Acta Orthop. Belg., 2017, **83**, 53-56

ORIGINAL STUDY

Union rates and midterm results after Extended Trochanteric Osteotomy in Revision Hip Arthroplasty. Useful and safe technique

Konrad Sebastian WRONKA, Peter Herman Johan CNUDDE

From the Prince Philip Hospital, HDUHB, Llanelli, Wales, UK

Aim of this study was to evaluate the outcome following extended trochanteric osteotomy in series of single surgeon, with emphasis on complications and union of osteotomy.

Retrospective Case Series of all patients who had revision Total Hip Replacement surgery performed by senior author between 2003 and 2012, with follow up between 1 and 10 years.

108 cases of revision hip arthroplasty with use of Extended Trochanteric Osteotomy were evaluated. In 101 cases solid bony union was achieved. In 7 cases where the bony union was not established, an asymptomatic and stable position was achieved. In 12 cases greater trochanter fracture was noted postoperatively with proximal migration 5 to 15mm. 1 patient required surgery to re-attach greater trochanter.

Extended Trochanteric Osteotomy is a safe and very useful technique that can be used in revision hip surgery.

Keywords : Extended trochanteric osteotomy, ETO ; revision hip arthroplasty ; revision hip replacement.

INTRODUCTION

Extended Trochanteric Osteotomy (ETO) is a well recognized and useful technique wh en performing revision total hip replacement. It is a surgical technique *(1,5,6)* that facilitates :

– Retrieval of cement
– Retrieval of stem
– More accurate debridement of distal femoral canal
– Correction of deformities of proximal femur
– Improved exposure of acetabulum

There are some concerns about union rate following ETO and about high rate of trochanteric pain due to metalwork prominence. Also, surgeons argue that this is very aggressive approach that may lead to inferior long term results.

OBJECTIVES

Aim of this study was to evaluate the radiological outcomes following ETO in a single surgeon's series, with emphasis on complications and union of osteotomy.

METHODS

We conducted a retrospective case series of all patients who underwent revision total hip replacement (THR) surgery performed by senior author between 2003 and 2012, with both clinical

■ Konrad Sebastian WRONKA,
■ Peter H. J. CNUDDE
Prince Philip Hospital, Llanelli, Hywel Dda University, Health Board, Wales, UK
Correspondence: Konrad S Wronka, ST4 Trauma and Orthopaedics, Prince Philip Hospital, Llanelli, Carmarthenshire United Kingdom SA14 8QF
E-mail : konradwronka@doctors.org.uk
Tel. : +44 7717065042

In this study we did not need any external funding.
The authors report no conflict of interests.

and radiological follow-up of at least 10 months (range 11-115 months). Patients' data was collected prospectively by senior author.

Clinical notes and radiographs were reviewed by an independent observer (KW) who was not involved in patients' care.

RESULTS

168 Revision THR procedures were undertaken in 165 patients during study period. In 108 cases an ETO was performed and those patients were included in the study. All of them had clinical and radiological follow-up of at least 10 months (medium 36, range 11-115). All procedures were performed by posterior approach. Following exposure of the hip and proximal femur, osteotomy line was marked with diathermy. Distal end of osteotomy was created using 2.5mm drill. Osteotomy was performed using oscillating saw reaching 12 to 14 cm from tip of greater trochanter. The attempt was made to keep anterior soft tissue attachment to osteotomised fragment. Before stem implantation, the Dall Miles (Stryker) cable was applied distal to osteotomy site to prevent propagation of a femoral shaft fracture. Following stem implantation, the osteotomy was reconstructed using 2 or 3 Dall-Miles (Stryker) cables in 94 cases, using Spider Clamp in 7 cases or trochanteric plate in 7 cases. Spider clamp or trochanteric plates were used if fracture of osteotomised fragment occurred intra-operatively (12 cases) or the fragment was found very thin and fragile (2 cases). The osteotomy site was filled with autologous bone graft obtained from acetabular reaming and if there were significant femoral deficiencies – additional synthetic bone graft was used. In all cases long uncemented, modular, fluted stem was used. 52 patients received Revitan stem (Zimmer), 50 patients received MP stem (Waldemar Link) and 6 patients had Restoration stem (Stryker) implanted. Post operatively patients were not given any brace, and were allowed to partially weight bear for first 6 weeks, with about 50% of body-weigh being transferred though the operated hip. After 6 weeks weight bearing precautions were relaxed and patients were allowed to mobilize without crutches or walking sticks, although some patients continued to use walking aids up to 3 months due to pain or for balance. Active range of movement of the hip and knee was encouraged from early post operative period.

In 101 cases solid bony union was observed on post-operative radiographs within 6 months. In 7 cases the bony union was not seen, but there was no displacement of osteotomised fragment, position of cables used for fixation was unchanged and there was no loosening of cables or bone reaction around cables. In all those 7 cases the ETO was fixed with two cables only. Those patients did not have symptoms related to osteotomy, therefore authors assume that a fibrous union was achieved. In all cases when plate or clamp was used, complete union of ETO occurred.

There were complications related to osteotomy noted. In 12 cases a greater trochanter fracture was noted postoperatively and the greater trochanter migrated proximally between 5 to 15mm. In one case exploration was required to re-attach greater trochanter, in remaining 11 cases the fracture healed spontaneously within 6 months.

11 patients out of the group of 108 reported symptoms of trochanteric pain during follow up. This was more common after trochanteric plate use or trochanteric fracture, but occurred as well after uneventful healing of osteotomy and no statistical significant difference was found in the prevalence of trochanteric pain and fracture or trochanteric plate use.

One failure of fixation occurred after first stage revision for infection, when a cable clamp failed. The osteotomy was repaired during previously planned 2nd stage revision. Other than that case, no other failures occurred and no reaction to cables was seen in any of cases.

In 2 cases the stem had to be re-revised following previous ETO due to stem subsidence and failure of stem to osteo-integrate. Healed osteotomy had to be re-opened and re-repaired. In both cases the osteotomy site healed again uneventfully.

There were no cases of sciatic nerve palsy in our group.

DISCUSSION

Extended Trochanteric Osteotomy (ETO) is a useful technique that can be utilized when perfor-

ming revision hip arthroplasty. First it was reported by Peters et al (*7*) and subsequently by Younger et al (*9*) for removal of well-fixed uncemented stems. This technique, popularized by Paprosky (*1,5*), proved to lead to good union rates and good outcomes. Paprosky (*1*) in his paper reported 92% union rate of ETO with further 7% of fibrous union in his series of 166 revision hip replacements, advocating its use. He stated that many of revision hip arthroplasty can be performed without ETO, however, in number of cases it is necessary to retrieve stem, cement or deal with deformities.

Also Park et al (*6*) were also great advocates of the use of an ETO. In their series of 62 revision THRs, author noted that there was significantly lower rate of femoral perforations and stem subsidence when ETO was used during surgery. Similarly, McInnis (*4*) noted high rate of femoral perforations and fractures in non-ETO group when compared it with patients who had ETO performed. Furthermore, Lerch et al (*2*) advocate the use of an ETO to prevent intraoperative femoral fractures, as he reports outcomes after ETO to be superior when compared to cases of intra-operative fracture that required fixation. This is in keeping with our own' experience, as we encountered no intra-operative femoral fractures or perforations in our series. Also, we found the rate of stem subsidence was small, with 6 stems subsiding 5 mm in initial 6 weeks and then no further subsidence except in 2 further stems that continued to subside and had to be revised.

One complication rate is comparable to those reported by others. Mardones (*3*) in his series of 73 patients had 1 nonunion, 1 stem revision and 4 osteotomy fragment fracture cases.

We believe, that there is significant learning curve in performing ETO and revision surgery. We included all ETO procedures performed by senior author from start of his work as a consultant till 2012, and as such included first independent cases of his independent practice. We observed that results of more recent procedures are improving, with a faster time to union and less fractures.

There are few papers (*8,10*) discussing biomechanical advantages of fixation of osteotomy. Schwab (*8*) found no statistically significant difference between 2 and 3 cable fixation during biomechanical cadaveric testing. In our series fixation with 2 cables was adequate in most of cases, when dealing with osteotomy fragment that was not fragile or fractured. In cases when osteotomised fragment is fractured or extremely fragile, one should consider using a clamp or plate to prevent trochanteric migration.

Authors accept the weaknesses of the paper. Main being the fact it is a retrospective case series review, with no control group. The senior author does perform revision hip arthroplasty without use of ETO, but only when there is no indication for osteotomy, often with use of cement-in-cement revision and the cohorts of these patients cannot be compared with those who did receive ETO. The group of patients who had revision to uncemented, modular stem without ETO was too small to compare with the studied cohort of patients.

Also, we do not have patient reported outcome measures (PROMs) for our patients. The collection of PROMs for new patients only started in 2012 in our institution, and no pre-op scores were available for patients included in the study. The intention of the paper was to evaluate union rate and complications related to osteotomy and measuring outcomes after revision hip arthroplasty, would be a much wider issue.

Furthermore, the length of clinical and radiological follow up is limited, as large number of patients were referred for surgery from local, rural hospitals and they had difficulties in attending our unit postoperatively. Despitebtheblogistical problems we managed to follow these patients up at least until the time that union of the ETO was observed.

CONCLUSIONS

Extended Trochanteric Osteotomy is a safe and very useful technique that can be used in revision hip surgery. When performed carefully and repaired meticulously using cables and supported by autologous bone graft, it results in reliable union with relatively infrequent complications. If intra-operative fracture of osteotomy occurs, this should be repaired with either Spider clamp of Trochanteric plate and cables. Revision hip

surgeons should be familiar with this technique and use it conscientiously when necessary.

Acknowledgment

The authors would like to acknowledge contribution Mrs Michelle Gerard-Wilson and Mr Riazzudin Mohammed for the help with the data collection.

REFERENCES

1. **Aribindi R, Paprosky W, Nourbash P, Kronick J, Barba M**. Extended proximal femoral osteotomy. *Instr Course Lect*. 1999 ; 48 : 19-26.
2. **Lerch M., Von Lewinski G., Windhagen H., Thorey F**. Revision of total hip arthroplasty : Clinical outcome of extended trochanteric osteotomy and intraoperative femoral fracture. *Technology and Health Care*. 2008 ; 16 : 293-300.
3. **Mardones R, Gonzalez C, Cabanela ME, Trousdale R. Berry D** Extended femoral osteotomy for revision of hip arthroplasty : results and complications. *J Arthroplasty*. 2005 ; 20 : 79-83.
4. **McInnis, DP, Horne, G, Devane, PA** Femoral revision with a fluted, tapered, modular stem seventy patients followed for a mean of 3.9 years. *J Arthroplasty*. 2006 ; 21 : 372-380.
5. **Miner TM, Momberger NNG, Chong D, Paprowsky W**. The extended trochanteric osteotomy in revision hip arthroplasty ; a critical review of 166 cases at mean 3 years, 9 month follow-up. *J Arthroplasty*, 2001 ; 16 (suppl) : 188-194.
6. **Park Y.-S., Moon Y.-W., Lim S.-J.** Revision Total Hip Arthroplasty Using a Fluted and Tapered Modular Distal Fixation Stem With and Without Extended Trochanteric Osteotomy. *Journal of Arthroplasty*. 2007 ; 22 : 993-999.
7. **Peters P, Head W, Emerson R**. An extended trochanteric osteotomy for revision total hip replacement. *J Bone Joint Surg*. 1993 ; 75B : 158-159.
8. **Schwab, J, Camacho J, KaufmanK , Chen Q, Berry D, Trousdale R**. Optimal Fixation for the Extended Trochanteric Osteotomy : A Pilot Study Comparing 3 Cables vs 2 Cables. *J Arthtroplasty*. 2008 ; 23 : 534-538.
9. **Younger, T, Bradford M, Magnus R, Paprosky W** Extended proximal femoral osteotomy : A new technique for femoral revision arthroplasty. *J Arthroplasty*. 1995 ; 10 : 329-338.
10. **Zhu Z., Ding H., Shao H., Zhou Y., Wang G**. An in-vitro biomechanical study of different fixation techniques for the extended trochanteric osteotomy in revision THA. *J. Orthop. Surg. and Res*. 2013 ; 8 : 7. doi : 10.1186/1749-799X-8-7.