Short duration and low suction pressure drain versus no drain following total knee replacement

Qunn Jid Lee, Wai Ping Mak, Wai Sun Hau, Sze Tsun Yeung, Yiu Chung Wong, Yuk Leung Wai
Total Joint Replacement Center, Yan Chai Hospital, Hong Kong

ABSTRACT

Purpose. To compare the short-term outcome in patients with or without a drain (short duration and low suction pressure) following total knee replacement (TKR).

Methods. A consecutive series of 106 women and 48 men (mean age, 69 years) underwent unilateral TKR. The first 77 patients used a low suction pressure (200 mm Hg) drain following TKR for 24 hours, and the next 77 patients used no drain.

Results. The 2 groups were comparable in terms of preoperative characteristics, the proportion of patients with pharmacological prophylaxis for deep vein thrombosis, the tourniquet time, and mode of anaesthesia. The mean drain output in the drain group was 221 ml. The time to achieve straight-leg-raising was earlier in the drain group (3.1 vs. 4.2 days, p<0.001).

Conclusion. The use of a short duration, low suction pressure drain following TKR enabled an earlier return of quadriceps power, without increasing haemoglobin drop and transfusion rate.

Key words: arthroplasty, replacement, knee; drainage; range of motion, articular

INTRODUCTION

Not using a drain following total knee replacement (TKR) may lead to haematoma formation, and thus increase pain and wound tension, and decrease the range of movement and rehabilitation progress. It may also result in wound dehiscence, infection, and persistent drainage. In addition, blood may seep out to soak through the wound dressing and cause infection, or seep into the subfascial plane and cause compartment syndrome or into the subcutaneous plane and cause ecchymosis, limb oedema, skin blisters, and skin necrosis. Nonetheless, use of a drain following TKR may result in pain, increased blood loss, need for transfusion, restriction in range of motion and rehabilitation, and retrograde infection. To reduce such risks, the use of a clamping drain and suction...
pressure,14,15 and autotransfusion of drained blood16,17 are suggested. This study compared the short-term outcome in patients with or without a drain (short duration and low suction pressure) following TKR.

MATERIALS AND METHODS

A priori sample size of 152 was required to achieve a power of 0.8 and 5% effect size in the range of motion, with a level of significance of 0.05 for a 2-tailed test. Between September 2012 and March 2013, a consecutive series of 106 women and 48 men (mean age, 69 years) underwent unilateral TKR under general or spinal anaesthesia. The first 77 patients used a low suction pressure (200 mm Hg) drain following TKR for 24 hours, and the next 77 patients used no drain. Patients with thrombocytopaenia, an abnormal clotting profile, or a history of bleeding disorder were excluded.

The 2 groups were matched in age, sex, body mass index (BMI), haemoglobin level, coronal alignment, range of motion, Knee Society knee and function scores, and Western Ontario and McMaster Universities Arthritis Index (WOMAC). The surgical protocol was standardised, including tourniquet use, medial parapatellar approach, patellar resurfacing, posterior-stabilised implants, cementation, haemostasis without tourniquet release, closure of quadriceps and retinaculum with continuous suture, and staples, compression dressing with gauze, cotton wool, and crepe bandage, and mechanical prophylaxis for deep vein thrombosis (DVT) using a calf pump for 4 to 7 days until full ambulation. Patients with a history of thromboembolism or a BMI of >30 were prescribed pharmacological prophylaxis (subcutaneous enoxaparin 40 mg daily) until full ambulation.

The drain tube (3 mm in diameter with a 70-mm terminal section of multiple perforations at 5-mm intervals) was unclamped and placed at the lateral gutter and connected to an 800 ml plastic bottle (Redivac) with a suction pressure of 200 mm Hg.

Outcome measures were performed by an independent assessor (specialist nurse). The amount of blood seeping through the skin wound was assessed by the degree of soaking of the dressing (blood stain visible on the outermost layer of bandage). The amount of intra-articular haematoma was assessed by the size of knee swelling. The amount of blood seeping extra-articularly was assessed by the size of calf swelling and the size of ecchymosis. The size of swelling was graded as small (barely observable), medium (considerable swelling without skin changes), or large (considerable swelling with tense shiny skin or blisters). Ecchymosis and skin blistering was measured as total cumulative area (cm²). Wound complications (persistent wound discharge and infection) were measured, as were the visual analogue score for pain and duration of maximal score. The progress of rehabilitation was measured by the days needed to achieve straight-leg-raising (quadriceps power ≥3) and the days needed to achieve knee flexion up to 90°. Knee range of motion, Knee Society knee and function scores, and WOMAC were measured up to 6 months. Patients with a range of motion <90° within 3 months underwent manipulation under anaesthesia (MUA).

The 2 groups were compared using the 2-sample t-test, Pearson Chi-squared test, and Fisher exact test. A p value of <0.05 was considered statistically significant.

RESULTS

The 2 groups were comparable in terms of preoperative characteristics, the proportion of patients with pharmacological prophylaxis for DVT, tourniquet time, and mode of anaesthesia (Table). The mean drain output in the drain group was 221 ml. The time to achieve straight-leg-raising was earlier in the drain group (3.1 vs. 4.2 days, p<0.001, Table). The 2 groups were comparable in terms of the degree of soaking of dressing, knee and calf swelling, bruising, blistering, wound discharge, rates of infection and DVT, and pain, as well as haemoglobin drop, transfusion rate, range of motion, Knee Society knee and function scores, WOMAC, and rate of MUA (Table).

DISCUSSION

Patients with a drain following TKR have been reported to have a higher blood loss (500–1000 ml), haemoglobin drop, and transfusion rate.14,15 Nonetheless, our patients with or without a shorter duration and low suction pressure drain were comparable, except for the time needed to achieve straight-leg-raising. Lower suction pressure (125 to 350 mm Hg) results in less blood loss.14,15 >70% of total drained fluid is collected in the first 24 hours; the risk of drain tube contamination increases from 9% to 19% thereafter.11

Comparing patients with or without a drain, the time to achieve straight-leg-raising has been reported
to be comparable, or longer in those with a drain. On the contrary, the time to achieve straight-leg-raising was earlier in our patients with a drain (3.1 vs. 4.2 days, p<0.001), probably owing to a smaller intra-articular haematoma that interfered less with the quadriceps mechanism. Pain was not the reason for such a difference, as the 2 groups had similar pain score and duration. Patients with or without a drain also have comparable in-patient range of motion. Only one study has reported an association of drain use and knee scores. In our study, there was a trend for better range of motion and Knee Society knee and function scores up to 6 months in patients with a drain. Nonetheless, a post-hoc power analysis showed that around 100 cases in each group would be needed to detect a significant difference in the knee scores.
In our study, the rate of MUA was higher in the no-drain group (6.5% vs. 1.3%, p=0.209), similar to the 8% vs. 0% reported in another study.4 A post-hoc power analysis showed that 200 patients in each group would be needed to have adequate power to detect any significant difference.

Larger haematoma is more commonly found in knees without a drain.1 In our study, the rate of large effusion was higher in the no-drain group (22.1% vs. 11.7%, p=0.085). As haemarthrosis may induce an inflammatory response in the knee, the larger amount of undrained blood may require a longer time for reabsorption and may lead to a prolonged inflammatory response and worse outcome at 6 months. A larger prospective trial is needed to assess the worse short-term outcome in patients without a drain.

CONCLUSION

The use of a short duration, low suction pressure drain following TKR enabled earlier return of quadriceps power, without increasing haemoglobin drop and transfusion rate.

DISCLOSURE

No conflicts of interest were declared by the authors.

REFERENCES


