e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(8); 214-217

Original Research Article

Outcome of Extended Trochanteric Osteotomy (ETO) in Revision Total Hip Arthroplasty

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Received: 10-06-2023 / Revised: 16-07-2023 / Accepted: 09-08-2023
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Conflict of interest: Nil

Abstract:

Background: Total hip arthroplasty (THA) has a very high rate of success and long-term dependability, although there are a few circumstances where the femoral component must be revised. Through the use of a controlled cortical fracture, extended trochanteric osteotomy (ETO) is a technique that makes it possible to expose the proximal femur. The present study was done to assess the outcome of extended trochanteric osteotomy (ETO) in revision total hip arthroplasty.

Material & Methods: The present prospective study was conducted at Department of Orthopaedics among 32 patients admitted to hospital for revision total hip arthroplasty during the period of study. Extended trochanteric osteotomy (ETO) procedure was used in revision total hip arthrolasty. All procedures were performed via the posterior approach. The recorded data was analyzed using SPSS Version 23.0 (SPSS Inc., Chicago, Illinois, USA).

Results: 15.6% of patients had age less than or equal to 55 years while 84.4% patients had age more than 55 years. Out of 32 patients 28.1% were male and 71.9% were female. The most common cause for failure of index injury was implant breakage/failure (37.5%) followed by aseptic loosening (21.8%), periprosthetic fracture (18.7%) , prosthetic joint infection (9.3%) and dislocation/subluxation (6.2%). Only 1 patient died after the operation and 3 had infection. Requirement of second r-THR was needed in 9.3% of patients.

Conclusion: ETO is a secure and effective procedure that can be applied during revision hip surgery. It produces a stable union with comparatively few difficulties when correctly executed, repaired methodically utilizing cables or wires, and supported by autologous bone graft.

Keywords: aseptic, extended trochanteric osteotomy, hip Joint, hip stability, revision total hip replacement.

Introduction

The total hip replacement (THA) treatment is regarded as one of the most effective ones in orthopedics. However, in the short- or long-term, some individuals will require a revision procedure. Total hip arthroplasty failure may be significantly influenced by a number of patient, surgeon, and/or implant-related factors. A THA revision is a very difficult procedure that necessitates training and rigorous preoperative preparation [1].

The patient's age, post-operative mobility, and capacity to adhere to rehabilitation guidelines are only a few of the many variables that influence the final clinical outcome. Additionally, the quality of the remaining bone stock from the unsuccessful arthroplasty is crucial. [2,3]

Preoperative planning that is accurate and in-depth is essential for a successful surgical treatment. Bone preservation should be one of the top concerns intraoperatively, and exposure should be adequate [4,5]. Notably, maintaining the femur's axial and rotational stability as well as treating any bone abnormalities already present are crucial for a successful procedure.

The extended trochanteric osteotomy (ETO) is one of the procedures that frequently follows a THA revision operation [4]. It is a highly effective operation that was first developed for the therapy of significant femoral bone abnormalities (Paprosky III-A and III-B) and for the excision of lengthy stems. The implantation of lengthy stems is now intimately tied to the use of this technique.

Better femur exposure and visibility as well as soft tissue preservation are the key benefits of ETO. Additionally, it encourages the femoral stem's quicker and safer removal, whether it is cemented or not.

If an implant fractures, the osteotomy site makes it considerably simpler to locate and remove the shards. It should be emphasized that removal without osteotomy is extremely difficult and can cause serious bone deformities when the implant has a porous surface. Therefore, using an osteotomy helps preserve bone stock and facilitates a more painless component extraction. Additionally, it is also possible to treat torsional and other femoral abnormalities.[5]

Hence the present study was conducted to assess the outcome of extended trochanteric osteotomy (ETO) in revision total hip arthroplasty.

Material & Methods

The present prospective study was conducted at department of orthopaedics among 32 patients admitted to hospital for revision total hip arthroplasty during the period of study. Ethical permission was taken from the institutional ethical committee before the commencement of study. Informed consent was signed by each patient before the procedure.

Patients above age of 18 years, who had a failure of total hip arthroplasty in past and willing to participate in the study, were included in the study and those with age less than 18 years, had a fresh injury and did not signed the consent form were excluded from the study.

Extended trochanteric osteotomy (ETO) procedure was used in revision total hip arthrolasty. All procedures were performed via the posterior approach. All patients underwent osteotomy site reconstruction with a combination of cables and metallic wires. For the first six weeks, patients were allowed to bear some weight with around 25% of their body weight passing through the surgically repaired hip without wearing any braces. The restrictions on weight-bearing were eased after six weeks, and patients were allowed to move around without crutches or walking sticks, but some continued to use them for three more months. From the very first post-operative day, active hip and knee ranges of motion were encouraged. All patients were followed to assess clinical and radiological outcomes.

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 23.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables will be expressed as Mean±SD and categorical variables were summarized as frequency and percentages. Chi-square test was applied for comparing categorical variables. A P-value of less than 0.05 will be considered statistically significant.

Results

The demographic data of patients showed that 15.6% of patients had age less than or equal to 55 years while 84.4% patients had age more than 55 years. Out of 32 patients 28.1% were male and 71.9% were female.(Table 1).

Table 1: Showing demographic data of patients

Variable		N (%)
Age	≤ 55 years	5 (15.6)
	>55 years	27 (84.4)
Gender	Male	9 (28.1)
	Female	23 (71.9)

The main cause of index injury was hip trauma in 53.1% of patients followed by inflammatory arthritis (9.4%), AVN (6.3%) and primary osteoarthritis (3.1%). Time to failure from index injury greater than 10 years was found in 40.6% patients, 2-10 years in 31.3% of patients and 25 % in less than 2 years patients. 53.1% of patients had cemented THA surgery, 34.3% had cemented hemiarthroplasty , 6.3% had uncemented THA and least 3.1 % had Femur IL nail/PFN/plate plus debridement & spacer.

Table 2: Shows different variable associated with primary surgical procedure

Variable		N (%)
Cause of index surgery	Primary osteoarthritis	1 (3.1)
	AVN	2 (6.3)
	Inflammatory arthritis	3 (9.4)
	Hip trauma	17 (53.1)
	Details not available	9 (28.1)
Time to failure from index surgery	Early < 2 years	8 (25)
	Midterm 2 - 10 years	10 (31.3)
	Late > 10 years	13 (40.6)
Type of index surgery	Cemented hemiarthroplasty	11 (34.4)
	Cemented THA	17 (53.1)
	Uncemented THA	2 (6.3)
	Femur IL nail/PFN/plate	1 (3.1)
	Debridement & spacer	1 (3.1)

The most common cause for failure of index injury was implant breakage/failure (37.5%) followed by aseptic loosening (21.8%), periprosthetic fracture (18.7%), prosthetic joint infection (9.3%) and dislocation/subluxation (6.2%). The mean HHS, WHO QOL and VAS pre-rTHR was 68.35±12.3, 75.83±15.4 and 8.34±2.3 respectively. 59.3% patients were followed up for less than 2 years while 40.6% were followed for more than 2 years. Follow up was done both clinically and radiologically. The mean HHS, WHO QOL and VAS post-rTHR was 78.68±11.5, 84.35±10.2 and 2.1±0.58 repectively. Only 1 patient died after the operation and 3 had infection. Requirement of second r-THR was needed in 9.3% of patients as shown in table 3.

Table 3: Shows variable associated with revision ETO

Variable		N (%)
Cause for failure of index surgery	Prosthetic joint infection	3 (9.3)
	Aseptic loosening	7 (21.8)
	Dislocation /subluxation	2 (6.2)
	Periprosthetic fracture	6 (18.7)
	Implant breakage/failure	12 (37.5)
	Miscellaneous	2 (6.2)
Pre-rTHR clinical status	HHS	68.35±12.3
	WHO QOL	75.83±15.4
	VAS	8.34±2.3
Follow up: duration	<2 years	19 (59.3)
	>2 years	13 (40.6)
Clinical/radiology FU	Both (clinical + radiological)	32 (100)
	Phone FU	0
Post rTHR clinical status	HHS	78.68±11.5
	WHO QOL	84.35±10.2
	VAS	2.1±0.58
Complications	Death	1 (3.1)
	Any other Infection	3 (9.3)
Second rTHR	Yes	3 (9.3)
	No	29 (90.6)

Discussion

ETO is a potent revision tool for surgeons performing hip arthroplasty. This secure technique enables the removal of cemented or uncemented femoral components that are mechanically stable. The inability of an extraction device attached to an implant to move after receiving many hard hits defines an implant as being mechanically stable. When this happened, all subsequent attempts at forcible physical extraction were given up in favor of ETO. Bone quality and greater trochanter condition should be thoroughly evaluated. The risk of non-union is raised by attempts to reach and divide the bone-implant contact, which leads to trochanter fragmentation, perforations, and iatrogenic fractures. To avoid these problems, ETO with a sizable reattachment surface is suggested. The degree of ETO needs to be carefully planned because it differs for various stems. Bone-implant bonding occurs at the metaphysio-diaphysial junction typically for proximally coated anatomical stems, and the osteotomy length is determined by the coated section of the stem. The osteotomy level should be raised to the implant's tip in both fully coated stems made of cementless material and those made of cement. [6]

The present study was conducted among 32 patients who visited to department of orthopedics for extended trochanteric osteotomy in revision total hip arthroplasty during the study period. The patients were assessed on different scale and conditions were recorded before and after operation.

In our study the 84.4% patients had age greater than 55 years and out of total patients 81.9% were females and rest were males. In a study conducted by Singh A et al [6] the average age was 59.9 years concluding that patient with older age had higher chances of having hip injury and in their study males and female ratio was almost equal which was dissimilar to our study.

Due to aseptic loosening, the indications for ETO are broad and not restricted. Additionally, it can be applied to periprosthetic joint infections (PJIs), particularly when there are no other options for removing the stem. ETO is utilized in this situation to treat periprosthetic infections as part of the two-stage procedure. Since more implants are being utilized, which increases the strain on eradicating infections, the key question is if it is safe. However, published data show acceptable infection eradication rates, comparable to those studies that do not use ETO [7]. In femur fractures caused by THA that are

periprosthetic, the ETO method is also used. Following the fracture lines in these situations, a fracture-induced osteotomy is typically carried out. This technique preserves the associated soft tissues while allowing access to the implant [8]. In our study also the main reason for conducting ETO was implant breakage (37.5%) followed by aseptic loosening (21.8%), pre-prosthetic fracture (18.7%) and prosthetic joint infection (9.3%).

The mean harris hip score, WHO quality of life and visual analogue scale for pain were calculated before and after doing ETO and it was found that the mean value of HHS and WHO-QOL increased after revision while VAS mean decreased showing the improvement in quality of life and decrease in pain of patients.

In our study 59.3% patients were followed up clinically and radiologically for less than 2 years while 40.6% were followed up for more than 2 years. This shows that application of this method has shown good results, but with short-term follow up, up to 2 years [9].

In our study only one patient died while 3 had infection after the procedure and it was comparable to that reported by Drexler et al [10] in a retrospective review of 34 patients, the ETO healed in all cases, and only 2 patients had femoral stem subsidence.

The purpose of the study was to assess the union rate, osteotomy-related problems, and results following revision hip arthroplasty. In our experience, if the stem is securely attached, this procedure is recommended since it enables the management of holes and fractures. The study's limitations were the few patients it included and the absence of a control group. Furthermore, because many patients were referred from remote hospitals and found it challenging to return for examinations, the length of clinical and radiological followup was constrained.

Conclusion

ETO is a crucial procedure for revision hip surgeons, to sum up. It facilitates the removal of the implant and cement mantle and allows great access to the femoral canal without damaging the bone stock. It is also time efficient, safe, cost-effective, and safe. ETO has good functional and radiological outcomes with fewer problems when it is skillfully carried out, painstakingly mended with wires, and supported with autologous bone graft. Plates and cables/wires should be used to fix intraoperative osteotomy fractures.

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