



Original Article

Effectiveness of treatment of transtrochanteric fractures with Dynamic Hip Screws using minimally invasive access[☆]



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ABSTRACT

Objective: To analyze the short-term results from treating unstable intertrochanteric fractures with Dynamic Hip Screws (DHS), using a minimally invasive route, focusing on the functional aspects and complication and mortality rates of the method.

Methods: This was a prospective longitudinal study on 140 patients who underwent fixation of transtrochanteric fractures with the DHS system with a lateral minimally invasive access in the hip, between January and December 2013. The patients were evaluated pre and postoperatively (after six months of follow-up) by means of the Parker and Palmer mobility score. Women comprised 65.7% of the sample, and 54.3% of the fractures were on the right side. The patients' mean age was 80 years, ranging from 60 to 93 years.

Results: We observed an overall decrease in the mobility score and an increase in the degree of dependence over the short term. However, we encountered only two deaths in the study sample and there were no cases of infection or nonunion.

Conclusion: Despite the efficacy of the treatment with DHS, with high rates of fracture consolidation and a low mortality rate, we noted that the patients still showed significant functional limitation at the follow-up six months after the operation.

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Eficácia do tratamento das fraturas transtrocanterianas com Dynamic Hip Screw com acesso minimamente invasivo

RESUMO

Objetivo: Analisar os resultados do tratamento de fraturas transtrocanterianas instáveis com o Dinamic Hip Screw (DHS) por via minimamente invasiva e avaliar aspectos funcionais, taxas de complicação e óbitos do método, em curto prazo.

Palavras-chave:

Procedimentos cirúrgicos operatórios

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Fraturas do quadril
Fixação interna de fraturas

Métodos: Trata-se de um estudo longitudinal prospectivo, com 140 pacientes submetidos à fixação de fraturas transtrocantericas com sistema DHS, com acesso minimamente invasivo lateral do quadril, de janeiro a dezembro de 2013. Os pacientes foram avaliados pré e pós-operatoriamente (com seis meses de seguimento), de acordo com o escore de mobilidade de Parker e Palmer. A amostra apresentou 65,7% de mulheres, com o lado direito mais acometido (54,3%). A média de idade foi de 80 anos, variação entre 60 e 93.

Resultados: Notamos uma diminuição global no escore de mobilidade e aumento no grau de dependência desses pacientes em curto prazo. No entanto, obtivemos apenas dois óbitos na amostra estudada e nenhuma infecção ou falha na consolidação das fraturas.

Conclusão: Apesar da eficácia do tratamento com DHS, com elevados índices de consolidação e baixa taxa de mortalidade, notamos que os pacientes, ainda assim, apresentam uma limitação funcional significativa no seguimento até seis meses pós-operatórios.

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Introduction

Proximal fractures of the femur, among which transtrochanteric fractures can be highlighted, are a public health problem that especially affects the elderly population. They have a large social and economic impact. The incidence of these fractures has been increasing as the population becomes increasingly elderly, thanks to improvements in living conditions and greater attention to preventive medicine.¹ An exponential increase in the incidence of fractures of the proximal third of the femur has been recorded, with peak occurrence around the ages of 75–80 years.^{1,2}

These patients present chronic degenerative diseases with incapacities and deficiencies. They make use of medications that cause somnolence, balance problems and altered muscle tone, and they give rise to low blood pressure. Together, these are responsible for an increased risk of falls and this, along with varying degrees of osteoporosis, favor this type of injury.

Hip fractures account for 30% of hospital admissions in the United States³ and this percentage has been gradually increasing. It is expected that by 2040, the number of patients will reach around 329,000, with an annual treatment cost of around 16 billion dollars.⁴ According to Tronzo,⁵ these fractures can be classified as stable (types I and II) or unstable (III, IV and V), according to the degree of comminution of the posteromedial cortical bone. This is one of the principles that need to be understood in choosing the osteosynthesis method.

The ideal treatment is surgical and the fixation technique needs to be reproducible and non-aggressive, and to have a low complication rate and good functional results. In 1941 Jewet and Eugene⁶ conceptualized an implant with a static fixed angle that would allow early mobilization for the patient and reduce the incidence of deformities due to skewed varus consolidation.^{7,8}

However, this implant was often found to fail, due to uncontrolled collapse of the fracture and consequent cut-out. This led some authors such as Freitas et al.,⁹ Smith-Petersen et al.,¹⁰ Thornton,¹¹ Jewett and Eugene⁶ and McLaughlin¹² to seek new implant designs with compatible biomechanical principles. The Richards sliding compression screw was developed by Richards Surgical Ltd and this was subsequently

modified by Synthes Ltd, under the name Dynamic Hip Screws (DHS). This device was recommended by Schatzker¹³ and the AO group.¹⁴ Unlike the antiquated rigid implants, the DHS brought in the possibility of promoting continuous compression through the focus of the fracture, which hitherto had been impossible.¹⁵

Shortly after this, cephalomedullary nails emerged as a means for treating these fractures. This type of fixation gained many adherents because of the low degree of aggressiveness in implanting them, the shorter duration of the operation and hospital stay, and the consequent lower degree of morbidity in relation to traditional osteosynthesis methods that used extramedullary tutors, which required large-sized accesses for their installation.^{16,17} In addition, the DHS method has a major biomechanical advantage in treating fractures that present severe instability. However, with this system, these fractures require anatomical reduction or valgus reconstruction, like in the technique of Dimon and Hughston,¹⁸ in order to diminish the risk of failure of the synthesis. When these reconstructions are necessary, the duration of the operation required is longer and the morbidity of the treatment is greater.

The aim of this study was to prove the efficiency of the DHS system for fixation of unstable fractures, with anatomical or valgus reduction, by means of a minimally invasive surgical access, and to evaluate the consolidation rate and functional recovery among the patients.

Material and methods

A non-randomized open prospective longitudinal study was conducted among patients with transtrochanteric fractures who were admitted to and treated at a referral hospital for orthopedic trauma cases in a state capital in Brazil, between January and December 2013.

In this study, 140 patients were evaluated, of whom 65.7% were women (Fig. 1). The patients' mean age was 79 ± 9 years, with a range from 60 (minimum age) to 93 (maximum age). The relative frequency of patients between the ages of 80 and 84 years was 28.6% (Fig. 2).

The right side was affected in 54.3% of the cases and nine patients (6.4%) were affected bilaterally. All of these cases had

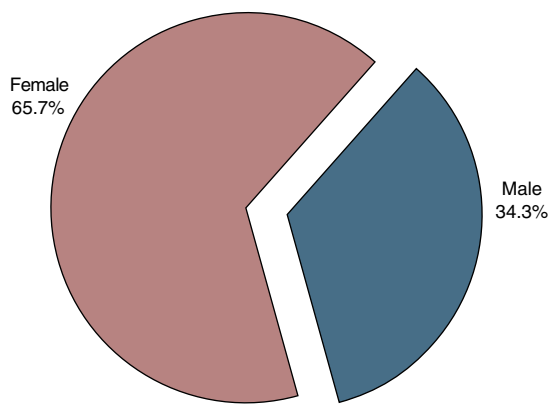


Fig. 1 – Gender prevalence among elderly people hospitalized with transtrochanteric fractures at an emergency service in the city of Manaus, Amazonas.

already received treatment in other services (Table 1). It was also observed that while 52.9% were classified as presenting normal weight, 12.9% had type I obesity. Most of the patients were living in their own homes (89.3%) and 53.6% made use of alcoholic drinks. The death rate over the period of the study was 1.4%.

Among the patients evaluated, 242 underlying pathological conditions were diagnosed. Among these, systemic arterial hypertension was the most frequent condition (45.0%) (Fig. 3). The intensity of pain among these patients ranged from mild to intractable, and 47.1% presented pain of moderate intensity (Fig. 4).

According to the mobility score of Parker and Palmer,¹⁹ in which nine points is the maximum score, we found that the mean was 5.42 in the preoperative evaluation and 3.91 in the postoperative evaluation, which indicates that there was a significant improvement among the patients evaluated ($p < 0.001$) (Fig. 5).

Young patients, patients presenting pathological fractures due to neoplastic diseases, those with stable transtrochanteric fractures and those with unstable fractures with an inverted fracture line were excluded. In this last case, the preferred option for osteosynthesis was a cephalomedullary nail. The Tronzo classification⁵ was used to evaluate the patients in this sample.

These patients were evaluated before the operation using the mobility score of Parker and Palmer,¹⁹ which we translated

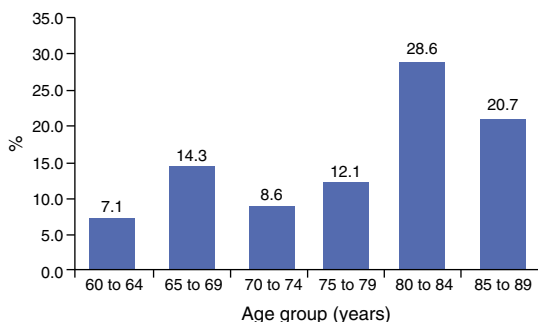


Fig. 2 – Age group prevalence among the elderly people hospitalized with fractures.

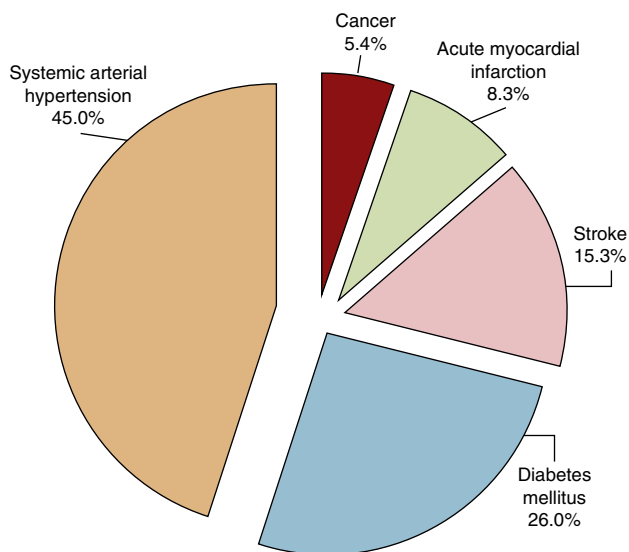


Fig. 3 – Underlying pathological conditions most frequently observed among the elderly people hospitalized with fractures.

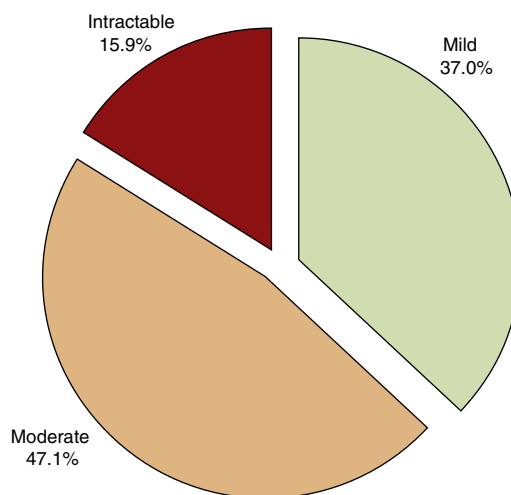


Fig. 4 – Intensity of pain among the elderly people hospitalized with fractures.

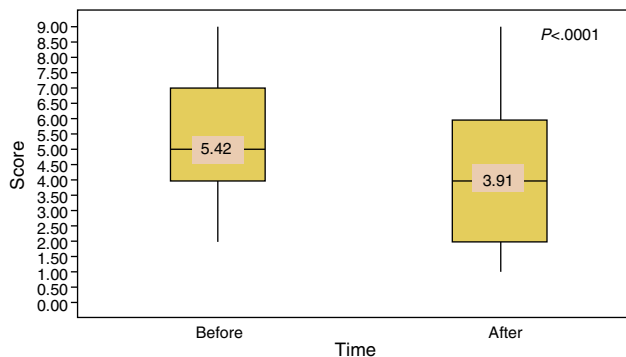


Fig. 5 – Mean scores before and after six months of follow-up among the elderly people hospitalized with fractures.

Table 1 – Personal characteristics of the patients evaluated.

Characteristics	Frequency (n=140)	%
<i>Side with fracture</i>		
Left	55	39.3
Right	76	54.3
Both	9	6.4
<i>BMI classification</i>		
Underweight	6	4.3
Normal weight	74	52.9
Overweight	33	23.6
Type I obesity	18	12.9
Type II obesity	9	6.4
<i>Housing</i>		
Own home	125	89.3
Nursing home	15	10.7
<i>Use of alcohol</i>		
Yes	75	53.6
No	65	46.4
<i>Death</i>		
Yes	2	1.4
No	138	98.6

ourselves (Table 2). For these evaluations, information was gathered from accompanying persons who were living with the patients, based on the day before the trauma. The patients underwent the operation on a radiolucent table, by means of a minimally invasive lateral access to the hip, under manual traction, of length approximately 5 cm. All of the cases were fixed using a DHS of 135°, with a three-hole plate. The operations were performed by the authors of this study.

The patients were followed up as outpatients and full weight-bearing was allowed four weeks after the operation on average. Six months after the operation, the patients underwent a new evaluation using the mobility score of Parker and Palmer.

Descriptive analysis was performed on the data and comparisons between the mean scores before and after the operation were made using Student's t test, taking the significance level to be 5%. All the variables were evaluated using the Minitab Academic statistical software, version 14.1.

Results

All of the 140 patients operated presented fracture consolidation by the sixth month after the operation. The series presented here did not show uncontrolled collapse or cut-out in any of the cases. There were no immediate intraoperative complications, and no need for any blood transfusion was

documented before the patients were released from the hospital. Two deaths were observed: one due to complications relating to delirium and the other due to pneumonia, which both occurred during the first postoperative week.

Discussion

Transtrochanteric fractures are typical of patients with vulnerable health^{1,5,20-22} and there is no doubt that they have a major social impact. Managing these cases is a challenge and the frequency of occurrence of such fractures has increased exponentially as a consequence of greater life expectancy for the world's population overall, thanks to improvements in general health conditions. These events provide ever-greater justification for conducting more studies on treatments for this condition.^{9,18}

The demographic data show that women and individuals of mean age 80 years were the groups with greater prevalence of these fractures in our sample. Studies published previously also showed that women and individuals of advanced age presented fractures of the proximal femur more frequently, because of their association with osteoporosis.^{1,18,23-25} The side predominantly affected by these fractures was the right side.

The treatment for transtrochanteric fractures has evolved over the last 50 years, especially with regard to the synthesis method.^{9,18,26}

Sliding screws now constitute one of the methods most used for treating the majority of transtrochanteric fractures.⁹ In Brazil, the results from surveys have proven the efficiency of DHS for surgical treatment of transtrochanteric fractures.^{8,16,27} Studies in the worldwide literature have proven that these fractures attain good consolidation when treated using DHS.^{5,28,29} In our series, we achieved a consolidation rate of 100% and only two deaths occurred within the first six months of follow-up.

However, these patients' functional recovery was poor. The mobility score of Parker and Palmer¹⁹ decreased from around six to four points after six months, which indicates that the patients presented increased difficulty in walking and consequently diminished autonomy. In the worldwide literature, we noted that, independent of the treatment method chosen, the time when the operation was performed or the previous level of autonomy, the patients' degree of dependence increased considerably after surgical treatment.^{23,30}

The incidence of complications when this system is used correctly is around 5%.¹⁴ Harrison et al.³¹ studied 6,905 cases of hip fracture and found that the deep infection rate was 0.7%. Reports in the literature have shown that the deep infection rate after a transtrochanteric fracture ranges from 0.15% to

Table 2 – Present authors' translation of the mobility index of Parker and Palmer.

Ability to walk	Without difficulty	With aids	Helped by other people	Does not walk
Walks inside the home	3	2	1	0
Walks outside of the home	3	2	1	0
Goes to shops and restaurants, makes family visits	3	2	1	0

15%.²⁹ In our population, we did not have any such cases of infection.

The mortality rate tends to be high, ranging from 12% to 41% over the first six months after the operation.³² In our sample, we found that the number of deaths within the first six postoperative months was low (1.4%), which proves that it is important that treatments for this condition should present a low degree of aggressiveness.

Conclusion

Use of DHS as the fixation method for transtrochanteric fractures, with a minimally invasive access, presented a high consolidation rate and low morbidity and mortality, along with a very low complication rate. However, we noted that even with the success of the treatment used, rehabilitation is difficult and precarious among these patients. The patients usually evolve with functional limitations and a significant degree of dependence, as seen in the follow-up six months after the operation.

Conflicts of interest

The authors declare no conflicts of interest.

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