVISATION OF EXTENDED TROCHANTERIC OSTEOTOMY

Orthopaedic

Dr Deepak kumar Asst. Professor, Deptt. Of orthopaedic surgery,KGMU Lucknow

Dr Shailendra singh Asst. Professor, Deptt. Of orthopaedic surgery,KGMU Lucknow

Dr Sanjiv Kumar* Asst. Professor, Deptt. Of orthopaedic surgery,KGMU Lucknow *Corresponding Author

Prof. Ashish kumar Professor, Deptt. Of orthopaedic surgery,KGMU Lucknow

Dr Madhuresh kumar Consultant orthopaedic surgeon, Apollo medix hospital

ABSTRACT

Introduction: The extended trochanteric osteotomy (ETO) is widely used for revision total hip arthroplasty (THA). We describe a novel technique for subtrochanteric osteotomy for revision total hip replacement. The aim of the study was to describe the femoral stem revision technique in order to reduce the complication rate of the extended trochanteric osteotomy.

Material and Methods: A prospective study was conducted on 12 patients(9 men 3 women) who underwent revision total hip replacement arthroplasty using the novel technique. .All the patients were followed clinically and radiologically. One patient was lost due to follow up. All the post op and follow-up radiographs were examined by experienced orthopaedic surgeons for alignment of the femoral component, subsidence, radiolucent lines, cortical hypertrophy, osteolysis, signs of stress shielding, and presence of heterotopic ossification.

Results: There was significant improvement in the Harris hip scores from a mean of 43±16.4 (range 18-74) to 82±8.0 (range 60-94) and radiologically bony union took place in all the cases. No complications of proximal migration were noted.

Conclusion: At the end of the study we concluded about the better results and the decreased complication rates observed with this technique in comparison to the standard extended trochanteric osteotomy method.

KEYWORDS

extended trochanteric osteotomy, revision hip arthroplasty

INTRODUCTION

Revision total hip replacement is a challenging and technically demanding procedure and is on rise these days and the frequency of revision hip surgeries is only expected to increase [1,2]. The study aimed for preservation of the bony landmark such as greater trochanter, lesser trochanter so that the femoral stem implantation can be easily done and more accurately. Removal of existing cemented or non cemented femoral component without osteotomy poses a high risk of intra-operative fracture rates as high as 7.8 % as per a review of the Mayo Clinic Joint Registry [3].We need to have the safe extraction technique of the femoral stems. Here comes the role of extended trochanteric osteotomy (ETO) for the safe extraction of cement and the stem which was popularised by Younger et al [4]. But good things come at some price. Complications like non-union, subsidence of the implant, fracture of the osteotomized fragment were reported [5,6]. The osteotomized fragment was to be secured at the end of the procedure generally with the help of Stainless steel wires which also posed with problem of metal implant reactions, vascular interruption, nerve injury. [7,8]

The aim of our study is to propose a technique for the femoral component revisions in revision total hip replacement. The objectives are to reduce the complication rates and achieve better end results by modifying the extended trochanteric osteotomy method.

MATERIALS AND METHODS

A prospective study was conducted between 2009- 2013 on 12 patients who underwent revision of femoral components using the novel technique. Clinic-radiological assessment was done for every patient during the follow up. One patient was lost on follow up.

Routine preoperative radiographs for the hips were done and templating was done in few cases in which the anatomy was distorted. Harris hip score was calculated in all the patients pre-operatively and post-operatively. Preoperatively, we established parameters of joint kinematic restoration that included determination of leg length and restoration of offset for abductor muscle tensioning.

In our study some of the patients (n=4) had underwent primary cemented THR and some hemireplacement arthroplasty(n=8). Patients of total and hemi replacement were placed in the same group of study because we wanted to emphasise about the femoral stem revision technique. The reasons for the revision were aseptic loosening of acetabular and femoral components both in 1 case and femoral component alone in 8 cases and broken implant (femoral stem) in 3 cases. Wagner revision stems (Zimmer Ltd, Winterthur, Switzerland) and Solution revision stems *(DePuy, Warsaw (IN), US)* were used in our patients.

All the patients were operated using lateral approach in lateral decubitus position. We used our modified method in which proximal osteotomy site was done 3 cm distal to lesser trochanter (sparing the greater trochanter) similar in principles of extended trochanteric osteotomy like reflecting the fragment with attached abductors and vastus lateralis, postero-lateral third of the diameter was cut using the oscillating saw and was extended upto the most distal point of the femoral stem thus preserving the proximal bony landmarks (Fig.1) which were helpful in the placement of the femoral stem later on and also preserving the osteolytic proximal femur bone stock and also sometimes the bone loss, the cause of which appears to be multifactorial namely stress shielding, massive osteolysis, extensive loosening and history of multiple surgeries[9] .Muscle and the soft tissue attachments to the the proximal femur were preserved prominently not disturbing the abductors. (Fig 2)

Thorough curettage of the cement and the fibrous tissue was done . The removal of the cement from the preserved proximal femur was done from the proximal side. And the implant removal was easy through the window created which can be hammered (gently) out proximally after removing the cement (Fig 3). We used stainless steel wire to secure the osteotomy fragment, thus decreasing the number of stainless steel wire loops to secure the osteotomized fragment hence preserving the local blood supply and avoiding the complications related to passing the cerclage wire and metal contacts with the prosthesis. Uncemented long stem femoral prosthesis was then implanted and the osteotomy window was closed by reattaching the osteo-muscular flap by stainless steel wire. (Fig 4,5) Intra-operative blood loss, complications and duration of surgery were recorded. Post-operative complications, limb length discrepancy or thigh pain were noted.

Rehabilitation protocol and follow up: The patients were immobilised for six weeks while promoting the quadriceps strengthening exercises

and knee mobilisation exercises although it varied in some cases depending upon the bone stock quality and stability of the implant. Patients were allowed for partial weight bearing after 6 weeks and were followed both clinically and radiologically and were allowed to full weight bearing after the signs of osseo-integration were present.

Patients were followed at six weeks, 12 weeks, 6 month ,12 months and annually thereafter for Harris hip scores. All the radiographs were examined by experienced orthopaedic surgeon(AK) for alignment of the femoral component, subsidence, radiolucent lines, cortical hypertrophy, osteolysis, signs of stress shielding, presence of heterotopic ossification, non union of the osteotomized fragment.

RESULTS

Statistical analysis was done by GraphPad InStat software, San Diego, U.S.A. All of our patients had bony union of the osteotomized fragment. There was no case reported of subsidence, proximal migration and non-union. There was significant improvement in the Harris hip scores from a mean of 43±16.4 (range 18-74) to 82±8.0 (range 60-94) (Fig. 1).

There was some degree of limb length discrepancy of average of 2 cm in two patients (one had lengthening, one had shortening) which was managed by appropriate shoe raises.

There was one patient with the tredelenburg gait (which was present pre-operatively too). although bony union was visible on the radiographs thereby concluding a possible reason of neuro-mucular origin. None of the patients in the follow up showed presence of any heterotopic ossification, cortical hypertrophy.

One patient had some bony resorption in Gruen Zone 7 but till last follow up , he has no problem in walking except occasional pain. One patient also developed superficial incision site infection which healed by debridement and extended intra-veinous antibiotic regimen.

DISCUSSION

The extended trochanteric osteotomy as popularised by Younger et al [4] stood the test of the time for the revision arthroplasty of cemented or uncemented femoral stems. Our rationale with this novel technique of modification of the extended trochanteric osteotomy deals the complications and encompassing the benefits of the later. We tried for this novel technique for reducing the complications with the fact to be kept in the mind that long-term outcome of femoral revision arthroplasty depends on proper restoration of joint mechanics by reconstructing the anatomic centre of rotation in combination with fixation that provides long-term stability [10]

In our study, we routinely used the lateral approach for hip which obviously has an advantage for preserving the posterior capsule and external rotators and thus reducing the chances of dislocation. The standard extended trochanteric osteotomy can be performed using the several approaches to hip. However, the most common being used, as documented in various studies, is the posterior approach which has reported 7% to 30 % post operative dislocation rate [11,12].

The obvious advantage of this novel technique is virtually excluding the chances of proximal migration of the osteotomized fragment which was up-to 6.6 % in the extended trochanteric osteotomy [5,6]. Similarly the incidence of the non union of the fragment is greatly reduced in comparison of the extended trochanteric osteotomy technique. however in our study we didn't have any reported case of the non-union which in the standard extended trochanteric osteotomy is as high as 11 % [5,13] .The main advantage would be the preservation of the greater trochanter and the proximal bony landmarks which keeps the abductor mechanism remain intact and more ease of optimal positioning of the femoral stem while insertion. lesser osteotomized fragment in comparison to extended trochanteric osteotomy ensured less decrease in the torsional strength of the femur. the use of stainless steel wires to reattach the osteo-muscular flap was less in comparison to standard extended trochanteric osteotomy hence decreasing the risk of vascular interruption, nerve injuries and possible chances of breakage and unravelling of cerclage wire[7,8].

We used the distally fixed uncemented long Wagner stem and Solution stem for our revisions. The problem with the revisions lies in the fact of the generally encountered osteolytic proximal femora bone stock and also the poor bone bed for the revision stems. However in our study we encountered mostly of type 1 proximal femoral deficiencies as per the Della Valle and Paprosky classification [14]. Although we don't recommend routine use of these stems , other stems like S-ROM prosthesis (Joint Medical Products, Stamford, CT, USA) can be used depending upon the anatomy.

Discussing about the benefits of the extended trochanteric osteotomy, it allows the direct visualisation of the remaining structural diaphyseal bone and prevents component malpositioning (which is the common cause for the failure as the component fails in varus and secondary varus deformity secondary to remodelling) or risks of fracture by allowing a straight trajectory of insertion and also preventing the undersizing or oversizing of the component (another cause of failure) [15]. This benefit remains with our technique. The disadvantage of this technique is the inability of any chance of soft tissue balancing as the extended trochanteric osteotomy allows for the distal advancement of the abductor musculature to increase the resting tension and the contractile force.

We acknowledge the limitation of our study, the major being the small sample size and lack of control group of patients operated through the standard extended trochanteric osteotomy method. However we gave the main focus on getting the good results with this novel technique which we achieved.

CONCLUSIONS

Based on our study, we conclude that the novel technique of subtrochanteric osteotomy for the femoral stem revisions can be safely used with better results than the conventional extended trochanteric osteotomy method by reducing the complication rates and retaining the benefits.

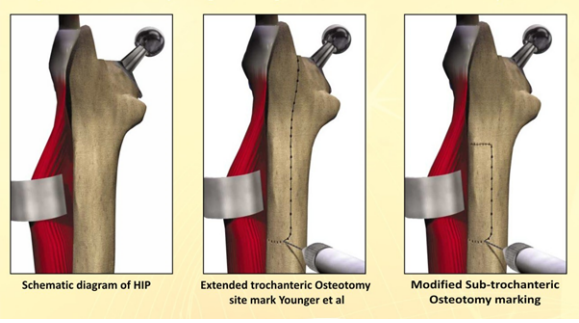


Figure 1: (Image (a,b) Courtesy of Depuy Synthes (obtained with permission)

Figure 2: Subtrochanteric osteotomy: adequate for removal of stem , cement and fibrous tissue.

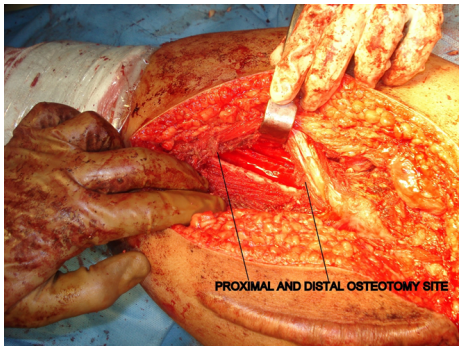


Figure 3: Removal of the implant through the window.

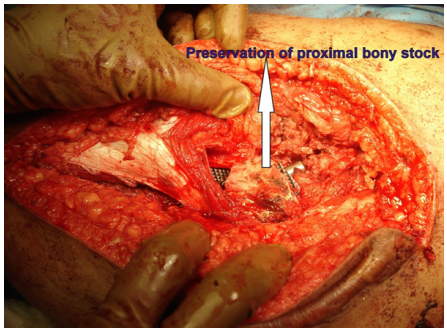


Figure 4 : Preserving the proximal bone stock and attachment of abductors.

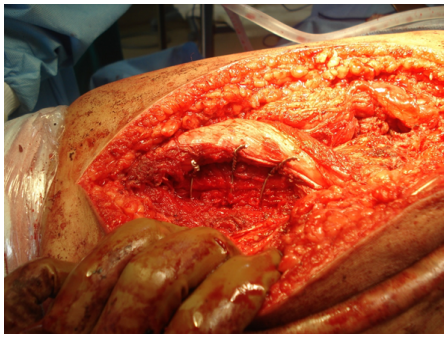


Figure 5 : Repositioning the osteomuscular flap by SS wire.

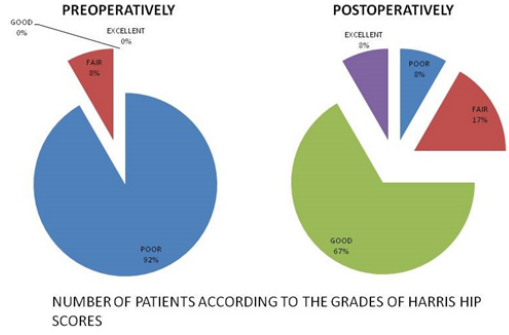
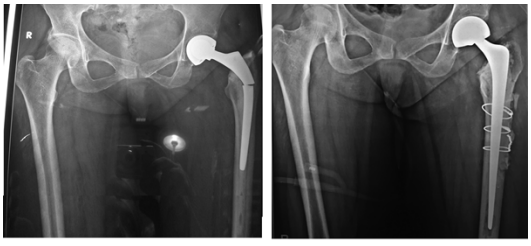
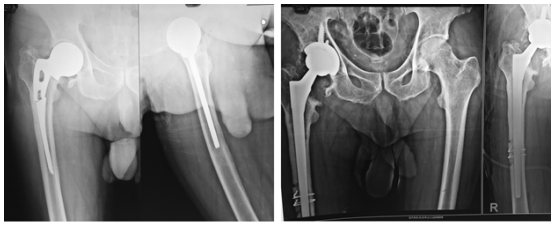


Figure 6 : PIE chart showing number of patients according to the grades of Harris Hip Scores.



Pre and post operative radiographs of revision hip surgeries

Figure:7



Pre and post operative radiographs of revision hip surgeries

Figure:8

REFERENCES

1. Kurtz S, Mowat F, Ong K, Chan N, Lau E, Halpern M. Prevalence of primary and revision total hip and knee arthroplasty in the United States from 1990 through 2002. J Bone Joint Surg Am. 2005;87:1487–1497.
2. Lohmander LS, Engesaeter LB, Herberts P, Ingvarsson T, Lucht U, Puolakka TJ. Standardized incidence rates of total hip replacement for primary hip osteoarthritis in the 5 Nordic countries: similarities and differences. Acta Orthop. 2006;77:733–740)
3. Berry DJ (1999) Epidemiology: hip and knee. Orthop Clin North Am 30: 183-190
4. Younger TI, Bradford MS, Magnus RE, Paprosky WG. Extended proximal femoral osteotomy: a new technique for femoral revision arthroplasty. J Arthroplasty. 1995;10:329–338.
5. Kuruvalli RR, Landsmeer R, Debnath UK, Suresh SP, Thomas TL. A new technique to reattach an extended trochanteric osteotomy in revision THA using suture cord. Clin Orthop Relat Res.2008;466(6):1444–1448. doi: 10.1007/s11999-008-0233-4.
6. .Mardones R, Gonzalez C, Cabanela ME, Trousdale RT, Berry DJ. Extended femoral osteotomy for revision of hip arthroplasty: results and complications. J Arthroplasty. 2005;20(1):79–83. doi: 10.1016/j.arth.2004.10.014
7. McCarthy JC, Bono JV, Turner RH, Kremchek T, Lee J. The outcome of trochanteric reattachment in revision total hip arthroplasty with a Cable Grip System mean 6-year follow-up. J Arthroplasty. 1999;14:810–814.
8. Schutzer SF, Harris WH. Trochanteric osteotomy for revision total hip arthroplasty: 97% union rate using a comprehensive approach. Clin Orthop Relat Res. 1988;227:172–183.
9. Babis GC, Sakellariou VI, O'Connor MI, Hanssen AD, Sim FH. Proximal femoral allograft-prosthesis composites in revision hip replacement: a 12-year follow-up study. J Bone Joint Surg Br. 2010;92:349–355.
10. Gravius S, Randau T, Wirtz DC. What can be done when hip prostheses fail? New trends in revision endoprosthetics . Orthopade. 2011;40(12):1084–94.
11. Yun AG, Padgett D, Pellicci P, Dorr LD. Constrained acetabular liners: mechanisms of failure. J Arthroplasty. 2005;20:536–41.
12. Aubriot JH, Lesimple P, Leclercq S.Study of Bousquet's non-cemented acetabular implant in 100 hybrid total hip prostheses (Charnley type cemented femoral component). Average 5-year follow-up. . Acta Orthop Belg. 1993;59 (1 Suppl.): S267–71.
13. MacDonald SJ, Cole C, Guerin J, Rorabeck CH, Bourne RB, McCalden RW. Extended trochanteric osteotomy via the direct lateral approach in revision hip arthroplasty. Clin Orthop Relat Res. 2003;417:210–216
14. Valle CJ, Paprosky WG. Classification and an algorithmic approach to the reconstruction of femoral deficiency in revision total hip arthroplasty. J Bone Joint Surg Am. 2003;85-A Suppl 4:1–6.
15. Harris WE, Revision surgery for failed, non septic total hip arthroplasty:the femoral side. Clin Orthop. 1982;170:8-20