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Results of patients who were followed up with special dressings without the use of drains after primary total knee arthroplasty

Primer total diz artroplastisi sonrası dren kullanılmadan özel pansumanla takip edilen hastaların sonuçları

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ABSTRACT

Aim: This study aimed to compare the clinical and functional outcomes of patients who used drains with those who used compressive dressings without drains after tourniquetless total knee arthroplasty (TKA) for primary gonarthrosis.

Materials and Methods: Between January 2019 and June 2023, 316 patients who had undergone total knee replacement were retrospectively evaluated. After excluding patients who used tourniquets, 120 patients who met the inclusion criteria were included in the study. Postoperative hemoglobin changes, early–late postoperative edema, pain, range of motion (ROM), clinical scores, and functional outcomes for 68 patients with drain (18 males and 50 females) were evaluated and compared with those of 52 patients without drain (11 males and 41 females).

Results: No significant difference in preoperative and postoperative hemoglobin values, 6th week Knee Society Score (KSS)–knee, and KSS-functional scores was observed between patients with and without drains ($p > 0.05$). Although a statistically significant difference in ROM was noted on the first postoperative day, no statistically significant difference in the postoperative second-week ROM was observed. Moreover, a significant difference in day 1 and 3 visual analog scale scores was observed between patients with and without drains ($p < 0.001$).

Conclusion: The findings of this study revealed that using a drain after primary TKA is not necessary. Although the clinical results of patients without a drain after TKA are similar to those of patients with a drain, patients can be treated and followed up with compressive dressings without a drain.

Keywords: Complication, compressive bandage, drain, total knee replacement.

ÖZ

Amaç*: Çalışmamızda primer gonartroz nedeniyle, turnikesiz total diz artroplastisi (TDA) yapılan hastalarda, dren kullanılan hasta grubuyla dren kullanılmayıp kompresif pansuman yapılan hasta grubunu klinik ve fonksiyonel olarak karşılaştırmayı amaçladık.*

Gereç ve Yöntem: *2019-Ocak ile 2023-Haziran tarihleri arasında total diz protezi gerçekleştirilen 316 hasta retospektif olarak değerlendirildi. Turnike kullanımı olan hastaların çalışma dışı bırakılması sonrasında dahil edilme kriterlerini içeren 120 hasta çalışmaya dahil edildi. Dren kullanılan 68 hasta (18 erkek,50 kadın) ile dren kullanılmayan 52 hastanın (11 erkek, 41 kadın) post-operatif hemoglobin değişiklikleri, cerrahi sonrası erken dönem ödemleri, ağrı durumları, hareket açıklıkları, klinik skorları ve fonskiyonel sonuçları değerlendirilerek birbiri ile karşılaştırıldı.*

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Bulgular: *Dren kullanımı olmayan hastalar dren kullanılan hastalarla karşılaştırıldığında hastaların pre-operatif ve post-operatif dönem hemoglobin değerlerinde, 6. hafta Knee Society Score (KSS)-diz ve KSS-fonksiyonel skorlarında anlamlı bir fark olmadığı görüldü. (p>0.05) Post-operatif 1. gün range of motion (ROM)'larında istatistiksel olarak anlamlı fark olmakla beraber post op 2. hafta ROM'ları arasında istatistiksel olarak bir fark gözlenmedi. Dren kullanılmayan hastaların 1. gün ve 3. gün Visual Analogue Scale (VAS) skorlarında dren kullanılanlara göre anlamlı fark olduğu izlendi (p <0.001).*

Sonuç: *Bu çalışmayla, primer TDA sonrası dren kullanımının mutlak gereklilik olmadığı sonucuna varılmıştır, Total diz artroplastisi sonrası dren kullanılmayan hastaların klinik sonuçları dren kullanılanlarla benzer olmakla beraber dren kullanılmadan kompresif pansuman yapılarak, hastaların tedavisi ve takibi mümkündür.*

Anahtar Sözcükler: *Dren, kompresif bandaj, komplikasyon, total diz protezi.*

INTRODUCTION

Total knee replacement surgery is one of the most common orthopedic surgeries and is associated with a significant risk of bleeding as it involves a soft tissue procedure and a surgical procedure on the bone. Severe bleeding after major surgery disrupts patients' hemodynamics and may worsen their vital signs and general condition. Approximately 10%–38% of patients undergoing total knee arthroplasty (TKA) require postoperative transfusion and show an average blood loss of 1,450–1,790 mL (1, 2).

Several studies have explored strategies for controlling bleeding during TKA to facilitate the surgical process and reduce postoperative complications, such as hematoma, circulatory disorders, and wound problems due to the lack of circulation in the skin. These strategies include preoperative use of erythropoietin and iron supplements, intraoperative use of tourniquet, tranexamic acid, hypotensive anesthesia, bleeding control, fiberglass adhesive, and femoral intramedullary canal occlusion with plugs (3). In addition, several precautions have been taken to reduce the risk of hematoma after surgery. These precautions mainly include the use of postoperative drains and tranexamic acid. The effect of tourniquets and drains on bleeding control has been evaluated previously (4). While some studies have suggested that tourniquet and drain are required, others have reported that the use of tourniquet and drain is not necessary (5). In the present study, patients who received compressive dressing without using a tourniquet and drain were compared with those who used a drain.

The use of drains has advantages and disadvantages. The main concerns of using drains are as follows: patients are subjected to an additional invasive procedure, the fixation material may cause an allergic reaction, a superficial skin infection may develop at the drain site, retrograde contamination may occur due to the contact of the closed blood flow route with air with each drain discharge, and additional surgical costs may incur (5, 6).

This study aimed to determine whether there is a difference in clinical and functional outcomes after TKA when a drain is not used and followed up with a compressive dressing versus when a drain is used.

The main hypothesis of this study is that using drains is not a necessity. We believe that using a compressive dressing with appropriate wound closure will have similar results to using a drain and that not using a drain will positively impact pain and range of motion (ROM) even in the early postoperative period.

MATERIALS AND METHODS

Patients

Between January 2019 and June 2023, 316 patients who had undergone TKA were retrospectively evaluated. After applying the exclusion and inclusion criteria, 120 patients who met the inclusion criteria were included in this study (Figure-1). The included patients were divided into two groups: those who used a drain (group 1) and those who did not use a drain but were followed up with a compressive dressing (group 2). Both groups did not use tourniquets. Group 1 included 68 patients (18 males and 50 females) and group 2 included 52 patients (11 males and 41 females). The mean body mass index (BMI) of group 1 was 28.6 ± 0.76 kg/m^2, whereas that of group 2 was 28.9 ± 0.6 kg/m^2, with no statistically significant difference between the two groups ($p > 0.05$). Early postoperative visual analog scale (VAS) scores, edema amounts, ROM on the first day, ROM at week 2,

Knee Society Score (KSS)–knee and KSS-functional scores at week 6, preoperative hemoglobin values, postoperative hemoglobin values, hemoglobin change amounts, and surgical times were evaluated and compared between the two groups.

The study protocol was approved by the regional ethical committee, and all patients provided informed consent.

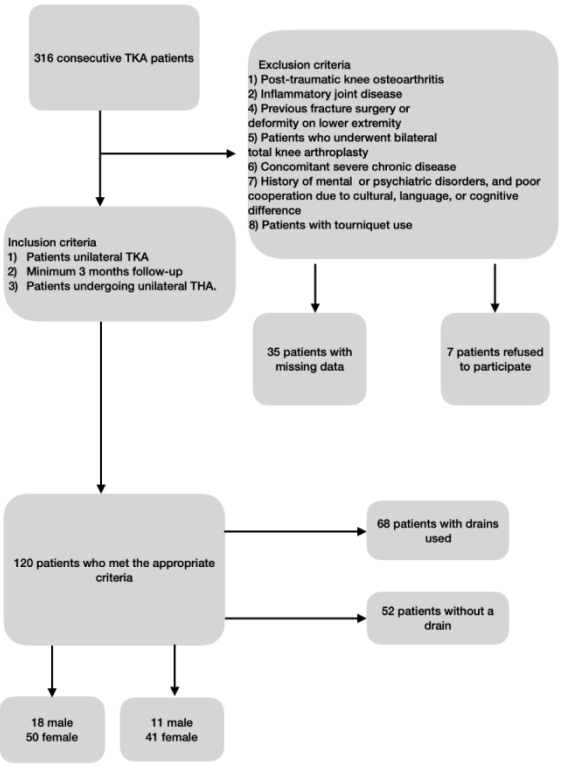

Figure-1. Inclusion and exclusion criteria for the patients.

Surgical method and dressing after surgery

All arthroplasty surgeries were performed under spinal or general anesthesia. All patients had undergone knee arthroplasty surgery using the standard medial parapatellar approach. There was no use of a tourniquet. A drain was used at the surgeon's preference. In patients in group 1, the drain was removed after 24 h and a standard dressing was applied. In patients in group 2, no drain was used, but a compressive dressing was applied. After the sponges were placed in the compressive dressing, tape was used to fix them. Afterward, one or two abdominal compresses were used around the knee, depending on the patient's leg circumference, followed by wrapping of an elastic bandage containing plaster cotton (Figure-2). The patients were dressed on the second postoperative day, and the sutures were removed 1 week after the standard dressing follow-up. In group 1, the elastic bandage was applied after standard dressing, and the dressing was renewed on the second postoperative day. Routine dressing follow-up was continued, and sutures were removed in the second week.

All patients received cruciate ligament-cutting implants. Preoperative and postoperative hemogram values, duration of surgery, and change in hemoglobin values were recorded.

Figure-2. a, taping of dressing sponges; b, placing abdominal compresses suitable for the patient's leg size; c, cotton wrapping; d, wrapping elastic bandage.

Postoperative follow-up

In the group without a drain, knee joint motion began on the first day. In the group with a drain, knee joint motion began after the drain was removed. Patients in both groups received the same analgesic treatment for pain management: 2*1 diclofenac sodium (75 mg), 3*1 Contramal (100 mg), and 2*1 Parol (1 g). Patients whose preoperative bleeding parameters were evaluated received 0.4 clexane for deep vein thrombosis (DVT) prophylaxis in the postoperative period, and DVT prophylaxis was continued for 3 weeks. Infection prophylaxis was performed 1 h preoperatively, and antibiotic prophylaxis was given until 48 h postoperatively. Blood loss was calculated based on the changes in the hemogram on days 1 and 3.

Patients were followed up for hematoma, ecchymosis, bullae, and superficial skin infection in the early postoperative period. Clinically, the ROM, tension, and excessive swelling of the crus were evaluated in terms of DVT. Suprapatellar circumference was measured to assess hematoma. The preoperative suprapatellar circumferences of the patients were measured on day 2 and at week 2 after surgery, and the difference between the preoperative and postoperative values was recorded.

Patients were discharged when their ROM exceeded 90° and their general condition was stable. Patients were examined at 2 weeks, 6

weeks, and 3 months through outpatient clinic visits.

Statistical analysis

The data were analyzed using the Statistical Package for Social Sciences (version 21.0; SPSS Inc, Chicago, Illinois, USA). All quantitative variables were calculated using central location measurements (mean and median) and dispersion measures (standard deviation and standard error). The normality of data was determined using skewness measurements and the Kolmogorov–Smirnov tests. Student's *t* test was used to compare normally distributed data between the two groups. All statistical tests were conducted two-sided with a significance level of 0.05.

RESULTS

Group 1 included 18 male and 50 female patients, whereas group 2 included 11 male and 41 female patients. The mean age of the patients in group 1 was 65.4 ± 8.1 (range 48–85) years, whereas that of the patients in group 2 was 65.9 ± 7.2 (range 47–78) years ($p > 0.05$). The BMI of the patients in group 1 was 28.6 ± 0.76, whereas that of the patients in group 2 was 28.9 ± 0.6, with no statistically significant difference between the two groups ($p > 0.05$). All patients included in the study were followed up by the same team until week 6; group 1 had a mean follow-up period of 23.04 ± 7.9 months, whereas group 2 had a mean follow-up period of 11.5 ± 9.2 months. During the follow-up period, no complications were observed in both groups. The demographic data and clinical results of the patients are shown in Table-1.

The VAS scores of the patients in groups 1 and 2 were 5.7 ± 0.79 and 6.8 ± 0.86, respectively, on the first day and 5.9 ± 0.82 and 3.8 ± 0.69, respectively, on the third day. A statistically significant difference in pain scores was observed on days 1 and 3 ($p < 0.001$). While patients without drains had better ROM on day 1, there was no statistically significant difference in ROM between the two groups at week 2 ($p > 0.05$). The mean total operative time was 64.9 ± 3.3 min in group 1 and 62.9 ± 3.2 min in group 2. As a result of not using a drain, the average surgical time was reduced by approximately 2 min. A statistically significant difference in the duration of surgery was observed between the two groups ($p < 0.001$).

Table-1. Demographic and Clinical Characteristics.

	Group 1 (With Drain)	Group 2 (Without Drain)	P value
Age (y)	65.4 ± 8.1 (range 48–85)	65.9 ± 7.2 (range 47–78)	
Sex (female/male)	50/18	41/11	
Side (right/left)	41/27	36/26	
BMI (kg/m^2)	28.6 ± 0.76	28.9 ± 0.6	p > 0.05
Postoperative day 1 VAS	6.8 ± 0.86	5.7 ± 0.79	p < 0.001
Postoperative day 3 VAS	5.9 ± 0.82	3.8 ± 0.69	p < 0.001
Postoperative day 1 ROM	92.1° ± 8.8°	94.9° ± 7.3°	p < 0.001
Postoperative ROM at week 2	101° ± 12.8°	106.7° ± 12.5°	p > 0.05
Preoperative Hb (g/dL), mean (SD)	13.4 ± 1.2	13.4 ± 1.4	p > 0.05
Postoperative Hb (g/dL), mean (SD)	13.2 ± 10.1	12.9 ± 1.4	p > 0.05
Hemoglobin decrease Hb (g/dL), mean (SD)	1.2 ± 0.7	0.5 ± 0.16	p < 0.001
Postoperative early edema (cm): day1	2.5 ± 1.1 cm	1.7 ± 0.84 cm	p < 0.001
Postoperative late edema (cm): week 2	2.4 ± 0.8	1.4 ± 0.4 cm	p < 0.001
KSS–knee score at week 6	80.6 ± 9.2	79.6 ± 9.6	p > 0.05
KSS-functional score at week 6	80.8 ± 10.4	81.6 ± 10.9	p > 0.05
Surgery time (min)	64.9 ± 3.3	62.9 ± 3.2	p < 0.001

VAS, visual analog scale; KSS, Knee Society Score; ROM, range of motion

While there was no statistically significant difference in preoperative and postoperative hemoglobin levels between the two groups (p> 0.05), a statistically significant difference in terms of a decrease in hemoglobin level was observed (p < 0.001). No patient was transfused in the postoperative period unless the hemoglobin level dropped below 8 mg/dL and their clinical status deteriorated. Patients in both groups did not require blood transfusions. Moreover, no statistically significant difference in the sixth week KSS–knee score and KSS-functional score was observed between the two groups (Table-1).

Peripatellar ecchymosis was observed in 15 patients in group 1 and 8 patients in group 2. In both groups, no bullae formation was observed. Two patients in group 1 had superficial redness and heat on their skin, but none in group 2. The cause of the superficial skin infection and redness around the drain was assumed to be a reaction to the drain and Vicryl. These two patients were treated without using antibiotics. There was no periprosthetic infection in any of the patients. None of the patients developed DVT or pulmonary embolism.

The difference in diameter of the suprapatellar region before and after surgery was used to diagnose early and late postoperative edema. A statistically significant difference in early (postoperative day 2) and late (postoperative week 2) edema (p < 0.001) was observed between the two groups.

DISCUSSION

Several studies on drain have focused on postoperative blood loss, reduced hemoglobin, and the need for transfusion. (4) Studies on postoperative pain and the need for analgesics also exist. Our study evaluated both postoperative blood loss and hemoglobin change and early and late postoperative clinical–functional well-being.

Wound healing problems are frequently encountered after TKA. The occurrence of circulatory failure due to severe hematoma formation and the need for revision surgeries is one of the predisposing factors in wound healing problems. The use of drains is an important approach for preventing hematoma formation (7, 8). Drains are believed to reduce bleeding into soft tissue, prevent hematoma formation, and reduce wound site discharge (9, 10). However, using a drain eliminates the tamponade effect of the hematoma and may increase blood loss (11). In our study, although there was no statistically significant difference in postoperative hemoglobin values between patients with and without drains, there was a statistically significant difference in the amount of bleeding between them.

In our study, we benefited from the tamponade effect of intra-articular hemorrhage using a compressive dressing we made in the absence of a drain. We prevented bleeding that would require transfusion using the compressive effect of the special dressing. Patients with hemoglobin levels less than 8 g/dL and symptoms such as hypotension and tachycardia mostly undergo transfusion (12). None of our patients developed this condition, and no blood transfusion was necessary. Thus, we were able to prevent allergic reactions, immune hemolytic reactions, transfusion-related acute lung injury, graft versus host disease, hepatitis, and viral infections, including acquired immune deficiency syndrome (13).

The use of drains does not increase postoperative complications, prolong surgical time, and affect postoperative functional scores (14). In our study, the duration of surgery for patients in group 1 was 64.9 ± 3.3 min, whereas that for patients in group 2 was 62.9 ± 3.2 min (p < 0.001). Using a drain that disrupts skin integrity and deep tissue continuity causes peripheral sensitization and decreases the nociceptor threshold (15). When skin continuity is disrupted, the concentration of local inflammatory mediators increases, causing secondary central sensitization. This two-level effect causes pain, hypersensitivity, and persistent pain at the injury site. In addition, drain extraction after a major surgical intervention causes pain and discomfort in the patient (16). This condition also increases postoperative stress. Our study found that these patients' VAS scores on days 1 and 3 were higher than those of patients who used drains (p < 0.001).

Several studies have focused on the use of drains, tourniquets, and various other methods to prevent hematoma formation and reduce bleeding after total knee replacement. In our study, we evaluated the effect of compressive dressing, which we developed using our methods, on surgical outcomes, in addition to not using drains. The transfusion needs and the change in hemoglobin values of patients who did

not use drains and instead used compressive dressings were comparable to those of patients who used drains; the clinical well-being of the patients in the early postoperative period was higher; and the need for additional invasive procedures due to drain removal was eliminated.

The strengths of this study include the presence of homogeneous study groups, follow-up with special dressings without the use of drains, the fact that the surgeons who performed surgery in both groups were single surgeons, and the fact that all patients were followed up by the same surgical team. The limitations of this study were that only a small number of patients were evaluated and the surgeons in both groups were different. Bleeding control and surgeon-dependent factors may change depending on the surgeon's preference.

Future studies with large sample sizes are needed to assess the impact of the use of drainless closure with specific dressing on the occurrence of rare complications.

CONCLUSION

Compressive dressing without the use of drains is an effective and simple method that does not increase complications in TKA surgery. Although the patients who did not use drains had better ROM and pain scores in the early period, their clinical and functional outcomes in the midterm were comparable to those of patients who used drains.

Conflict of interest: The authors declared no conflict of interest.

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