No need for routine closed suction drainage in elective arthroplasty of the hip

A prospective randomized trial in 104 operations

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Submitted 02-05-01. Accepted 03-05-01

Background **The purpose of this study was to determine the utility of closed suction drainage (CSD) in elective total hip arthroplasty (THA).**

Patients and methods **We randomized 104 elective, consecutive THAs to receive drainage (53) or no drainage (51). 60 arthroplasties were cemented and 44 hybrid.**

Results **In the drainage group, 2 hematomas and 2 superficial wound infections occurred; there were no wound complications in the undrained group (p = 0.04). Patients receiving drainage had a greater reduction in hematocrit (10.4 vs 7.4) (p = 0.03), and longer hospital stay (5.1 days vs 4.7) (p = 0.01). At the 3-month follow-up, we found no deep wound infections in either group.**

Interpretation **We no longer use CSD in elective, primary, routine THA.**

Waugh and Stinchfield (1961) advocated closed suction drainage (CSD) in orthopedic surgery, since then this has become standard care in total hip arthroplasty (THA) surgery. CSD systems are still utilized with the aim of preventing wound hematomas, reducing wound complications and, hopefully, the likelihood of a deep infection.

Several authors have pointed out that routine use of CSD is controversial, and retrospective studies indicate that this practice may be unnecessary in uncomplicated cases (Hadden and McFarlane 1990, Acus et al. 1992). Hardly any evidence-based information from prospective randomized trials is available (Ritter et al. 1994, Niskanen et al. 2000).

We wished to determine whether elective THA can be safely done without CSD.

Material and methods

Between March and October 2001, 103 patients underwent 105 elective THAs in a single institution (Hospital Italiano de Buenos Aires). After approval by the Institutional Review Board and Informed Consent, the patients were randomized to receive a standard closure with or without CSD. The study was done in accordance with the Helsinki Declaration. The decision to use CSD was made by placing even and odd values in a computer-generated table of randomized numbers. We excluded patients with pre-existing coagulopathies and those requiring anticoagulation before or after surgery due to pre-existing clinical conditions. 1 patient without a drain developed an acute obstruction of an abdominal aortic bypass immediately after surgery and required additional vascular surgery via an abdominal approach, 6 units of blood and postoperative heparinization. The wound healed uneventfully, but this man was excluded from the analysis, leaving 102 patients (104 hips) in the study.

The series consisted of 54 men and 48 women with an average age of 63 (24–87) years. Their preoperative diagnoses were osteoarthrosis in 80 patients, avascular necrosis in 10, hip dysplasia in 6 and other diagnoses in 6.

Table 1. Preoperative variables and duration of surgery

Drain	Patients (hips)	Average age (y)	Male/female (patients)	Height (cm)	Weight (kg)	Preoperative hematocrit (%)	Duration of surgery (min)
Yes	52 (53)	65	26/26	168	81	41	97
No	50 (51)	61	28/22	169	77	40	100
P-value		0.1	0.9	0.4	0.2	0.2	0.5

Surgery was performed during hypotensive epidural anesthesia (mean arterial pressure: 50 mm Hg) by the same surgical team. Antibiotic prophylaxis was routinely administered during induction and was continued for 12 hours. A standard posterolateral approach was used in 102 operations and a transtrochanteric approach in 2. During posterior exposure of the hip, the posterior circumflex vessels lying between the quadratus femoris and the neck were routinely identified and coagulated. 60 arthroplasties were cemented and 44 hybrid. Before closure, the second assistant told the operating surgeon, who was blinded to the randomization during the procedure, whether the patient should receive CSD. Among 104 operations, 53 were given CSD and 51 standard closure without drainage.

2 drainage tubes were brought out through the skin and placed under the fascia. 1 patient was excluded from the randomization due to persistent bleeding throughout surgery and received CSD. The drains were removed the morning after surgery. The routine dressing consisted of 4 dry sponges underneath an elastic bandage. Immediately after surgery, the perimeter of the midthigh was measured.

Thomboembolic prophylaxis consisted in one bolus of unfractionated heparinat (15U/kg of body weight) given immediately after cup insertion, followed by acetylsalicylic acid (500 mg qd) (Aspirina, Bayer, Argentina) for 3 weeks in 91 procedures (89 patients). 13 patients were considered at high risk of thromboembolic disease and received sodium enoxaparin 40 mg qd (Clexane, Aventis Pharma, Argentina) throughout their hospital stay followed by the same dose of acetylsalicylic acid for a total of 3 weeks.

The patients were encouraged to perform flexion-extension exercises immediately after surgery, were mobilized out of bed on the second postoperative day, and ambulated with protection for 45 days. Weightbearing was allowed, as tolerated.

The dressing was evaluated on a daily basis and the need to change or reinforce the dressing due to excessive bleeding before the second postoperative day was recorded. During the hospital stay, persistent bleeding or serous drainage, need for a transfusion, fall in hematocrit, changes in the perimeter of the midthigh at discharge, and duration of hospital stay were recorded. Patients were followed for 3 months for wound and systemic complications.

The demographic variables, preoperative hematocrit and duration of surgery were similar in patients with and without CSD (Table 1).

In the statistical analysis we used the unpaired t-test, Fisher's exact test and 95% confidence intervals. Alpha was set at 0.05.

Results

No intraoperative complications were recorded and none of the patients died during the follow-up.

Blood transfusion was required after 39 operations: 21 of those with CSD required an average of 1.6 (1–3) U/patient; and 18 without a drain required an average of 1.5 (1–3) U/patient. The mean volume of blood collected in the CSDs was 290 (50-550) mL. Patients receiving CSD had more marked reductions in hematocrit (10.4 vs 7.4) ($p = 0.03$), and a longer hospital stay (5.1 vs 4.7 days) than those without a drain ($p = 0.01$) (Table 2).

2 patients had a persistent serous drainage which delayed discharge, both had ben given CSD; postoperative antithrombotic prophylaxis consisted in acetylsalicylic acid in one and sodium enoxaparin in the other. On discharge, all wounds were clean. 2 patients, who received CSD, developed a superficial wound infection, one of them at the

Table 2. Comparison of in–hospital variables. Range is given in parentheses. 95% confidence intervals are shown between brackets

Drain	Hematocrit reduction	Transfusion (patients)	Change, thigh perimeter (cm)	In-hospital stay (days)
Yes	10.4 (–2–20) [8.7–11.7]	21 [14–29]	1.6 (–2–5) [1.16–2.04]	5.1 (4–10) [4.8–5.5]
No	7.4 (–12–19) [5.7–9.1]	18 [11–25]	1.7 (–5–8) [1.04–2.39]	4.7 (3–7) [5.7–7.6]
P-value	0.03	0.7	0.8	0.01

Table 3. Patients with associated postoperative complications

Complication	Drain group	No drain group	P-value
Dressing reinforcement	6	10	0.3
Persistent drainage	2	0	0.5
Hematoma	2	0	0.5
Superficial wound infection	2	0	0.5
Deep venous thrombosis	1	1	1
Pulmonary embolism	1	0	1

drain site, they were subsequently treated with oral antibiotics and had an uneventful course. 2 patients developed a wound hematoma, both had CSD and their postoperative antithrombotic prophylaxis was acetylsalicylic acid in one and sodium enoxaparin in the other. 1 patient had the hematoma spontaneously drained 2 weeks after surgery and the other required surgical drainage 11 days after surgery. Both patients had an uneventful course. If all wound complications (hematoma and superficial infection) are included, we had 4 complications in patients with CSD and none among those without drainage ($p = 0.04$) (Table 3).

1 patient in each group developed a clinically deep venous thrombosis diagnosed with ultrasound, both had been given acetylsalicylic acid after surgery. One of the patients with a distal clot was not treated and the other with a proximal clot received acenocumarol (Sintrom, Novartis, Argentina). 1 patient who was given sodium enoxaparin after surgery had a non-fatal pulmonary embolism diagnosed 4 days after surgery and was treated with unfractionated heparin followed by oral anticoagulation.

Discussion

The data in the literature regarding the benefits of the routine use of CSD after elective THA are inclusive. This practice is deeply rooted in the orthopedic community, but it doesnot necessarily have a scientific basis. Indeed, some reports have suggested that routine, uncomplicated THA can be safely performed without CSD (Ritter et al. 1994, Niskanen et al. 2000).

Numerous studies have compared whether or not CSD should be used after joint arthroplasty. However, some of these have not been prospective (Hadden and McFarlane 1990, Acus et al. 1992) or have evaluated only a few patients with a hip replacement (Beer et al. 1991, Ovadia et al. 1997, Niskanen et al. 2000). Moreover, the use of antithrombotic prophylaxis, which may be associated with excessive bleeding, has not always been mentioned (Beer et al. 1991, Ovadia et al. 1997). To our knowledge, only one prospective, randomized trial comprising more than 100 patients has been done (Ritter et al. 1994).

The aim of our pilot study was to determine whether CSD alter the postoperative course of elective THA performed using a uniform protocol, with strict inclusion criteria and postoperative medication. These criteria were followed in the vast majority of elective primary THA cases performed in our institution.

Theoretically, the drain should remove the postoperative hematoma and thereby reduce the incidence of infections. However, in a recent prospective, randomized study, the use of a drain did not reduce the volume of the postoperative hematoma around the arthroplasty (Widman et al. 2002). Moreover, suction tubes can be a cause of infection if retrograde migration of bacteria occurs along the tubes (Sørensen and Sørensen 1991, Overgaard et al. 1993). In a prospective study of 489 clean hip and knee operations, Sørensen and Sørensen (1991) detected bacterial growth in the drain tip of 56 patients, and 5 of them subsequently developed an infection. This finding may explain development of superficial infections in 2 of our patients, 1 of which occurred at the drain site.

When all wound complications were considered, we found a statistically significant difference between the two groups, suggesting that the course of healing of the wound was more uneventful in patients with no CSD. This observation has not yet been confirmed by prospective, randomized trials involving elective hip arthoplasties. However, in a prospective randomized trial of 70 patients undergoing surgery for femoral neck fracture, Cobb (1990) reported that the group with CSD had more wound complications in general and, in 3 cases, the complications involved the drain: the tube was sutured to the wound, an infection occurred at the drain site and a persistent leak was found.

In the present study, we applied a vacuum to the drains immediately after surgery. Persistent bleeding promoted by the negative pressure at the surgery site may explain the more marked decline in hematocrit in patients with CSD, as has been recently suggested (Widman et al. 2002).

Ritter and coworkers (1994) randomized 415 patients undergoing total hip or knee replacements for CDS or no drainage, and found no differences in the incidence of wound complications between the two groups. Their surgical technique differed from ours since they did not routinely repair the posterior soft tissues, only minimal hypotension was induced, and all patients were given acetylsalicylic acid postoperatively. Moreover, 10 patients were briefly immobilized when persistent wound drainage was detected. In our study, no patient was kept in bed because of persistent drainage. We believe that some patients at high risk of thromboembolic disease may require anticoagulation with warfarin or low molecular weight heparin (Di Giovanni et al. 2000).

The cost of a CSD system in our institution is USD 30. With the prevalence of elective primary THAs during 2001 in our institution (154 hips), we could expect to save USD 4620 in one year, if CSD were not routinely utilized, and an additional sum due to a shorter hospital stay in patients without CSD.

With this THA protocol, we believe that there is strong evidence that CSD is of no benefit in primary, uncomplicated THA. Moreover, the course of healing of wounds was uneventful in patients not receiving CSD. With the current rate of deep acute postoperative infections after primary THA surgery in our institution, which was 0.5% in the last 1000 operations, randomization of more than 2000 operations would be needed to find a statistically significant difference among the two groups. With the numbers available and our thromboembolic prophylaxis protocol, THAs performed without CSD were not associated with an increase in the incidence of hematoma, reoperation or deep infection at three months of follow-up.

We thank Mrs. Margaret Peterson, PhD, for the statistical analysis and Miss Brenda Morteo, for preparing the manuscript.

No competing interests declared.

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