Influence of Early post Operative Weight Bearing on Hip Function after Femoral Trochanteric Fractures

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ABSTRACT

Background: *Proximal femoral fractures are one of the commonest reasons for an elderly patient to be admitted to an acute orthopaedic ward. Rigid fixation with early mobilization of patients should be considered as the standard treatment.* ***Objective:*** *The purpose of this study was to investigate the effect of early weight bearing after undisplaced trochanteric femoral fractures fixed by dynamic hip screw on hip function.* ***Methods:*** *Thirty patients with age ranged from fifty to seventy years with undisplaced trochanteric femoral fractures fixed with dynamic hip screw participated in this study. They were assigned randomly into two experimental groups. Group (A) consisted of fifteen patients (9 males and 6 females) with mean age of 57.93 (± 5.70) years who received a conventional program of physical therapy (breathing exercises, static quadriceps exercises, range of motion exercises and strengthening exercises for the hip, knee and ankle muscles) in addition to a program of early weight bearing (within 48 hours post-operatively). Each patient was treated for three sessions per week for a total period of four weeks. Group (B) consisted of fifteen patients (7 males and 8 females) with mean age of 60.87 (± 4.19) years who received the same conventional physical therapy program as in group (A) in addition to program of late weight bearing (2 weeks post-operatively). Each patient was treated for three sessions per week for a total period of four weeks. All patients were assessed before and after the study for their pain severity, limp, support, distance walked, sitting, stairs, put on shoes and socks, and range of motion by using Harris hip score.* ***Results:*** *The results revealed that there were significant differences between both groups in favor of group (A) regarding support, distance walked, sitting, stairs, put on shoes and socks; however no significant differences between groups were found regarding pain severity, limp and range of motion.* ***Conclusion:*** *Starting weight bearing early after undisplaced trochanteric femoral fractures fixed with DHS significantly improved the function of the hip joint than late weight bearing.*

Key words: *Hip Trochanteric Fractures, Early Weight Bearing, Physical Therapy.*

INTRODUCTION

Proximal femoral fracture is one of the commonest reasons for an elderly patient to be admitted to an acute orthopaedic care[20,21]. Femoral neck and intertrochanteric fractures account for 90% of the proximal femoral fractures occurring in elderly patients. Proximal femoral fractures in elderly patients are often pathologic, usually resulting from minimal to-moderate physical trauma to areas of bone significantly affected by osteoporosis. The incidence of proximal femoral fractures among females is two to three times higher than among males. The risk of a proximal femoral fracture doubles every ten years after age of fifty[5].

Surgical treatment is necessary to optimize post-injury mobility and functional recovery in the most of hip fracture patients[13]. Rigid fixation with early mobility of patients should be considered as the standard treatment. Although many devices can achieve rigid fixation, the dynamic hip screw (DHS) is the most commonly used one for intertrochanteric fractures due to its advantage as a high union rate with interfragmental compression effect[16].

The most important aspect of post-surgical management of hip fracture is early mobility, to prevent the complications associated with bed rest[27]. Walking within 2 weeks post-surgery is a verification of good quality of surgery with no complications. As a matter of fact, in one of the early series, the walking ability within two weeks postoperatively was more prognostic than the pre- fracture walking ability for early return home[2,3].

Weight bearing process is suggested to promote fracture healing in lower extremity fracture. Theoretically, if the effect of weight bearing is great, loss of weight bearing should produce a much lower union rate. Thus, most bed-ridden patients should have an

unsatisfactory outcome with lower extremity fractures[26].

For the vast majority of hip fracture patients, the post-operative instructions should be to allow unrestricted mobilization and weight-bearing from the time of surgery. Restricted weight-bearing are unnecessary[7]. Delaying mobilization till after a check X-ray has been completed is also an outdated and unnecessary practice. Regardless of fracture pattern or the degree of osteoporosis, with current implants for extracapsular fractures, it should be possible to fix all fractures with sufficient stability to allow full weight-bearing. The only patients in which delayed weight-bearing may be of value is for displaced intracapsular fractures treated by internal fixation, and even in this situation there is no evidence to date to support the theory that delaying weight-bearing will reduce the risk of fracture healing complications[22].

Restricted weight bearing may significantly delay the functional recovery of elderly patients, including their return to independent living. It has been demonstrated that unrestricted weight bearing does not increase the rate of complications after internal fixation (using nails or screws) of non-displaced fractures of the femoral neck or stable intertrochanteric fractures. Those who have a displaced or unstable fracture, however, often are restricted to partial weight bearing because of the potential for failure of the fixation and/or the risk of non-union. Surgeons are often also hesitant to permit early, unrestricted weight bearing until they are sure that fracture healing is occurring appropriately[14,27].

Partial weight bearing with crutches or walker assistance is routine for patients with hip fractures for at least four weeks after discharge, and full weight bearing is permitted after four weeks, depending on individual clinical condition[16].

Although it is well accepted that early mobilization is vital for avoiding post operative medical complications, the optimal weight bearing status after hip fractures surgery remains controversial. Restricted weight bearing can delay the elderly hip fracture patient's functional recovery and return to independent living, yet there is hesitancy among some surgeons to allow immediate unrestricted weight bearing. Because of concern about mechanical failure, particularly in patients with unstable intertrochanteric fracture patterns, investigators advocate protected weight bearing until there is radiographic evidence of fracture healing[15].

Although full weight bearing is more accepted in current hip fracture management, there is still some uncertainty reflected in local practice[10]. Ten to twenty years ago, weight bearing was delayed until radiographic evidence of bony callus formation was present. This delay of up to 6 to 10 weeks in weight bearing and ambulation resulted in functional deficits and disability. Within the last 5 to 10 years, earlier weight bearing has been encouraged, reported to be safe, and may facilitate fracture healing. Ultimately, immediate weight bearing may result in decreased costs of care, less hospitalization, and a decreased need for prolonged inpatient rehabilitation. This premise, however, has not been substantiated in the literature. It is believed that an aggressive physical therapy program with early weight bearing may facilitate long term success with patients by quickly decreasing the level of impairment that leads to functional limitations and disability in these patients[23]. Despite routine ambulation protocols for patients with fractured hip encouraging ambulation as soon as possible after surgery, early mobilization is challenging and uncomfortable for the patient and requires the assistance of one or sometimes two physiotherapists available 7 days per week[19]. Therefore the purpose of this study was to investigate the effect of early weight bearing on hip functional limitations and disability after undisplaced impact trochanteric femoral fractures fixed by DHS.

MATERIALS AND METHODS

Subjects

This study was conducted in the Department of Orthopedic Surgery, Faculty of Medicine, Cairo University, and the outpatient clinic of the Faculty of Physical Therapy, Cairo University on thirty patients (sixteen

males and fourteen females) diagnosed as undisplaced impact trochanteric femoral fractures fixed by DHS, referred from an orthopedic surgeon after the operation. Their ages ranged from 50-70 years and were randomly assigned into two experimental groups.

Group (A): Consisted of fifteen patients (nine males and six females) who received a conventional program of physical therapy which consisted of breathing exercises, static quadriceps exercises, range of motion exercises and strengthening exercises for the hip and knee muscles in addition to a program of early weight bearing (within 48 hours post-operatively). Each patient was treated for three sessions per week for a total period of four weeks.

Group (B): Consisted of fifteen patients (seven males and eight females) who received the same physical therapy program as in group (A) in addition to a program of late weight bearing (2 weeks post-operatively). Each patient was treated for three sessions per week for a total period of four weeks.

Exclusion criteria included previous hip or lower extremity surgery, pathological conditions of the lower extremity e.g. tumors, infections and other systemic diseases, eg. diabetes, rheumatoid arthritis.

Evaluation procedure

All patients were assessed before and after the exercise program for functional ability using the Harris hip score. Patients received verbal and written descriptions of all procedures, and the testing was performed after they signed written informed consent form.

The Harris hip score is a multidimensional observational assessment which contains eight items representing pain, walking function, activities of daily living, and range of motion of the hip joint. Final score ranges from 100 (no disability) to 0 (maximum disability). The index consists of questions about pain and activities of daily living and assessments of hip function and range of motion[8].

Treatment procedures

The physical therapy program consisted of deep respiratory exercises[13]; active and active assisted range of motion exercises for hip, knee and ankle[18,19,20,21,22,23], ten repetition for each exercise; static quadriceps exercise five to ten repetition as tolerated two to three times; and strengthening exercises for hip abductors, hip extensors, knee flexors, knee extensor, ankle dorsiflexors and ankle planterflexors[23]. All strengthening exercises were performed in three sets, five repetitions each[24] in addition to a weight bearing program. For group (A), all patients started the weight bearing on postoperative day three[23], and for group (B), all patients started the weight bearing after two weeks post-operative. Patients began weight bearing as tolerated[3] with modified three point gait i.e. the patient advances the assistive device with the affected limb simultaneously and then advance the non-affected limb. The patient walked for an 8 meters distance and progressed with 3 meters each session for a maximum of 45 meters at the end of the fourth week[18]. During this process, gradual weaning from the walker to forearm crutches to cane was proceeded as tolerated[13].

RESULTS

Unpaired t-test revealed no significant difference between group (A) with mean age of 57.93 (±5.70) and group (B) with mean age of 60.87 (±4.19) with t- test = 1.61 and P value = 0.12 (Table 1). Chi square test revealed no significant difference between group (A) (females / males) [6 / 9 (40 / 60%)] and their corresponding in group (B) [8 / 7 (53.3 / 46.7%)] with Chi square test = 0.53 and P value = 0.46 (Table 1).

Table (1): Demographic data of both groups.

	Group A	Group B	Test value	P-value
Age (yrs.)	57.93(± 5.70)	60.87 (± 4.19)	T = 1.61	0.12 (NS)
Gender (F/M)	6/9 (40/60%)	8/7 (53.3/46.7%)	χ^2= 0.53	0.46 (NS)

Data are expressed as means (± SD) χ^2= Chi square test NS= Not significant

Within group (A) differences

Paired t-test showed significant difference (P < 0.05) between the means before and after treatment in group (A) as regards to pain severity, limp, range of motion, support, distance walked, sitting, stairs and put on shoes and socks (Table 2).

Table (2): Within group (A) differences.

	Before	After	t-value	P-value
Pain	10 (± 0.00)	36.0(± 5.071)	19.85	0.00
Limp	0 (± 0.00)	7.8(± 0.775)	39.00	0.00
Range of motion	0 (± 0.00)	3.53(± 0.639)	21.38	0.00
Support	0 (± 0.00)	6.2(± 2.210)	10.86	0.00
Distance walked	0 (± 0.00)	8.6(± 2.028)	16.42	0.00
Sitting	1.2 (± 1.521)	5.0(± 0.00)	9.67	0.00
Stairs	0 (± 0.00)	2.6(± 1.056)	9.53	0.00
Put on shoes and socks	0 (± 0.00)	3.86(± 0.516)	29.00	0.00

Within group (B) differences

Paired t-test revealed that there was a significant difference (P< 0.05) between the means before and after treatment in group (B) as regards to pain severity, limp, range of motion, support, distance walked, sitting, stairs and put on shoes and socks (Table 3).

Table (3): Within group (B) differences.

	Before	After	t-value	P- value
Pain	10.0 (± 0.00)	36.66 (± 4.88)	21.16	0.00
Limp	00.0 (± 0.00)	07.60 (± 1.056)	27.88	0.00
Range of motion	00.8 (± 1.014)	04.06 (± 0.593)	10.34	0.00
Support	00.0 (± 0.00)	04.73 (± 0.70)	26.05	0.00
Distance walked	00.0 (± 0.00)	06.40 (± 1.54)	16.00	0.00
Sitting	03.40 (± 1.68)	05.00 (± 0.00)	3.68	0.00
Stairs	00.0 (± 0.00)	01.86 (± 0.351)	20.54	0.00
Put on shoes and socks	00.0 (± 0.00)	02.80 (± 1.014)	10.69	0.00

Comparison between groups

Unpaired t-test was used to show difference between groups as regards to pain severity, limp, range of motion, support, distance walked, sitting, stairs and put on shoes and socks. The results of the present study revealed that there were significant differences between the mean difference values of both groups in favor of group (A) (P < 0.05) regarding support, distance walked, sitting, stairs, put on shoes and socks where the mean difference values in group (A) was higher than group (B). However, no significant difference was found between groups regarding pain severity, limp and range of motion (Table 4).

Table (4): Between groups differences.

	Group A	Group B	t-value	P-value
Pain	26.00 (± 5.071)	26.66 (± 4.88)	0.366	0.71 (NS)
Limp	07.80 (± 0.775)	07.60 (± 1.056)	0.591	0.55 (NS)
Range of motion	03.53 (± 0.639)	03.26 (± 0.315)	0.748	0.46 (NS)
Support	06.20 (± 2.210)	04.73 (± 0.703)	2.449	0.02
Distance walked	08.60 (± 2.028)	06.40 (± 1.549)	3.338	0.00
Sitting	03.80 (± 1.521)	01.60 (± 1.682)	3.757	0.00
Stairs	02.60 (± 1.056)	01.86 (± 0.351)	2.553	0.016
Put on shoes and socks	03.86 (± 0.516)	02.80 (± 1.014)	3.630	0.001

DISCUSSION

Hip fractures are a major problem for health-care providers because of the increasing incidence of fractures in an ageing population[19]. Hip fractures are a common medical problem that can reduce the quality of life for elderly adults. More than 300,000 people over the age of 50 are expected to fracture at hip each year, at an estimated cost of $ 5 billion per year[18].

Although it is well accepted that early mobilization is vital for avoiding post operative medical complications, the optimal weight bearing status after hip fractures surgery remains controversial[15]. Although full weight bearing is more accepted in current hip fracture management, there is still some uncertainty, and this is reflected in local practice[10]. Therefore this study was conducted to investigate the effect of early weight bearing after undisplaced trochanteric femoral fractures fixed by dynamic hip screw (DHS) on hip functions.

The hip functions and disabilities in the current study had been assessed by using the Harris hip score. The reason of choosing this scale is that now it is the scoring tool that is most commonly used worldwide for assessment of hip functions in general. It has become widely used as a means of comparing results and hip pathology[12,25]. Hoeksma et al. (2003)[8] concluded that the Harris hip score is a suitable measure for evaluating the success of rehabilitation interventions, such as exercise therapy.

According to the current results in this study, there was a significant difference between patients in group (A) who received a program of early weight bearing exercises (48 hours after the surgery) and a physical therapy program, and group (B) who received a program of late weight bearing exercises (two weeks postoperatively) with the same physical therapy program of group (A). The significant improvement was in favor of group (A) regarding support, distance walked, sitting, stairs, put on shoes and socks. No significant differences between both groups were found regarding pain severity, limp and range of motion.

The results of the current study are similar to the results of previous studies like those of Oldmeadow et al. (2006)[19] who used a prospective randomized method to investigate the effect of early ambulation after hip fracture surgery on patient and hospital outcomes. They highly recommended early ambulation after hip fracture surgery. They concluded that keeping patients in bed longer than 2 days post-surgery can contribute to delayed functional recovery and delayed discharge. They found that the consequences of the prolonged bed rest associated with the medical instability more poor functional progress on day 7 postoperative and a perceived need for high levels of care at discharge from the acute care. These consequences have implications for the overall health-care system. Thus, there is a clear priority to identify strategies to keep the elderly mobile and able to return to the community.

The study of Koval et al. (1996)[15] also supported early weight bearing. They prospectively followed 596 patients > 65 years of age with femoral neck or intertrochanteric fractures who were allowed immediate unrestricted weight bearing using a walker after surgery. More than 79% of patients were available for one year follow-up, and the overall revision surgery rate for loss of fixation, non-union, osteonecrosis, or prosthetic dislocation was 3.4%. They concluded that these results support the use of unrestricted weight bearing in elderly patients after surgical fixation of hip fractures.

Cheng et al. (1989)[4] described a study of 102 patients with a mean age of 76.8 years in which bed exercises were done for the first few days after hip fracture surgery. On the 4th post-operative day, the patients were started on full weight bearing exercises between parallel bars. They found that 82.2% of the patients could walk independently with a cane at four weeks, and that their average hospitalization was one month. Another study supported the results of the present study. Kamel et al. (2003)[11] studied the relationship between the time to ambulation after hip fracture surgery and the development of postoperative complications and length of hospital stay. Findings linked delayed ambulation to

increased frequency of postoperative complications and prolonged length of hospital stay[11]. These findings, combined with the lack of biomechanical justification for delayed ambulation after a hip fracture surgery, should encourage early postoperative ambulation.

In contrast to the previous studies, Penrod et al. (2004)[24] stated that more sessions of physical therapy in the hospital did not significantly increase the odds of recovery of walking ability 1 year post-hospital discharge for hip fracture after controlling for patient characteristics, hospitalization experience, discharge situation, and social supports. Parker and Gurusamy (2005)[22] also stated that delayed weight-bearing may be of value for patients with displaced intracapsular fractures treated by internal fixation.

The relationship between the amount of physical therapy that patients received immediately after hip fracture surgery up through 8 weeks and functional status at 2 and 6 months post-discharge was examined by Penrod et al. (2004)[24] who found that there was a mobility advantage at 2 months post-hip fracture for patients who received more physical therapy between the day of hip fracture surgery and the first 3 postoperative days. But the association between early physical therapy and mobility was attenuated at 6 months post-fracture. These findings are consistent with those of other studies, which found that more physical therapy sessions in the hospital were associated with better early mobility (at time of hospital discharge)[1,6,9]. Moreover, there are other findings of no mobility differences at later time points[1,17].

Conclusion

Starting weight bearing early after undisplaced trochanteric femoral fractures fixed with DHS significantly improved the function of the hip joint than late weight bearing.

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الملخص العربي

تأثير التحميل المبكر لوزن الجسم بعد الجراحة على وظائف مفصل الفخذ بعد الكسور المدورية الفخذية

الغرض من هذه الدراسة : هو استقصاء تأثير التحميل المبكر على وظائف مفصل الفخذ بعد الكسور المدوريه الفخذية المثبتة بالمسمار الديناميكي . العينة وطرق البحث : شارك في هذه الدراسة ثلاثون مريضا تم تقسيمهم عشوائياً على مجموعتين لكل مجموعة خمسة عشرة مريضا . تلقت المجموعة الأولي (أ) برنامج للتحميل المبكر بالاضافه لبرنامج العلاج الطبيعي التقليدي وتلقت المجموعة الثانية (ب) برنامج التحميل المتأخر بالاضافه لبرنامج العلاج الطبيعي التقليدي وكانت مدة العلاج لكل مريض اثنتا عشرة جلسة على مدار أربعة أسابيع بمعدل ثلاث جلسات في الأسبوع. وتراوحت أعمارهم بين الخمسون والسبعون سنة . تم تقييم شدة الألم ، العرج ، السند ، المشي ، الجلوس ، السلالم ، وضع الحذاء و الجوارب و المدى الحركي . النتائج : أثبتت نتائج الدراسة وجود فرق ملحوظ ذو دلاله إحصائية بين المجموعتين لصالح المجموعة الأولي (أ) فيما يخص التحسن في الوظائف الأتيه السند ، المشي ، الجلوس ، السلالم ، وضع الحذاء و الجوارب . وعدم وجود فرق ملحوظ ذو دلاله إحصائية بين المجموعتين فيما يخص التحسن في شدة الألم ، العرج و المدى الحركي . الاستنتاجات : بناء على البيانات والنتائج الحالية : نوصى بإضافة برنامج التحميل المبكر لبرنامج العلاج الطبيعي التقليدي الذي سيحسن بشكل ملحوظ وظائف مفصل الفخذ.

الكلمات الدالة : الكسور المدورية الفخذية ، التحميل المبكر ، العلاج الطبيعي .