

EFFICIENCY OF DEEP VEIN THROMBOSIS PREVENTION IN PROXIMAL FEMUR FRACTURES

EFICIÊNCIA DA PREVENÇÃO DA TROMBOSE VENOSA PROFUNDA NAS FRATURAS DO FÊMUR PROXIMAL

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ABSTRACT

Objective: To determine the efficiency of the deep vein thrombosis (DVT) prophylaxis protocol in postoperative patients due to proximal femoral fractures and to assess any statistical difference between the types of fractures. **Methods:** A retrospective observational study based on the analysis of patients' medical records who underwent to a surgical intervention due to proximal femoral fractures in 2017 and 2021 at Hospital IFOR – Rede D'Or São Luiz. These patients were selected according to previously determined inclusion and exclusion criteria. A total of 99 patients were included divided by sex, age, laterality, length of stay, and death. According to the institutional protocol, was used chemoprophylaxis with low-molecular-weight heparin, associated use of pneumatic compression with compression stockings, and early gait. The DVT diagnosis was determined by clinical evaluation and imaging tests such as venous Doppler ultrasonography and laboratory tests. **Results:** The protocol was effective in our study. Only one (1.01%) patient developed DVT. Due to the lack of samples, we could not achieve our secondary objective. **Conclusion:** The institutional protocol is efficient for DVT prophylaxis and essential in these cases. **Level of Evidence II, Prognostic Study.**

Keywords: Aged. Venous Thrombosis. Femoral Fractures. Diagnosis. Disease Prevention. Multimodal Treatment.

RESUMO

Objetivo: Determinar a eficiência do protocolo de profilaxia contra trombose venosa profunda (TVP) em pacientes de pós-operatório devido à fratura do fêmur proximal e avaliar a diferença estatística entre os tipos de fratura. **Método:** Estudo retrospectivo observacional a partir da análise de prontuários de pacientes submetidos à intervenção cirúrgica em razão de fratura do fêmur proximal no período de 2017 e 2021 no Hospital IFOR – Rede D'Or São Luiz. Foram selecionados 99 pacientes segundo critérios de inclusão e exclusão determinados previamente, que foram catalogados por: idade, sexo, lateralidade, dias de internação, entre outros. Conforme protocolo institucional, utilizou-se quimioprofilaxia com heparina de baixo peso molecular, associado ao uso concomitante de compressão pneumática e meias elásticas, e deambulação precoce. O diagnóstico de TVP foi determinado por meio de avaliação clínica e exames de imagem, como a ultrassonografia com Doppler venoso e exames laboratoriais. **Resultados:** A utilização do protocolo se mostrou eficaz neste estudo, havendo apenas um paciente (1,01%) que desenvolveu TVP. Não foi possível atingir o objetivo secundário, pois a amostragem foi insuficiente. **Conclusão:** O protocolo institucional para a profilaxia de TVP foi eficiente, uma vez que apenas um paciente evoluiu com tal complicação. **Nível de Evidência II, Estudo Prognóstico.**

Descritores: Idoso. Trombose Venosa. Fraturas do Fêmur. Diagnóstico. Prevenção de Doenças. Terapia Combinada.

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INTRODUCTION

Life expectancy of the world population has gradually increased, which has caused a perception that chronic and degenerative diseases among old adults have had remarkable expansion. Osteoporosis is particularly worrisome because of its high prevalence in this population, especially among women. This increased the risk of fractures and the costs associated with this theme, becoming a serious public health problem.¹ Among all the sites

with fracture diagnoses, proximal femur has a high frequency and perhaps the greatest impact on morbidity and mortality, estimated at about 6.5 million new cases worldwide by 2050.² When we consider the different regions of the world, note that this variable also influences hip fracture incidence. According to the literature, over 60 years and disregarding gender, its frequency ranges from 3 to 0.7/10,000 in Siena, Italy³ and 122 to 50.1/10,000 in Oslo, Norway.⁴ The incidence of fractures gradually

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The study was conducted at Hospital IFOR, Rede D'Or São Luiz.

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varies throughout Europe, with higher incidences in Norway, Sweden, and Denmark, and lower incidences in cities around the Mediterranean Sea.^{4,5} In South America, the annual incidence of hip fractures in women over 50 years ranges from 9.4/10,000 in Venezuela to 44.9/10,000 in Chile.^{6,7}

The surgeries needed reduce life expectancy of patients suffering from hip fractures by 15% and 20% considering the general population, and the number of deaths in the first six months after the traumatic event is high. The mortality rate ranges from 15% to 50% during the first year of convalescence.^{8,9}

After the interventional treatment, adverse complications in this type of fracture included deep vein thrombosis (DVT) and pulmonary thromboembolism (PTE). Before establishing the protocols, the programs that dealt and avoided such adversities—anticoagulants, for example—had an incidence range from 55% to 80%.¹⁰

Some factors found in the patients' medical history increase the probability of thromboembolism, such as a positive family risk, age over 60 years, cardiomyopathy, chronic edema of the lower limbs, immobilization, obesity, sedentarism, excessive blood loss, blood transfusion, long hospital stay, among others.¹¹

The risk is notably higher from the second to third week of postoperative, with 29% of thrombi occurring in the first 12 days and 23% in 22 to 24 days after surgery. Using the Doppler ultrasound examination on the venous system of the lower limbs and contrast venography helps an early diagnosis.^{12,13}

Preventive health care of DVT in patients undergoing to an osteosynthesis of proximal femoral fracture is a consensus among all orthopedists. However, due to the scarcity of studies, the literature still lacks a consensus on which medication to use or what would be its ideal time of use.¹⁴ The orthopedic literature indicates vitamin K inhibitors and low-molecular-weight heparins.¹⁵ A systematic review, which compiled 26 studies conducted on 2,600 individuals, found that low-molecular-weight heparin (LMWH) and unfractionated heparin (UFH) effectively reduced DVT. Some reports states that, compared to UFH, LMWH is significantly more effective and safer. A subcutaneous injection of 40 mg once a day is sufficient and effective regarding to the LMWH dose.^{16,17}

Mechanical prevention methods, such as using compression stockings, can reduce the occurrence of DVT by more than 50%. The association of methods are considered potential auxiliary measures, such as active and passive kinesiotherapy of the lower limbs and the application of early load.

Therefore, the importance of using preventive methods for DVT is undeniable in patients undergoing hip bone surgery, but the literature lacks a consensus if the combined or individualized use is better. Thus, the main objective of our study is to determine the efficacy of the DVT prevention program used in patients who underwent to a hip osteosynthesis in our institution. Our secondary objective is to compare the DVT rates considering femoral neck fractures, both transtrochanteric and subtrochanteric.

METHODS

This study was approved by the Research Ethics Committee of *Plataforma Brasil* under no. CAAE 51475021.6.0000.5625.

A retrospective and observational study was conducted from analyzing medical records of patients with proximal femoral fractures who underwent to osteosynthesis from 2017 to 2021 at Hospital IFOR Rede D'Or / São Luiz. An investigation protocol was created so that the collected data could be compiled and tabulated with the following information: service number; age at the length of stay; sex; affected side; skin color; body mass index (BMI); fracture; positivity for DVT; and outcome (death).

A strategy was elaborated to search for electronic medical records where the period of investigation was limited stipulated by this

research. To locate patients, ICD-10 was used (fracture of femur – S72, fracture of neck of femur – S72.0, pertrochanteric fracture – S72.1, subtrochanteric fracture – S72.2, fracture of femur, part unspecified – S72.9). And age was limited (> 60 years).

A total of 143 eligible medical records were found and after applying the inclusion and exclusion criteria, 99 medical records were included. Among them, 74 (74.75%) were women and 25 (25.25%) were men. Regarding skin color, 79 (79.80%) were White, 10 (10.10%) Black, 7 (7.07%) Yellow, and 3 (3.03%) did not declare. Regarding laterality, 55 (55.56%) fractured the left side and 44 (44.44%) right side (Table 1). And regarding the fracture type, 44 (44.44%) presented transtrochanteric fracture, 49 (49.49%) femoral neck fracture, and 6 (6.06%) subtrochanteric fracture. The average length of stay ranged from 6.10 to 35 days (Table 2). The average BMI of the sample group was 23.5.

Patients from seven studies were included using the following criteria:

1. Patients of both sexes;
2. Age > 60 years;
3. Post-operative care > 6 months;
4. Proximal femoral fractures operated in our service;
5. No history of coagulopathies;
6. No personal history of DVT;
7. Patients included in the institutional DVT prevention protocol.

Non-inclusion criteria were:

1. Patients with incomplete medical records
2. Patients who did not sign an informed consent form for the use of their medical records;
3. Shaft and distal femoral fractures.

Chemoprevention was used as VTE prevention protocol by subcutaneously applying 40 mg of enoxaparin once a day, or subcutaneously applying 5,000 IU of unfractionated heparin every 8 hours associated with mechanical prophylaxis. Chemoprophylaxis was initiated 12 hours before the surgery and maintained 12 to 24 hours after the surgery for 21 to 28 days. Contraindications to pharmacological methods are active bleeding or active peptic ulcer, allergy to heparin, thrombocytopenia, coagulation dysfunction (thrombocytopenia < 100,000/mm³ or INR > 1.5), uncontrolled systemic arterial hypertension (> 180 × 110 mmHg), persistent renal failure (clearance rate < 30 ml/min), recent intracranial or ocular surgery < 2 weeks, and CSF collected in the last 24 hours.

Compression stockings applied immediately after the surgery is also recommended considering the patient's tolerance, medical release, gait (stimulated on the first postoperative day), supervision of the physiotherapy team. Contraindications of the auxiliary method (intermittent pneumatic compression and compression stocking) are open fractures, severe heart failure, peripheral arterial insufficiency in the lower extremities, and infection or ulcers in the lower extremities.

Table 1. Laterality.

	Right	Left	Overall Total
Neck	24	25	49
Subtrochanteric	3	3	6
Transtrochanteric	17	27	44
Overall Total	44	55	99

Table 2. Length of stay.

	Patients	Time average
Neck	49	5.31
Subtrochanteric	6	9.00
Transtrochanteric	44	6.59
Overall Total	99	6.10

Clinical evaluation and imaging were used to detect DVT. Clinical analysis includes detection of pain in the lower extremities; palpation of the affected area; observation of distal perfusion; palpation of the peripheral pulse, observation of edema; positivity for specific propaedeutic maneuvers such as *Homans*, clubbing, and swollen calf; hyperemia, pallor, or local heat.

In suspicion of DVT, color Doppler ultrasound, MRI, and laboratory tests are used.

Only one patient (1.01%) had a postoperative complication, as Table 3 shows, but he progressed well and did not die. After the osteosynthesis of proximal femur, 2 patients (2.02%) died, but not due to DVT complications.

An informed consent form was made for this study.

RESULTS

Table 1 shows that among 99 patients, only one (1.01%) developed DVT. Table 4 shows that two patients died (2.02%). One was a white woman with a transtrochanteric fracture on the right side, length of stay of 35 days, and BMI 25.3. And the other was white, with a left hip fracture, 89 years, and length of stay of 11 days. Their death was unrelated to DVT.

We could not determine if a relationship between the type of fracture with DVT exist, since the number of patients with this complication was too low to perform a statistical analysis.

DISCUSSION

Proximal femoral fractures highly contribute to increase mortality and functional disability rates, mainly because they occur in patients with previous comorbidities that increase the risk of postoperative complications. Until the third month after surgery, DVT is the most prevalent. This contributes with the death rates, especially when accompanied by pulmonary embolism.

Table 3. Relation between injury site and DVT.

DEEP VEIN THROMBOSIS			
	No	Yes	Overall Total
Neck	48	1	49
Subtrochanteric	6		6
Transtrochanteric	44		44
Overall Total	98	1	99

Table 4. Relation between injury site and deaths.

DEATHS			
	No	Yes	Overall Total
Neck	49		49
Subtrochanteric	6		6
Transtrochanteric	42	2	44
Overall Total	97	2	99

Still, only some patients with DVT develop full PE symptoms. This subclinical manifestation results from a partial venous obstruction that varies from 10% to 40% of vascular caliber.

We believe that, because of this, a diagnostic underreporting may have occurred, thus justifying the small number of DVT cases in our study. The literature still lacks a consensus on which drugs are more effective and safer. Some drugs are very effective in reducing VTE incidence, such as Enoxaparin (ENX) and other substances that act on the coagulation cascade, like acetylsalicylic acid (AAS), rivaroxaban (RVX), fondaparinux (FPX), or apixaban (APX). However, these substances have adverse effects and complications, which can increase the risk of bleeding. According to the literature, ENX and AAS have similar bleeding risks and better results for prophylaxis than RvX.

In our data—regardless of skin color and BMI—no patients with a higher length of stay and > 60 years developed DVT.

A patient with femoral neck fracture developed DVT even with the prevention protocol. The patient was a white man, 90 years, BMI 26.3. He was hospitalized for 3 days and, despite thrombosis, did not die. Other participants did not develop DVT. This is probably because of the prophylaxis protocol for DVT of our institution.

Two patients died and both were women. The first was white, 91 years, BMI 25.3, length of stay of 35 days, with a transtrochanteric fracture. The other was white, 89 years BMI 21.7, length of stay of 11 days, with a transtrochanteric fracture. Thrombosis was not the cause of death, which was attributed to other comorbidities—thus, not related to DVT. A late heart disorder and septic shock secondary to urinary tract infection were recognized.

We found that the length of stay ranged from one to 35 days (6.10 days average). This average was lower than most data compared in other studies,¹⁸ which ranged from 10.65 to 42 days. We believe that the multidisciplinary teamwork (physiotherapists, pharmacists, physicians, nurses, and nutrition team), with the correct medicine and physical resources, is essential to a high prevention efficacy. The application of our institutional protocol had an index of 1.01% DVT, which corroborates with the literature whose incidence ranges from 0 to 3%.

We failed to observe a heterogenous distribution when evaluating the different types of proximal femoral fractures. The epidemiological distribution found in the literature is 61.3% for transtrochanteric, 32.7% for cervical, and 6.0% for subtrochanteric fractures. In our study, we found 44.44%, 49.49%, and 6.06% of transtrochanteric, cervical, and subtrochanteric fractures, respectively.

Since only one patient developed DVT, we could not achieve our secondary objective which was to determine whether the type of fracture was significantly related to the onset of DVT.

CONCLUSION

Using thromboprophylaxis is indispensable to prevent DVT after the surgical treatment for proximal femoral fractures. Regarding the efficacy of the institutional protocol, only one (1.01%) patient developed this complication. The deaths of two patients were not related to DVT.

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