

Are drains required following a routine primary total joint arthroplasty?

Skand Kumar · Subbaraju Penematsa · Sailesh Parekh

Received: 14 July 2006 / Revised: 23 July 2006 / Accepted: 24 July 2006 / Published online: 11 October 2006
© Springer-Verlag 2006

Abstract The purpose of this study was to evaluate the benefits of suction drainage following primary total joint arthroplasty. We reviewed primary total hip and knee replacements separately and together in 126 consecutive patients. There were 63 patients each in the drainage and no drainage groups. Sex distribution and anticoagulant use were similar in the two groups. All patients underwent the same operative technique and method of closure. The mean postoperative fall in haemoglobin was 3.2 and 3.3 gm/dl in the drainage and no drainage groups respectively. There was no statistically significant difference between the two groups with regard to blood transfusion requirements, rehabilitation time, postoperative complications such as hypotension and wound infections ($p>0.05$). The average rehabilitation time in both groups was 8–9 days. The routine use of a suction drain is unnecessary after an uncomplicated total joint arthroplasty.

Résumé Le sujet de cette étude était d'évaluer les bénéfices du drainage aspiratif après arthroplastie primaire. Nous avons revus 126 cas consécutifs d'arthroplastie totale de la hanche et du genou. Il y avait 63 patients dans chacun

des groupes, drainés ou non drainés. La technique opératoire était la même chez tous les patients et le genre ainsi que le traitement anti-coagulant étaient similaires dans les deux groupes. La chute de l'hémoglobine était respectivement de 3,2 et 3,3 g/dl dans les groupes drainés et non drainés. Il n'y avait pas de différence significative entre les deux groupes pour la nécessité de transfusion, le temps de récupération, et les complications post-opératoires ($p>0,05$). Le temps moyen de récupération dans les deux groupes était de 8–9 jours. Le drainage aspiratif n'est pas nécessaire après une arthroplastie totale non compliquée.

Introduction

Suction drains are used routinely after total joint arthroplasty by most orthopaedic surgeons without established evidence to support the benefits [7, 8]. It is believed to decrease haematoma formation, which would otherwise impair wound healing, restrict mobilisation, increase pain and increase the likelihood of infection. However, the literature available to support these beliefs is sparse.

Some publications report no significant difference in the incidence of wound problems, infection rates or postoperative rehabilitation [4, 9]; others reported greater blood loss, haematoma formation, higher transfusion rates and delayed function [20–22]. In this study we present the comparison of drainage and no drainage in 126 patients who had primary total hip and knee replacements.

Materials and methods

This retrospective study was conducted between August 2000 and July 2002 on 126 consecutively selected patients,

S. Kumar
Princess Royal Hospital,
Brighton and Sussex University Hospitals,
Haywards Heath, UK

S. Penematsa
Nuffield Orthopaedic Centre,
Oxford, UK

S. Parekh
Birmingham City Hospital,
Birmingham, UK

S. Kumar (✉)
40 Old Farm Close,
Haywards Heath, West Sussex, UK RH17 7GA
e-mail: skandkumar@gmail.com

who had primary total hip and knee replacements in a district general hospital. There were 63 patients (with a mean age of 69 years) in each group, i.e. drainage and no drainage. Sex distribution and anticoagulant use were similar in the two groups. The details of their distribution in further subgroups are given in Table 1. Only patient records with complete data were considered and were matched for age, sex, indication and premorbidity conditions. Patients with significant systemic illness (over ASA grade 2), revision surgery and organ failure were not included in the study to avoid confounding factors. There was one patient on warfarin in the drainage group and two patients in no drainage group. Fifty-six patients had replacement on the left and 70 had replacement on the right.

The total joint replacements were performed under general or regional anaesthesia by surgeons who were of consultant grade or those under direct supervision of the consultants. All primary total hip arthroplasties were performed with the patient in the lateral position using the standard Hardinge approach. Pulsed lavage was used to prepare the implant bearing surfaces. The implants used were the Exeter total hip system (Stryker), the CPT hip with Trilogy cup (Zimmer) and the Charnley Elite prosthesis (DePuy).

The total knee arthroplasty was performed using a tourniquet and a medial parapatellar approach was used. Pulsed lavage was used to prepare the surfaces. The components used were the PFC Sigma knee system (Depuy), the Rotaglide (Corin Medical) and the Low Contact Stress prosthesis (DePuy), which were implanted using gentamicin Palacos (Schering-Plough) polymethyl-methacrylate cement.

Postoperatively, compression bandages were used for thromboprophylaxis and patients were mobilised under the care of a physiotherapist. All patients were mobilised the day after surgery and weight-bearing was permitted if comfortable. Thromboprophylaxis was uniform with low molecular weight heparins started postoperatively. Those on warfarin recommenced it postoperatively. Drains were removed after 48 h and dressings were checked at 48–

72 h for signs of infection. Patients with suspicious, oozy and oedematous-looking wounds had a culture swab taken and began oral antibiotic prophylaxis, which was modified according to the reports. Intraoperative and postoperative complications, i.e. a fall in haemoglobin, blood transfusion, systemic illness, and discharge from hospital after achieving satisfactory physiotherapy goals such as straight leg raising and independent stair climbing were recorded. Blood was transfused in those with symptomatic anaemia. Statistical analysis of all observations using the Mann–Whitney U test, Fisher's exact probability test and the Chi-squared test without Yates correction was carried out as appropriate.

Results

There were 63 patients in each group, i.e. the drainage and no drainage groups. In the knee replacement group, there were 44 patients with drains and 48 patients without drains. Nineteen patients with total hip replacement had drains and 15 patients had no drains (Table 1).

Patients with total knee replacement had an average fall in haemoglobin of 2.6 g% in the drainage group and 2.8 g% in the no drainage group. Patients with total hip replacement had a drop in haemoglobin of 3.8 g% and 3.7 g% in the drainage and no drainage groups respectively. Thirty-four and 28 patients received blood transfusion in the drainage group and no drainage groups respectively. There was no significant difference between the two groups on comparing the patients with a fall in haemoglobin postoperatively and blood transfusion requirements (Table 2).

There were no wound problems and frequent dressing change requirements in patients without drains were not required. The drains were removed 48 h postoperatively and a wound check was carried out. Ten patients in each group appeared to have oedematous and oozy wounds and were treated with prophylactic oral antibiotics. All these wounds healed well and the microbiology results showed no growth of organisms.

There were no intraoperative surgical and postoperative complications in the form of chest infections, hypotension, abdominal distension and cardiac complications. There was no significant difference between the drainage and no drainage groups on comparing the duration of hospital stay to achieve adequate rehabilitation (Table 2).

Discussion

The reports on the use of suction drains in joint replacements have disagreed on their benefits [4, 10, 20]. A survey of British Orthopaedic Association members indicated that

Table 1 Patient demographics

	Males	Females	Mean age	Right joint	Left joint	Warfarin
Total knee (n=92)						
Drainage	16	28	67	22	22	0
No drainage	29	19	70	26	22	0
Total hip (n=34)						
Drainage	11	8	70	11	8	1
No drainage	7	8	69	11	4	2

Table 2 Results of total joint arthroplasty with and without drainage

	Haemoglobin fall	Blood transfusion	Transfusion units	Infection	Positive cultures	Postoperative complications	Hospital stay
Total knee (<i>n</i> =92)							
Drain (<i>n</i> =44)	2.6	21	2.5	0	0	5	8.2
No drain (<i>n</i> =48)	2.8	18	2	0	0	6	8.5
Total hip (<i>n</i> =34)							
Drain (<i>n</i> =19)	3.8	13	2.8	0	0	5	8.9
No drain (<i>n</i> =15)	3.7	10	2.1	0	0	2	8.4
<i>p</i> value	0.48*	0.13**	0.39*	0	0	1.00***	0.32*

*Based on a non-parametric test (Mann–Whitney *U* test)

**Based on the Chi-squared test without Yates correction

***Based on Fisher's exact probability test

87% used suction drains [6]. Widman et al. showed no effect of drains in reducing the postoperative haematoma volume even with use of two drains [25]. Holt et al. found the need for more dressing changes and areas of ecchymosis without an increase in patient and nursing discomfort [10]. Kim et al. and Holt et al. recommended the use of drains as they found a repeated need to change dressings in patients without drains, which resulted in discomfort for the patient and nursing staff even though there was no increase in the infection rate [10, 12].

Waugh and Stinchfield [24] and Parrini et al. [21] supported the use of suction drains to prevent haematomas and thereby decrease infection. Alexander et al. also supported the use of suction drainage as the fluid removed was deficient in opsonic proteins, which are important for defensive action [2]. Cerise et al. and Nora et al. showed experimentally and clinically the increased bacterial colonisation with the use of drains [5, 18]. Minnema et al. and Willett et al. showed 6% positive cultures in hip arthroplasties with closed suction drainage [15, 26]. Many studies have shown the use of drainage increasing the infection rate by providing a portal of entry for bacteria [11, 13, 14]. We found oedematous and oozy wounds in 6 patients (2 in total hip replacements and 4 in total knee replacements) in the no drainage group until the fifth postoperative day. None of the patients ended up with infection or a prolonged hospital stay. Microbiology results of all these swabs showed no growth of organisms.

There is a divergence of opinion about the transfusion requirements, postoperative pain and rehabilitation with the use of drains [4, 10, 17, 19, 21]. Some studies have shown increased transfusion requirements with drains, while others have shown no differences following uncomplicated joint arthroplasty [1, 3, 9, 17, 20]. Walmsley et al. showed a 7% lower rate of transfusion in patients without drains [23]. These reports differ in their assessment of surgical techniques, implant usage, blood loss and units transfused.

On splitting into homogenous groups, the group sizes are too small to detect significant differences in blood loss or fall in haemoglobin levels. However, none of the studies provides a compelling reason to use drains. All patients were optimised before being considered for surgery. Blood loss calculation during operation and afterwards is subjective and variable. Therefore, changes in haemoglobin levels are a reliable means of assessment of blood loss. Our hospital has a transfusion policy in place and transfusions are performed in symptomatic postoperative anaemia. Even though we found increased transfusion requirements in patients with drains, this was not statistically significant ($p>0.05$). There was no significant fall in haemoglobin levels in either of the two groups postoperatively.

Our study design is retrospective and therefore has its limitations. The strong point about this process is that the observations happened in the past and the persons entering data on the observations were uninfluenced and unaffected. Due to different staff members entering the patient records, the tendency towards bias, favouring one or other group, was eliminated. All staff members are trained in making and entering basic observations, and hence the standardisation in record maintenance. We included well-documented observations and details of all the procedures carried out using the same approach by the consultant in charge or those under his supervision. All patients were matched with regard to their demographics and morbidity. Moran et al. reported no difference in hip scores, hospital stay and short-term clinical results after total joint arthroplasties performed either by consultants or supervised trainees [16]. Our study also showed that a standardised procedure performed by consultants and supervised trainees using a variety of implants showed no difference with regard to early postoperative results. We found no significant differences in the postoperative complication rate, rehabilitation and hospital stays between the two groups.

We conclude that the routine use of suction drainage should be avoided after an uncomplicated total joint arthroplasty since it does not influence the incidence of wound complications and postoperative rehabilitation, and this helps to cut expenses.

References

- Adalberth G, Bystrom S, Kolstad K, Mallmin H, Milbrink J (1998) Postoperative drainage of knee arthroplasty is not necessary: a randomized study of 90 patients. *Acta Orthop Scand* 69:475–478
- 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* 132:59–63
- Ashraf T, Darmanis S, Krikler SJ (2001) Effectiveness of suction drainage after primary or revision total hip and total knee arthroplasty. *Orthopedics* 24:1158–1160
- Beer KJ, Lombardi AV Jr, Mallory TH, Vaughn BK (1991) The efficacy of suction drains after routine total joint arthroplasty. *J Bone Joint Surg* 73A:584–587
- Cerise EJ, Pierce WA, Diamond DL (1970) Abdominal drains: their role as a source of infection following splenectomy. *Ann Surg* 171:764–769
- Chandratreya A, Giannikas K, Livesley P (1998) To drain or not drain: literature versus practice. *J R Coll Surg Edinb* 43:404–406
- Crevoisier XM, Reber P, Noesberger B (1998) Is suction drainage necessary after total joint arthroplasty? A prospective study. *Arch Orthop Trauma Surg* 117:121–124
- Esler CN, Blakeway C, Fiddian NJ (2003) The use of a closed-suction drain in total knee arthroplasty. A prospective, randomised study. *J Bone Joint Surg Br* 85:215–217
- Hadden WA, McFarlane AG (1990) A comparative study of closed-wound suction drainage vs. no drainage in total hip arthroplasty. *J Arthroplasty* 5:S21–S24
- Holt BT, Parks NL, Engh GA, Lawrence JM (1997) Comparison of closed-suction drainage and no drainage after primary total knee arthroplasty. *Orthopedics* 20:1121–1124
- Jepsen OB, Larsen SO, Thomsen VF (1969) Post-operative wound sepsis in general surgery. II. An assessment of factors influencing the frequency of wound sepsis. *Acta Chir Scand Suppl* 396:80–90
- Kim YH, Cho SH, Kim RS (1998) Drainage versus nondrainage in simultaneous bilateral total knee arthroplasties. *Clin Orthop Relat Res* 347:188–193
- Lidwell OM (1961) Sepsis in surgical wounds. Multiple regression analysis applied to records of post-operative hospital sepsis. *J Hyg (Lond)* 59:259–270
- Magee C, Rodeheaver GT, Golden GT, Fox J, Edgerton MT, Edlich RF (1976) Potentiation of wound infection by surgical drains. *Am J Surg* 131:547–549
- Minnema B, Vearncombe M, Augustin A, Gollish J, Simor AE (2004) Risk factors for surgical-site infection following primary total knee arthroplasty. *Infect Control Hosp Epidemiol* 25:477–480
- Moran M, Yap SL, Walmsley P, Brenkel IJ (2004) Clinical and radiologic outcome of total hip arthroplasty performed by trainee compared with consultant orthopedic surgeons. *J Arthroplasty* 19:853–857
- Niskanen RO, Korkala OL, Haapala J, Kuokkanen HO, Kaukonen JP, Salo SA (2000) Drainage is of no use in primary uncomplicated cemented hip and knee arthroplasty for osteoarthritis: a prospective randomized study. *J Arthroplasty* 15:567–569
- Nora PF, Vanecko RM, Bransfield JJ (1972) Prophylactic abdominal drains. *Arch Surg* 105:173–176
- Ovadia D, Luger E, Bickels J, Menachem A, Dekel S (1997) Efficacy of closed wound drainage after total joint arthroplasty. A prospective randomized study. *J Arthroplasty* 12:317–321
- Parker MJ, Roberts CP, Hay D (2004) Closed suction drainage for hip and knee arthroplasty. A meta-analysis. *J Bone Joint Surg Am* 86:1146–1152
- Parrini L, Baratelli M, Parrini M (1988) Ultrasound examination of haematomas after total hip replacement. *Int Orthop* 12:79–82
- Reilly TJ, Gradisar IA Jr, Pagan W, Reilly M (1986) The use of postoperative suction drainage in total knee arthroplasty. *Clin Orthop Relat Res* 208:238–242
- Walmsley PJ, Kelly MB, Hill RM, Brenkel I (2005) A prospective, randomised, controlled trial of the use of drains in total hip arthroplasty. *J Bone Joint Surg Br* 87:1397–1401
- Waugh TR, Stinchfield FE (1961) Suction drainage of orthopaedic wounds. *J Bone Joint Surg Am* 43:939–946
- Widman J, Jacobsson H, Larsson SA, Isacson J (2002) No effect of drains on the postoperative hematoma volume in hip replacement surgery: a randomized study using scintigraphy. *Acta Orthop Scand* 73:625–629
- Willett KM, Simmons CD, Bentley G (1988) The effect of suction drains after total hip replacement. *J Bone Joint Surg Br* 70:607–610