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Decrease of Blood Transfusion Needs in Knee Arthroplasty with Elastic Bandage

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Abstract

The objective of this study is to analyze a postoperative technique after the total knee arthroplasty, by dressing the leg with an elastic strapping to decrease bleeding by compression, and the need for blood transfusion.

Between January 14, 2004 and July 31, 2007, 60 knees from 53 patients underwent surgeries. These surgeries involved 56 primary arthroplasties, seven bilateral arthroplasties and four revision arthroplasties. Follow-up was 35 (25-49) months. As far as gender, 46 were women and seven men. The patients' ages ranged from 41 to 85 years old, with an average of 66 years. The parameters analyzed were the rates of hemoglobin and hematocrit, evaluated both, before operation and five days after surgery, clinical parameters occurring during hospitalization and complications such as significant bleeding, infection, and venous deep thrombosis.

Before surgery, hemoglobin rates were on average 13.9, ranging from 11.6 to 15.5, and hematocrit averaged 41, ranging from 36 to 47. In the postoperative, hemoglobin rates were 11.2 on average, varying from 7.8 to 14.8, and the hematocrit rates were 33.7, ranging from 23 to 44. Among the 56 patients who underwent knee arthroplasty, only one (1.9%) required blood transfusion. No complications were observed in the study group.

The present study evaluated the elastic banding after total knee arthroplasty and showed a lower incidence of blood transfusion when compared to other research works. An elastic bandaging technique carried out after total knee arthroplasty has proven to be safe and complication free in the studied series.

Keywords: Arthroplasty; Knee; Blood transfusion

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Introduction

Blood transfusion is a common procedure after total knee arthroplasty, since it is a major surgery, with a great potential for postoperative bleeding. This is aggravated by the fact that most patients are elderly, in their sixties or seventies, and usually present comorbidities that can decrease the rate of preoperative hemoglobin, further increasing the chance of postoperative blood transfusion [1]. The indication for blood transfusion must be careful and follow a specific protocol. Complications as transmission of infections, reactions to the homologous material, hemolysis, acute lung injury and changes in micro-circulation are well known [2]. Several strategies are used to avoid homologous blood transfusion, such as autotransfusion, which has a high cost and can present technical problems, or the use of erythropoietin and antifibrinolytics also with potential complications. Bleeding in total knee arthroplasty occurs in the postoperative phase, after releasing the pneumatic tourniquet. In addition to good hemostasis, it seemed a good idea to develop an effective and safe elastic bandage technique.

The objective of this study is to test a technique of elastic bandaging in the immediate postoperative period after a total knee arthroplasty, in order to evaluate the incidence of blood transfusion and its possible complications.

Materials and Methods

From January 14, 2004 to July 31, 2007, 60 knees from 53 patients underwent surgery. These surgeries involved 56 primary arthroplasties, seven bilateral cases and four revision arthroplasties. The follow-up time was 35 (25-49) months. As far as gender, there were 46 women and 7 men. The patients' age ranged from 41 to 85 years old, with an average of 66 years. In all cases, blood was

Figure 1: The surgeon proceeds with the normal dressing on the surgical incision, and, before releasing the pneumatic tourniquet, wraps the operated limb from the thigh root to the ankle with a layer of orthopedic cotton.

Figure 2: The surgeon wraps the limb with a layer of crepe bandage and another of elastic bandage up to the ankle and releases the tourniquet.

previously reserved, and for all patients, the daily use of Enoxaparin 40 mg until hospital discharge and 12 h before surgery was indicated.

The parameters analyzed were the rates of hemoglobin and hematocrit in the preoperative period and on the fifth postoperative day, as well as the clinical parameters during hospitalization and complications, such as expressive bleeding, infection and deep vein thrombosis.

Parameters for the indication of blood transfusion

Blood transfusion was indicated when the hemoglobin rates were less than nine, associated with clinical parameters.

Technique

The proposed elastic bandaging technique is performed as follows.

1. After the end of the surgical procedure using the usual technique, the surgeon proceeds with the normal dressing of the surgical incision, and before releasing the pneumatic tourniquet, he wraps the operated limb from the thigh root to the ankle with a layer of orthopedic cotton, another layer of crepe bandage and finally the elastic bandage with slight tension (Figure 1).

2. The pneumatic tourniquet is then released (Figure 2), and the peripheral perfusion of the foot and toes is checked, in addition to the dorsalis pedis and posterior tibial pulse. If any doubt persists, the surgeon uses an Oximeter that should be used after mild manual heating of the fingertip to be checked, since in our experience the Oximeter does not work well in cases of cold extremities, even with good perfusion (Figure 3).

3. After checking the perfusion, the surgeon bandages the foot with a layer of orthopedic cotton, overlaid with a layer of crepe bandage and finally with a layer of elastic bandage with slight tension (Figure 4).

Figure 3: The surgeon palpates the dorsalis pedis and posterior tibial pulses and measures the perfusion with the aid of an oximeter.

Figure 4: The surgeon bandages the foot with a layer of Orthopedic Cotton, overlaid with a layer of Crepe bandage and finally a layer of Elastic Bandage with slight tension.

Figure 5: After bandaging, the surgeon examines the peripheral perfusion.

4. After bandaging the foot, the surgeon examines again the peripheral perfusion (Figure 5).

5. The result of the elastic bandage can be seen in Figure 6.

Results

Among the 53 patients who underwent knee arthroplasty, only one (1.9%) required blood transfusion until the fifth postoperative day. One patient underwent a primary unilateral prosthesis, and until the fifth postoperative day, she maintained hemoglobin rates above nine. However, a bleeding occurred on the seventh postoperative day, which required a blood transfusion. This occurrence excluded

Figure 6: Elastic Bandage.

her from our studied group. Another patient underwent bilateral primary knee arthroplasty and needed a blood transfusion before the fifth postoperative day, once his hemoglobin rate was 7.8.

The average hospital stay was five days and the hemoglobin and hematocrit rates changed a little between preoperative and postoperative dates. In the preoperative period, hemoglobin average rates were 13.9, ranging from 11.6 to 15.5, and hematocrit average rates were 41, ranging from 36 to 47. In the postoperative period, hemoglobin average rates were 11.2, ranging from 7.8 to 14.8, and hematocrit average rates were 33.7, ranging from 23 to 44.

No complications were identified in the studied group, even in terms of superficial or deep infection, or deep vein thrombosis. No complaints regarding discomfort related to bandaging with the elastic bandage were reported.

Discussion

Blood transfusion is a necessary procedure in severe anemia, and its indication within careful protocols is indispensable in the medical arsenal. However, approximately 20% of cases of homologous transfusion result in some type of adverse effect [3]. There is a risk of viral contamination such as HIV and hepatitis, in addition to other complications that can occur such as reactions to homologous material, hemolysis, acute lung injury and changes in the microcirculation [2]. Autotransfusion is an alternative to homologous blood transfusion, however, in addition to the high cost, there are technical problems such as citrate poisoning, and reports of complications such as increased rates of sepsis, disseminated intravascular coagulation and renal failure [4].

Other strategies to decrease the incidence of blood transfusion in the postoperative period of total knee arthroplasty consist of using erythropoietin and antifibrinolytic agents in the preoperative period. These conducts are also not free of complications.

Erythropoietin stimulates the proliferation of erythrocyte precursor cells at the bone marrow level, increasing its production in one to two weeks. Erythropoietin, in addition to a high cost, can promote hypertension and there are reports of increased rates of thromboembolism [5].

Antifibrinolytic agents act in the coagulation cascade and theoretically minimize blood loss, however, some authors believe that these drugs cannot significantly reduce postoperative bleeding in large joint arthroplasties [6,7]. Antifibrinolytic agents can also cause adverse effects such as anaphylactic reactions [7].

In patients undergoing knee arthroplasty operated at our service, we often use Enoxaparin 40 mg subcutaneously twelve hours before surgery and daily during hospitalization. We also encourage the full load walk with the help of a walker from the day after the surgery, as soon as the patient feels confident for such. We believe that the benefits of these actions in order to decrease the incidence of deep venous thrombosis are significant. Moreover, avoiding the use of anticoagulants to decrease post-operative bleeding does not outweigh the risks of deep venous thrombosis.

The technique of postoperative elastic bandaging in knee arthroplasty proved to be effective in reducing the incidence of blood transfusion, when compared to other series in the literature. In our series, only one patient (1.9%) required blood transfusion, while Malta et al. [8] showed a series with 8% blood transfusions. In his work, he also reports that its incidence was lower than the incidences reported by most authors. Other authors reach blood transfusion incidences in arthroplasties ranging from 38% to 95% [9,10].

In our series, we had no infections, deep vein thrombosis, nor any other type of complication related to surgery or the technique of elastic bandaging.

Conclusion

The series studied with post-operative elastic bandaging in total knee arthroplasty showed a lower incidence of blood transfusion when compared to other series reported in the literatures.

The technique of elastic bandaging in the postoperative period of total knee arthroplasty proved to be a safe and complication-free technique.

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