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Research Article

Usage of Positive Pressure Hemovac Drain following Total Knee Arthroplasty: Reduce Blood Lossor Not

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Abstract

Background: The purpose of this study was to compare the usage of positive and negative pressure hemovac drain according to blood loss and blood transfusion requirements in patients who diagnosed primary osteoarthritis and scheduled to undergo Total Knee Arthroplasty (TKA).

Methods: Between January- May 2015 patients were reviewed retrospectively. Fifty patients who scheduled to undergo TKA were enrolled in the study. Patients were divided into two groups. In the first post operative day, hemovac drains were kept under positive pressure in the patients of Group I. In the second day, drains were removed by switching into a negative pressure after the passive range motion exercises. In Group II, it had been kept in negative pressure until the hemovac drain removed. Both groups underwent the same rehabilitation program after the surgeries. Age, gender and body mass index of patients were similar in both groups.

Results: Preoperative value of hemoglobin (g/dl), hematocrit (%) and the number of erythrocytes (mm3) were similar in both groups. These values were also similar in both groups in the first four days after the surgery. The average blood loss from hemovac drain, and the amount of erythrocytes us pension used postoperatively were found similar statistically in both groups ($p>0.05$). Furthermore, 9 of the 24 patients in Group I, and 13 of the 26 patients in Group II were performed the allogeneic erythrocyte suspension transfusion, and the need for allogeneic transfusion in both groups were found similar statistically ($p>0.05$).

Conclusion: Considering the consequences of the present study, early usage of the positive pressure hemovac drain does not reduce the amount of blood loss, the amount of transfused allogeneic erythrocyte suspension, and the need for allogeneic transfusion at the postoperative period.

Introduction

TKA is a major orthopedic surgical procedure usually performed after primary or secondary osteoarthritis. Many methods have been described to reduce blood loss after TKA. In order to reduce blood loss; cell protect ion system, local or systemic injections of tranexamic acid and autotransfusion are used [1,2]. Allogeneic Blood Transfusions (ABT) have some problems including transition of infectious diseases, allergic reactions, graft-versus-host disease and hemolytic reactions [3,4].

Open or closed drainage systems are frequently used postoperatively in TKA [5]. The usage of closed drain system was defined by Waugh and Stinchfield in 1961 due to the high infection rates caused by the open drainage system, and has been put in a routine usage [6]. The closed system usage in TDR is known to be applied for the prevention of intra-articular hematoma, diminish the wound tension and accelerate wound healing as well as to reduce the risk of infection [7,8]. However, some studies have shown to increase blood loss and the risks of retrograde infection [9].

The purpose of our study was to investigate whether postoperative usage of the positive pressure hemovac drains in patients undergo TKA due to primary osteoarthritis reduces blood loss and the requirement of ABT compared to standard negative pressure drains.

Material and Methods

Patients who undergo TKA due to primary gonarthrosis were reviewed retrospectively between January- May 2015. Revision cases, patients that predispose to bleeding and use medicines that affect bleeding were excluded. Also, patients developing myocardial infarction, pulmonary embolism or gastrointestinal bleeding postoperatively were excluded. Fifty patients who were performed fixed insert TKA due to primary gonarthrosis were included in the study. All surgical procedures were performed with standard medial parapatellar incision under tourniquet. The bleeding from the hemovac drain after surgery was followed. The hemovac drains were kept under positive pressure at the first postoperative day in Group I. In the second day, drains were removed by switching

Table 1: Demographics of Patients.

	Positive Hemovac Group (n:24)	Negative Hemovac Group (n:26)	p
Gender (male/female)	3/21	3/23	1.000
Age (years)	65.4±9.5	64.5±7	0.586
Body Mass Index	32.4±5.1	32.6±5.5	0.866
Preoperative Hemoglobin (g/dl)	13.2±1.6	12.5±1.7	0.113
Preoperative Hematocrit (%)	40.4±4.6	38.6±4.6	0.161
Preoperative Number of Erythrocytes (10^6/mm^3)	4.8±0.5	4.8±0.6	0.900

Table 2: Postoperative Comparison of Both Groups.

		Positive Hemovac Group (n:24)	Negative Hemovac Group (n:26)	p
Postoperative 1. Day	Hemoglobin	11.2±1.3	10.6±1.3	0.092
	Hematocrit	33.4±3.5	30.1±3.8	0.942
	Number of Erythrocytes	4±0.5	4.1±0.5	0.522
Postoperative 2. Day	Hemoglobin	10.4±1.6	10.7±1.3	0.711
	Hematocrit	31.8±4	31±6.7	0.870
	Number of Erythrocytes	3.8±0.5	4±0.6	0.268
Hospital Discharge	Hemoglobin	10.1±1.3	10.6±1.2	0.067
	Hematocrit	30.1±3.8	30.8±6.4	0.066
	Number of Erythrocytes	3.7±0.4	3.9±0.5	0.082

into negative pressure after passive range motion exercises. The other group had been kept in negative pressure until the hemovac drain removed. Both groups underwent the same rehabilitation program after the surgery. In group I, 21 of 24 patients were women (87.5%), and the average age was 65.4±9.5. In group II, 23 of 26 patients were women (88.5%), and the average age was 64.5±6.9. Patients age, gender and body mass index were similar in both groups (Table 1).

Statistical Analysis

IBM SPSS Statistics Version 20.0 program was used for statistical analysis of the study. Data were analyzed by descriptive statistical methods (average, standard deviation). Mann-Whitney U test was used in the analysis of quantitative data that are not normally distributed between independent groups. Chi-square test was used in the analysis of qualitative data in independent groups. A 95 % confidence interval and significance at $p < 0.05$ were accepted.

Results

Preoperative hemoglobin (g/dl), hematocrit (%), the number of erythrocytes (106/mm^3), were similar in both groups (respectively; p=0.113, p=0.161, p= 0.900). The values of hemoglobin and hematocrit, and the numbers of erythrocyte were also similar in both groups in the first four days after the surgery and at the hospital discharge (p>0.05), (Table 2). The amount of postoperative bleeding to hemovac drain was 646.7±177 cc in Group I, and 646.9±212.9 cc in Group II. We found that the amount of blood loss were similar in both groups (p=0.950).

The average amount of erythrocyte suspension used postoperatively was 1.3±0.5 unit for Group I, and 1.6±0.8 unit for Group II, and for both groups it was identified statistically similar (p=0.343). In addition, 9 of the 24 patients (37.5%) in group I, and 13 of the 26 patients (50%) in group II were performed transfusion of the allogeneic erythrocyte suspension, and the need for allogeneic transfusion in both groups were found similar statistically (p=0.407).

Discussion

Allogeneic Blood Transfusion (ABT) is frequently required depending on blood loss after TKA. Lin, et al. [10] showed that the average blood loss can be observed up to 1222 ml in patients undergoing single stage bilateral TKA. Great amount of blood loss was also shown in similar studies [10-13]. Using tourniquets during surgery can reduce blood loss in postoperative periods [14]. In addition, compressive bandage and local cold application methods make it possible to reduce blood loss from the drain after the surgery. Studies have shown that most of the blood loss in TKA occurs during the first few postoperative hours [15]. Kumar, et al. [16] showed that 37% of blood loss occurs in the first 2 hours, and also 55% of blood loss occurs in the first 4 hours. Therefore, successful control of bleeding in this period helps to prevent bleedings that need TKA. Some meta-analyses showed that use of the closed system continuous suction drain after TKA increased the need for ABT [9].

Therefore in early postoperative term, the blood loss can be taken under control with creating a tamponade effect in the joint as drain by keeping under positive pressure or clamping. Ryu et al. [17] showed that drain clamping in first 24 hours following TKA reduced blood loss. Moreover, Kiely et al. [18] found that the blood loss could also be reduced by clamping intermittently in closed system drains after TKA. We aimed to reduce blood loss with positive pressure drain age system by creating intra-articular tamponade effect instead of drain clamping method and prevent blood loss requiring ABT. This method was similar with results of some studies [19-21].

Tai et al. [14] stated that ABT requirement depended on intraoperative blood loss was more than blood loss from the drain. Although closed system drain applications which were followed

as intermittent or 24 hours drain clamping or drain clamping for negative and positive pressure were not successful to reduce ABT after TKA, the passive positive pressure method was found unsuccessful in the study [19-21]. The weaknesses of our study were its retrospective nature, limited number of cases and lack of randomization.

Conclusion

The group applied the positive pressure drain in postoperative period was found unsuccessful to decrease of need for ABT and the amount of bleeding according to negative pressure drain. However level 1 studies are required for supporting these data.

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