



Total Knee Arthroplasty (TKA): Role of Drains

Authors

Dr K.V Santhosh Reddy¹, Dr Pramod Kumar. S^{2*}

¹Senior Resident, Department of Orthopaedics, Government Medical College, Nizamabad, Telangana
Mobile: 96760 44464

²Senior Resident, Department of Orthopaedics, Government Medical College, Nizamabad, Telangana

*Corresponding Author

Dr Pramod Kumar. S

Mobile no: 94921 14232

Abstract

Placement of closed suction drains after total knee arthroplasty is an age-old practice; however, benefits and disadvantages of this procedure remain disputable in various studies. Although there is no established evidence to support the use of drains in total knee arthroplasty (TKA), they are thought to reduce the formation of a haematoma and the incidence of deep infection. The aim of the study was to assess the need for drainage after total knee arthroplasty (TKA). This study was conducted at tertiary care hospital, Nizamabad after obtaining permission from the hospital ethics committee. This includes two groups of patients each 30 of both sexes, undergoing total knee arthroplasty. In control group drains were placed and in study group there was no drain. TKA was performed in most of osteoarthritis patients and few were suffering with rheumatoid arthritis. In this study noted significant average reduction of haemoglobin and haematocrit in drained patients on the first postoperative day. Most of patients in the study group required a change of dressing in the first 24 h and had ecchymosis when compared to the control group. There was a statistically significant difference in the duration of hospital stay with the control group requiring a longer stay in the hospital. The visual analog score was higher in control group than in study group, observed differences in the mean VAS values between both groups but these values were not significant. This concludes that there were benefits in terms of lower analgesic intake, lower blood loss on the first postoperative day and lower need for dressing reinforcement, but increase in hospital stay.

Keywords: Total knee arthroplasty, drains, hematoma, analgesics, VAS score.

Introduction

Total knee replacement (TKR) is a standardized surgical procedure with high success rates in the treatment of advanced degenerative osteoarthritis (OA) and rheumatoid arthritis of this joint. Substantial bleeding can occur in the subcutaneous and intra-articular space after TKR; this event can lead to blood transfusions, with their potential complications^[1]. In order to evacuate blood trapped

in the joint cavity, prevent the formation of hematoma and therefore reduce the incidence of abovementioned complications, an intraarticular closed suction drain is often installed at the end of total knee arthroplasty^[2].

The use of suction drains (SD) in arthroplasty is still controversial. It is believed that the drainage is limited only to a restricted area, failing to prevent infection if retro-grade migration of bacteria occurs. Drains can also hamper rehabilitation in the

immediate postoperative period. There is no obvious advantage of using SDs, other than lower need for dressing changes during surgery; moreover, in patients

Undergoing TKR with SDs, the risk of transfusion is higher^[3]. With the aging population, there has been increasing demand for joint replacements, which are effective methods to improve the quality of life with recovery of movement and improvement in pain, although these surgeries cause large blood loss and lead to dramatic consequences in patients with chronic illnesses; in prosthesis revision surgeries, the losses may be higher.^[4] However, this age-old practice was questioned as multiple articles failed to demonstrate that fewer infections occurred owing to the use of drains; contrarily, some authors reported retrograde infection caused by bacteria migration through drain lumen.^[5] Although lots of orthopaedists still follow this practice empirically, debate over the benefits of closed suction drains has never stopped.^[6]

The study was conducted to know blood loss, complications, postoperative pain and intake of analgesics, clinical outcome of drains in total knee arthroplasty.

Material and Methods

Total Knee arthroplasty were performed in consecutive 58 patients (of them 2 subjects underwent non simultaneous bilateral surgery). The inclusion criteria were knee arthritis impeding daily activities. Exclusion criteria included significant bone loss that required augmentation, previous thrombo embolism and intake of opioids preoperatively. The patients were followed up postoperatively at the second week, six months, and at one year. These patients were divide into 2 groups, each consist of 30 TKA. A study group consisted of 30 knees, in which we did not use drainage after TKA and a control group with 30 knees, in which drain was inserted post surgery. Both groups were comparable in terms of preoperative characteristics.

All the patients were selected by simple randomization by using a closed envelope technique.

The patients were asked to open the envelope just prior to the surgery. Well-written informed consent was taken from all the patients enrolled in the study. The study was conducted after taking hospital Ethics Committee permission. Spinal, combined with epidural anaesthesia was used in the majority of cases. The standard surgical steps were followed. All the patients were given three doses of second generation cephalosporin (one within 30 min before the procedure and two doses at 12-hour interval post-operatively). Three doses of 1 g intravenous tranexamic acid (one pre-operatively and two post-operatively at 12-hour interval) were given to all the patients. Anterior midline incision and medial parapatellar approach were used for all the cases. Pneumatic tourniquet was used in all the cases and was deflated prior to closure to catch the bleeders. Local infiltration with 0.5% sensorcaine (bupivacaine), 2 mL ketorolac (non-steroidal anti-inflammatory drug, NSAID), and 80 mg of tobramycin (aminoglycoside) diluted in 30 ml of normal saline was infiltrated locally in each knee just before cementing. NexGen_ LPS- was used in all the cases. Patella was not replaced in any of the cases. Bone cement Palacos_ LV was used in all the cases. The closed suction drain used in the control group was Number 10/12 Romo Vac_(Romsons, India). Thick compression dressing was done in all the patients post-operatively. Similar pain management protocols were followed in both the groups. Drain removal in all the patients was done after 24h.

All patients received low molecular weight heparin, starting 12 hours before surgery. They also wore compression stockings from the 2nd postoperative day. Antibiotics were administered intravenously 30 minutes before surgery. If the operation had extended, antibiotics were continued up to 3 days. In each case proper knee alignment was restored. Rehabilitation protocol was the same in both groups. On the 1st postoperative day patients stood up with a walker, performed active flexion of the operated knee up to 90°. Exercises with continuous passive motion were commenced. From the 2nd postoperative day, patients were allowed to walk on

crutches with full weight bearing as tolerable. The primary outcome measures assessed were pain, pre and post-operative haemoglobin, dressing change within 24 h, range of motion, early infection, and discharge from the wound/drain site, ecchymoses around the wound, and the duration of hospital stay. Visual analog scale (VAS) assessed pain intensity. Intake of analgesics was determined. Requirement for dressing reinforcement and the length of hospital stay were also evaluated. During hospitalization all patients had dressings covering the site of drain exit in the control group and similar expected site on skin in the study group. All patients were clinically and radiologically evaluated preoperatively, during hospitalization, then at follow up, approximately 6 and 12 months after surgery. Radiographs in the anteroposterior and the lateral view were performed using the knee society roentgenographic evaluation system, any radiological findings suggesting prosthesis loosening at postoperative visits were determined. 10 Range of movement of operated knee and complications were examined postoperatively. There was a statistically significant difference in the duration of hospital stay with the control group requiring a longer stay in the hospital. After compilation of collected data, analysis was done using statistical package for social sciences (SPSS), version 20 (IBM, Chicago, USA). The results were expressed using appropriate statistical methods

Results

A total of 60 patients recruited equally into two groups, (study/ no drain group and control/drain group) and treated primary cemented total knee arthroplasty to assess the need for drainage after total knee arthroplasty was included in this study.

Table 1: Demographic data

Base line characters	Control group	Study group
Number	30	30
Age in years	66.5±5.65	68.0±6.59
Height in cms	152.9±10.25	154.5±8.56
Weight in kgs	55.65±6.85	58.96±5.62
BMI	28.9±1.23	29.5±1.52
Etiology		
Osteoarthritis	24	27
Rheumatoid arthritis	6	7

Table 2: Blood parameter

Haemoglobin	Control group	Study group
Pre operative haemoglobin (g/dl)	12.2	11.8
Post operative haemoglobin(g/dl)	8.6	9.8
Pre operative haematocrit	37.5	37.6
Post operative haematocrit	26.6	30.0

Table 3: Operative parameter

Parameter	Control group No. effected	Study group No. effected
Dressing change within 24 h	3	6
Early infection	2	1
Ecchymosis	2	3
Decreased range of movements	6	2
Duration of hospital stay in days	6	4

Table 4: Post operative VAS score

	Control group	Study group
Day 1	5.7	4.8
Day 2	4.9	3.5
Day 3	3.5	2.8
Day 4	2.9	2.1
Day 5	2.5	2.0
Day 7	2.1	1.9

In this study VAS score was higher in control group than in study group. We observed differences in the mean VAS values between both groups but these values were not significant.

Table 5: Complications

	Control group	Study group
Prolonged wound healing	3	1
Prolonged healing of injured scar	2	1
Superficial wound infection	1	0
Persistent leg edema	2	1

There was a statistically significant difference in the duration of hospital stay (p < 0.0006) with the control group requiring a longer stay in the hospital.

Discussion

Waugh and Stinchfield are the first authors who advocated the use of drains in modern orthopaedics [7].

The practice of closed suction drain is constantly being challenged by many surgeons worldwide with a decline in its use. Hematoma formation and thus the fear of subsequent infection has been the prime reason for the use of closed suction drain. It is the age-old belief that draining the wound prevents the increased collection of blood in different compartments of the wound post-operatively which is the cause of hematoma formation. Hematoma being a good culture medium for the bacteria with low level of opsonic proteins hinders the normal phagocytic activities and also delays the normal wound healing process^[8,9]. Theoretically, drain usage does not allow the tamponade effect to occur which is an important step in filling the dead space in an operated wound. Various methods have been used in order to determine the level of post-operative hematoma formation namely weighing the post-operative dressings, using ultrasound of the wound and single-photon emission computed tomography. However none of these methods has shown that there is a major role of the drain in the prevention of haematoma formation. On the contrary, there is always some amount of hematoma which is left unevacuated in the wound irrespective of drain usage.

In the present study the two groups were comparable in terms of age, height, weight like parameters. Etiology includes major of osteoarthritis and in few cases rheumatoid arthritis.

In this study noted significant average reduction of Hb and HCT in drained patients on the first postoperative day. The possible explanation of this is that the presence of a drain reduces the tamponade effect. The results were in comparison with some authors demonstrated higher blood loss when drain was used^[10,11] and in contrary to some studies suggest that a suction drain does not increase blood loss after TKA^[12].

In our study more patients in the study group required a change of dressing in the first 24 h and had ecchymosis when compared to the control group, the final results were not statistically significant in our study.

Parker et al.^[13] found that the only definite advantage of using drains, demonstrated in a meta-analysis, was to reduce the bleeding through the wound, as shown by the small number of dressings in the group in which drains were used. Furthermore, the use of drains reduced local lesions at the surgical site. Dora *et al.* had similar findings after total hip arthroplasty¹⁰. Goes et al. compared the laboratory results of opening the drain at six and 12 h after TKR, and did not observe statistically significant differences in laboratory values. However, the volume of drained blood was higher when the drain was opened after 6 h^[14]

In our study early infection was observed in drain group. Willemen et al.²⁰ concluded that the clinical evaluations of surgical wound healing were similar for all groups (drain removed after 24 and 48 h) and clearly showed no advantage in continuing use of the drain after 24 h; if drainage is maintained for a longer period, there is an increased risk of bacterial contamination^[15].

Blood loss is another major and important concern following total knee arthroplasty, the majority of the loss occurring in the first few hours post-operatively^[16]. The reason behind this is that there is increased reactive blood flow in the wound, once the tourniquet is deflated. There is an associated risk of blood loss leading to blood transfusion especially in the patients where a drain has been used.

It has been our observation that a drain interferes with postoperative physiotherapy and the nursing care thus delaying the mobilization which further adds to the duration of hospital stay which was significant in our study. Our finding was similar to those of other studies^[9]. The presence of drain interferes with the post-operative knee range of movements to some extent which itself contributes to an increase in the duration of hospital stay.

In this present study need of NSAIDS were more in control group with drain than the study group. A study done by Holt *et al.*^[17] observed no statistically significant difference in postoperative opioid consumption after TKA, regardless of the presence of a drain. Confalonieri *et al.*^[18] evaluated patients after unicompartamental knee arthroplasty and noted

lower analgesic requirements on the 1st postoperative day in patients without drain.

Disruption of continuity of skin and deeper tissues along with the application of the drain causes peripheral sensitization, resulting in a decrease of nociceptors threshold^[19] In addition concentration of local inflammatory mediators increases and secondarily induces central sensitization. This two level action causes pain hypersensitivity and persistent decrease in the pain threshold at the site of injured as well as surrounding uninjured tissues. Moreover, opioid receptors are present in inflamed tissues^[20].

The present study conclude that there is no rationale for the use of drain after primary TKA. There are benefits in terms of lower analgesic intake, lower blood loss on the first postoperative day and lower need for dressing reinforcement during hospitalization. It has been our observed that drain interferes with postoperative physiotherapy and the nursing care thus delaying the mobilization which further adds to the duration of hospital stay.

References

1. Seo ES, Yoon SW, Koh IJ, Chang CB, Kim TK. Subcutaneous versus intraarticular indwelling closed suction drainage after TKA: a randomized controlled trial. *Clin Orthop Relat Res.* 2010;468(8):2168–76.3
2. Waugh TR, Stinchfield FE. Suction drainage of orthopaedic wounds. *J Bone Joint Surg Am* 1961;43-A:939–46.
3. Kęska R, Paradowski TP, Witoński D. Outcome in primary cemented total knee arthroplasty with or without drain: a prospective comparative study. *Indian J Orthop.* 2014;48(4):404–9.6.
4. Gibon E, Courpied JP, Hamadouche M. Total joint replacement and blood loss: what is the best equation? *Int Orthop.* 2013;37(4):735–9.
5. Parker MJ, Roberts CP, Hay D. Closed suction drainage for hip and knee arthroplasty. A meta-analysis. *J Bone Joint Surg Am* 2004;86-A: 1146–52.
6. Chandratreya A, Giannikas K, Livesley P. To drain or not drain: literature versus practice. *J R Coll Surg Edinb* 1998;43:404–6.
7. Waugh TB, Stinchfield FE. Suction drainage of orthopaedic wounds. *J Bone Joint Surg [Am]* 1961;43-A:939-46.
8. Alexander JW, Korelitz J, Alexander NS (1976) Prevention of wound infections. A case for closed suction drainage to remove wound fluids deficient in opsonic proteins. *Am J Surg* 132(1),59–63.
9. Cheung G, Carmont MR, Bing AJ, Kuiper JH, Alcock RJ, Graham NM (2010) No drain, autologous transfusion drain or suction drain? A randomised prospective study in total hip replacement surgery of 168 patients. *Acta Orthop Belg* 76(5), 619–627.
10. Dora C, von Campe A, Mengiardi B, Koch P, Vienne P. Simplified wound care and earlier wound recovery without closed suction drainage in elective total hip arthroplasty. A prospective randomized trial in 100 operations. *Arch Orthop Trauma Surg* 2007;127:919-23.
11. Li C, Nijat A, Askar M. No clear advantage to use of wound drains after unilateral total knee arthroplasty: A prospective randomized, controlled trial. *J Arthroplasty* 2011;26:519-22.
12. Ritter MA, Keating EM, Faris PM. Closed wound drainage in total hip or total knee replacement. A prospective, randomized study. *J Bone Joint Surg Am* 1994;76:35-8.
13. Parker MJ, Roberts CP, Hay D. Closed suction drainage for hip and knee arthroplasty. A meta-analysis. *J Bone Joint Surg Am.* 2004;86(6):1146–52.
14. Goes RFA, Silva AF, Lyra FS, Loures FB, Palma IM, Cobra HAA, et al. Estudo prospectivo randomizado após uso de dreno na artroplastia total do joelho com implante. *Rev Bras Ortop.* 2013;48(3):257–62.19
15. Willemen D, Paul J, White SH, Crook DW. Close suction drainage following knee

- arthroplasty. Effectiveness and risks. Clin Orthop Relat Res. 1991;264:232-4.21.
16. Senthil Kumar G, Vonarx OA, Pozo JL (2005) Rate of blood loss over 48 hours following total knee replacement. Knee 12, 307-309.
 17. Holt BT, Parks NL, Engh GA, Lawrence JM. Comparison of closed-suction drainage and no drainage after primary total knee arthroplasty. Orthopedics 1997;20:1121-4.
 18. Confalonieri N, Manzotti A, Pullen C. Is closed-suction drain necessary in unicompartmental knee replacement? A prospective randomised study. Knee 2004;11:399-402
 19. Busch CA, Shore BJ, Bhandari R, Ganapathy S, MacDonald SJ, Bourne RB, *et al.* Efficacy of periarticular multimodal drug injection in total knee arthroplasty. A randomized trial. J Bone Joint Surg Am 2006;88:959-63.
 20. Stein C. The control of pain in peripheral tissue by opioids. N Engl J Med 1995;332:1685-90.