

COMPARISON OF THE FUNCTIONAL OUTCOME OF EXTRAMEDULLARY AND INTRAMEDULLARY FIXATION FOR UNSTABLE INTERTROCHANTERIC FEMORAL FRACTURES

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Abstract

Objective: The purpose of this study was to compare the functional outcome of patients undergoing extramedullary and intramedullary fixation types for unstable intertrochanteric fractures of the femur. **Methods:** 52 cases of unstable intertrochanteric femoral fractures (AO/OTA 31A2.2-31A3.30) were treated in between 1st January 2016 to 31st December 2017 at the Department of Orthopaedic Surgery, Chittagong Medical College Hospital. Patients were divided into two groups by consecutive sampling. Group A underwent intramedullary fixation while group B underwent extramedullary fixation. Patients were evaluated clinically and radiologically for outcome. All patients were followed up for an average of 24 weeks. Outcome was assessed using the Lower Extremity Measure (LEM) Score. **Result:** In this study, 52 cases of unstable intertrochanteric fractures were divided into two groups and treated. In the study, 27 patients were male and 25 were female. In the intramedullary group, 07(27%) were from younger age group and 19(73%) were in the older age group. In the extramedullary group 06(23%) were from the younger age group while 20(77%) were from the older age group. In the study, 27 (52%) fractures united within 10-12 weeks and there was no significant difference amongst the two groups. There was no significant difference in the overall functional outcome amongst the two groups ($p=0.552$) at four months. **Conclusion:** In this study, there was no significant difference in the functional outcome of patients with unstable intertrochanteric fractures treated with intramedullary or extramedullary fixation although large, multicentre and longer duration studies can be undertaken to evaluate this further.

Keywords: Extramedullary, intertrochanteric, femoral, fractures

СРАВНЕНИЕ ФУНКЦИОНАЛЬНЫХ РЕЗУЛЬТАТОВ ЭКСТРАМЕДУЛЛЯРНОЙ И ИНТРАМЕДУЛЛЯРНОЙ ФИКСАЦИИ НЕСТАБИЛЬНЫХ МЕЖВЕРТЕЛЬНЫХ ПЕРЕЛОМОВ БЕДРЕННОЙ КОСТИ

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Аннотация

Цель: Целью данного исследования было сравнение функциональных результатов лечения пациентов с нестабильными межвертельными переломами бедренной кости, которым проводилась экстрамедуллярная и интрамедуллярная фиксация. Методы: В период с 1 января 2016 года по 31 декабря 2017 года в отделении ортопедической хирургии больницы Медицинского колледжа Читтагонга было пролечено 52 случая нестабильных межвертельных переломов бедренной кости (АО/ОТА 31A2.2-31A3.30). Пациенты были разделены на две группы методом последовательной выборки. Группа А подверглась интрамедуллярной фиксации, а группа В — экстрамедуллярной фиксации. Результаты лечения оценивались клинически и рентгенологически. Все пациенты наблюдались в среднем в течение 24 недель. Результаты оценивались с использованием шкалы оценки состояния нижних конечностей (LEM). Результат: В данном исследовании 52 случая нестабильных межвертельных переломов были разделены на две группы и подвергнуты лечению. В исследовании участвовали 27 мужчин и 25 женщин. В группе интрамедуллярной фиксации 7 (27%) пациентов были из более молодой возрастной группы, а 19 (73%) — из более старшей. В группе экстрамедуллярной фиксации 6 (23%) пациентов были из более молодой возрастной группы, а 20 (77%) — из более старшей. В исследовании 27 (52%) переломов срослись в течение 10-12 недель, и существенной разницы между двумя группами не было. Не было существенной разницы в общем функциональном исходе между двумя группами ($p=0,552$) через четыре месяца. Заключение: В данном исследовании не было существенной разницы в функциональном исходе у пациентов с нестабильными межвертельными переломами, леченных интрамедуллярной или экстрамедуллярной фиксацией, хотя для дальнейшей оценки этого можно провести более крупные многоцентровые исследования с большей продолжительностью.

Ключевые слова: экстрамедуллярные, межвертельные, бедренные переломы

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INTRODUCTION

Intertrochanteric fractures of the femur are one of the commonest fractures specially in the elderly population. Stable fixation and early mobilization are the treatment of choice for these fractures. Among them, the unstable type fractures pose a dilemma for the surgeons regarding type of fixation. Newer intramedullary devices are challenging the time-tested extramedullary devices. Intramedullary and extramedullary fixation methods are two of the widely used techniques for intervention. The sliding compression screw and side plate, introduced in the 1950's, has been the standard of care for surgical treatment of intertrochanteric fractures of the femur for many years. In the 1990s, intramedullary devices started gaining popularity despite any conclusive evidence of superior performance. The proposed advantages were insertion through a so-called minimally invasive incision and improved fracture fixation

biomechanics [1,2]. There have been various published studies regarding comparative outcome of intramedullary versus extramedullary fixation for unstable intertrochanteric fracture. Most studies have focused on radiographic evidence of failure and reoperation rates without considering patient function [3]. Parker and Handoll compared extramedullary to intramedullary devices in a meta-analysis of >3,500 patients and found no significant differences in mortality rates, nonunion, infection, cutout, blood loss, operation duration and radiation time [4]. Reindl et al in 2015 found no significant difference in functional outcome in 204 patients in a multicentre study although there was significant difference in neck shortening [5]. Aktselis et al in 2014 and Xu et al in 2010 reported the Parker and Palmer mobility score in their studies. Intramedullary fixation was associated with higher functional scores [6, 7]. Moreover, intramedullary fixation has much higher economic costs in comparison to extramedullary fixation types. Also, such types of fractures are expected to rise in the near future due to increase in life expectancy [8]. This study is aimed at studying if there is any significant difference in the functional outcome of the patients undergoing intramedullary fixation versus extramedullary fixation.

Materials & method

A Quasi experimental study was conducted from January 2016 to December 2017 among 52 femoral bone fracture patients attending at orthopedic surgery department, Chittagong Medical College Hospital, Chittagong after obtaining requisite consent from the patient. Patients above 18 years with AO/OTA 31 A2.2-A2.3 & A3 fractures and fit for anesthesia were included in this study. Data were collected through the assessment and X-ray report of patients in the orthopedic surgery Department. The collected data were entered into the computer and analyzed by using SPSS (version 20.1). The study was approved by the institutional ethical committee. Purposive sampling was done according to availability of the patients. Patients were divided into two groups by consecutive sampling. Group A underwent intramedullary fixation while group B underwent extramedullary fixation. All patients were followed up for an average of 24 weeks. Outcome was assessed using the Lower Extremity Measure (LEM) Score.

Results

Table 1 showing the demographic characteristics of respondents. The percent of individuals undergoing intramedullary fixation does not statistically differ significantly by sex group ($p=0.052$), age group ($p=0.749$) or side of fracture ($p=0.578$).

Table 1: Demographic characteristic of respondents (n=52)

Parameter	Intramedullary group	Extramedullary group	p-value
Age (years)			
Younger group(<40y)	07 (27%)	06 (23%)	0.749
Older group(>40y)	19 (73%)	20 (77%)	
Gender of patients			
Male	17 (65%)	10 (38%)	0.052
Female	09 (35%)	16 (62%)	

Table 2 shows there was no significant difference in complications among the two groups of fixation ($p=0.607$)

Table 2: Distribution of patients according to complications and interventions (n=52)

Complications	Intramedullary group	Extramedullary group	p-value
No complications	20 (77%)	18(69%)	0.607
Post-operative deep infection	00(0%)	01(04%)	
Post-operative superficial infection	02(08%)	01(04%)	
Intermittent pain	04 (15%)	06(23%)	
Non-union	00 (00%)	00(00%)	

Table 3 shows there is no significant relation between radiological union and type of fixation ($p=0.595$)

Table 3: Association between radiological union and intervention (n=52)

Radiological union	Intramedullary group	Extramedullary group	p-value
Within10-12weeks	14(54%)	13(50%)	0.595
Within12-16weeks	12(46%)	12(46%)	
Within16-24weeks	00(00%)	01 (4%)	

Table 4 shows an independent t-test found the mean functional outcome was statistically higher in respondents with injury to surgery interval of less than 15 days ($M= 100.96$, $SD= 7.22$) compared to respondents with injury to surgery interval of more than 15 days ($M= 93.42$, $SD=16.96$), $t(50)= 2.09$, $p=0.045$.

Table 4: Association of functional outcome to injury to surgery interval

Injury to surgery interval	Outcome	Mean	SD	t	p-value
Early (<15 days)	100.96	7.22		2.09	0.045*
Late (>15 days)	93.42	16.96			

Figure 1 shows that 46% patients in the intramedullary group had excellent outcome in comparison to 44% in the extramedullary group. Both the groups were similar with regard to good and fair outcomes with 2% each. However, there was no poor outcome in the intramedullary group compared to 2% patients with poor outcome in the extramedullary group.

Figure1: Bar Chart showing Functional Outcome of study population at 4 months

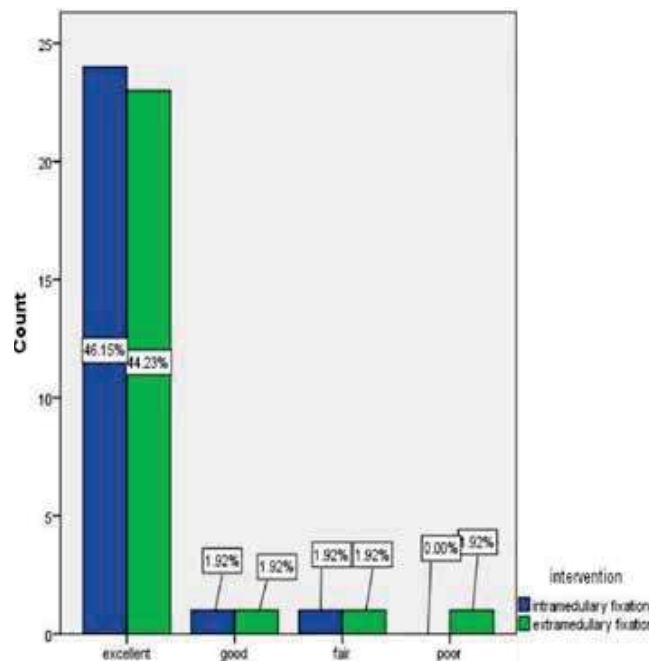


Table 5 shows the final functional outcome of the study population. In the intramedullary group 25 (96%) patients had satisfactory outcome (excellent and good) while 01(04%) had unsatisfactory outcome (fair and poor). The statistical difference among the two groups was not significant ($p=0.552$)

Table 5: Final functional outcome of the study population

Functional outcome	Intramedullary group	Extramedullary group	P value
Satisfactory outcome	25(96%)	24(92%)	0.552
Unsatisfactory outcome	01(04%)	02(08%)	

Table 6 shows that in a logistic regression model after adjusting for other factors, the association between satisfactory outcome and injury to surgery interval did not persist. ($p=0.998$)

Table 6: Logistic regression analysis to assess factors associated with satisfactory outcome

Factors	B	Wald	Sig.	Exp(B)	95% C.I.for EXP(B) Lower Upper
Age	-.163	.000	1.000	.850	.000
Injury to surgery interval	-18.305	.000	.998	.000	.000

CI=Confidence Interval

Table 7 shows that in the intramedullary fixation group 1 patient had unsatisfactory outcome and 25 patients did not have unsatisfactory outcome. In the extramedullary fixation group, 2 patients had unsatisfactory outcome and 24 patients did not have unsatisfactory outcome.

- Control group Absolute Risk (ARC) = $c / (c+d) = 2/26 = 0.077 = 7.7\%$
- Experimental group Absolute Risk (ART) = $a / (a+b) = 1/26 = 0.038 = 3.8\%$
- Absolute Risk Reduction (ARR) = $ARC - ART = 0.077 - 0.039 = 3.9\%$
- Relative Risk (RR) = $ART / ARC = 0.038 / 0.077 = 0.5 = 50\%$
- Relative Risk Reduction (RRR) = $(ARC - ART) / ARC = 0.077 - 0.038 / 0.077 = 0.039 / 0.077 = 0.5 = 50\%$
- Number Needed To Treat (NNT) = $1 / ARR = 1 / 0.039 = 26$

Table 7: Association of intervention to unsatisfactory outcome

Intervention	Unsatisfactory Yes	Outcome No	Total (N)
Intramedullary fixation	1 (a)	25 (b)	26 (a+b)
Extramedullary fixation	2 (c)	24 (d)	26 (c+d)
Total	3	49	52

DISCUSSION

In this study, the injury to surgery interval was from 3 days to 31 days. In a student's t test, this injury to surgery interval was found to be significantly associated with functional outcome. The patients who were operated within 15 days of injury, had significantly better functional outcome at four months than those treated after 15 days ($p=0.045$). However, in a logistic regression model, no association was found with early injury to surgery interval and satisfactory outcome ($p=0.998$). In a study in 2008 Amer N. Al-Ani et al found patients who had the operation more than thirty-six and forty-eight hours after admission were less likely to return to independent living within four months (odds ratio, 0.44 and 0.33, respectively) [9]. In that study, the importance of surgical timing remained significant after adjusting for several possible confounders ($p < 0.05$). In this study, 20(77%) patients in the intramedullary group and 18(69%) in the extramedullary group had no complications. Only 01(04%) patient in the extramedullary group had deep infection. 1(04%) patient in the extramedullary group had superficial infection while 02(08%) patients in the intramedullary group had superficial infections. No patient had non-union although 04(15%) patients in the intramedullary group and 06(23%) patients in the extramedullary group complained of intermittent pain. In 2016, Reind et al reported no infection in their study but reported 3 cases of implant failure [11]. Aktelis et al in 2010 and Pajarinen et al in 2005 also reported no superficial or deep wound infection in their study [6,10]. Finally, 49(94%) patient had satisfactory outcome from a total of 52. 25(96%) patients in the intramedullary group and 24(92%) in the extramedullary group had satisfactory outcome. The difference in functional outcome was not significantly different ($P=0.552$). Authors around the world have reported mixed results regarding functional outcome of patients treated by these two methods. Reind et al in 2016 in a multicentre study reported similar results with no significant difference at 6 months ($p=0.45$) [5]. Aktselis et al in 2014 reported no significant difference in functional outcome at 3 months and 6 months post-operatively but reported significant difference in functional outcome in the intramedullary group at 12 months [6]. Pajarinen et al in 2005

reported significant improvement in restoration of walking ability ($P=0.040$) in patients treated with intramedullary fixation compared to extramedullary fixation method [10]. Chua et al in 2013 reported significant improvement in functional status in patients treated with intramedullary fixation at 6 months ($P=0.002$) [11].

Conclusion

According to this study, there is no significant difference in the functional outcome of unstable intertrochanteric fractures treated by intramedullary fixation or extramedullary fixation. Both devices demonstrated low complication rate and high fracture healing rates. Both the techniques were safe and implant failure was not observed in any case.

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Conflict of Interest

Authors declare no conflict of Interest

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