ORIGINAL ARTICLE

On the use of drains in orthopedic and trauma

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Abstract

Introduction: The use of drains in trauma and Orthopaedic practice has been affected by the concept of evidence based medicine that has become accepted as standard of care for all surgical or medical practice, which questions all care processes that cannot be backed by evidence to be beneficial to the patient. There have been a large number of multi centre meta-analytical studies that found drains to be of little or no benefit in trauma and Orthopaedic operations. Because of these studies, there are few situations where drains are routinely used e.g. Calcaneal fractures in developed countries. Even major procedures like total knee and arthroplasties are being performed without drains. We set to find out whether such evidence can be found in our practice.

Materials and Methods: Between 2004 and 2012, eighty six patients matched for sex and type of injury and operative procedures to be done were prospectively selected and assigned to use or no use of drains in their operations. Complications like haematoma, drain migration, infection, inadvertent drain stitching were observed in the two groups.

Results: Eighty six major orthopaedic operations were studied. There was no evidence of occurrence of complication arising from non use of drains in the undrained group. Those patients whose wounds were drained had no need for drain change thus making the wound care less eventful

Conclusion: Postoperative wound drains make for neat postoperative period with less tissue swelling. There was no statistically significant differences between the drained and undrained wounds in terms of infection rates, haematoma or seroma formation.

Key words: Drains, drained surgical wounds, undrained surgical wounds

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Introduction

Records of the use of drains in surgical practice have been found in the works of Hippocrates dating to BC 450.[1] Since then, there is a lot of experience in the use of drains in general surgery leading to a clear cut indication on when to use or when not to use them.[1-4] Current evidence suggests lack of difference in outcomes of orthopedic surgical wounds that were drained and those not drained. However, lack of statistical difference does not necessarily translate into lack of clinical or scientific difference and response may vary between populations. Orthopedic surgeons have formed personal opinions on why they use drains without having evidence-based reasons for their use. The accumulation of hematoma following surgery, provides a veritable medium for bacterial colonization and proliferation by the tension they create, hematomas can impair tissue perfusion and discourage wound healing while encouraging bacterial proliferation. Adequate intraoperative hemostasis by the use of cautery and ligatures as well as handling of gentle tissue can reduce the amount of extravasated fluid and tissue swelling. Extravasated fluids contain low opsonins which can encourage bacterial growth.[2,3] Opponents of drains in surgery will say that drains allow for bacterial transmigration, drain migration and pin track infection, and may predispose a patient to inadvertent stitching of drain to the tissues and add additional cost to the patient. However, additional cost

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may be incurred by the patient, not to mention the distress cause to the patient for another visit to the theatre.[4-7] In a study of Orthopedic surgeons of the mid-Trent region of the United Kingdom, up to eighteen surgeons adduced reasons to their use of drain only if the patient is obsessed without giving any additional reasons or explanation.[8]

The duration of drain use, however, has been extensively studied and is less controversial than its usage.[7-10] These studies have indicated that drains should not be used longer than 24 hours. In practice, however, up to 69% of all Orthopedic surgeons leave drains for longer than 24 hours. In this study, we evaluate the effectiveness or other wise of use of drains in our practice using some parameters of wound outcomes and drain behaviors like (hematoma, migration, blockage, breakage, sepsis) and duration of hospital stay.

Materials and Methods

Eighty six major orthopedic operations were studied prospectively over a period of eight years between 2004 and 2012. The study was conducted at national orthopedic hospital Dala Kano, federal medical center Katsina and the Ahmadu Bello University teaching hospital, Zaria. The patients operations ranged from below the knee amputation to exploratory laminectomies for suspected spinal cord tumor. Each type of operation was divided into two groups with patients being randomly assigned to drain and no drain groups. Patients were assigned to a group by a flip of a coin. Perioperative antibiotics are given to all patients for at least forty-eight hours. Anti-coagulant chemotherapy was given on case by case basis because some patients could not afford them. Intraoperative hemostasis was secured by use of sutures or cautery. The surgical wounds were lavaged with a liter of normal saline followed by insertion of one Redivac drain for each patient in drain group. The drain is made of polyvinyl chloride with the bottle prevacuumed to 50mmHg. The bottles were changed only if the pressure indicator falls below the prevacuumed pressure or if the bottle becomes full. At any time of bottle change, the tubings are clamped with an artery forceps. The wounds are subsequently closed in layers. The drain is secured against migration by nylon 2/0 suture. The drain is maintained for a period of two days or if drainage over the first twenty-four hours was found to be less than a hundred milliliters, then the drain is removed. For those patients with drains, the volume of effluent collected is measured. Tube migration or blockage is noted. Presence of hematoma, dressing's soilage and infections were documented for all patients. The two patients with laminectomies were drained without choice of drainage or not. Comparisons between quantitative variables were conducted using student's *t*-test and Fisher's test for categorical variables. Statistical significance was considered as $P < 0.05$. Analysis was done with IBM Statistical Package for the Social Sciences software (SPSS) Statistics version 20.

Table 1: Types of operations

20-Excision arthroplasty of the hip
10 Bimalleolar ankle fracture reconstructions
20 Kuntscher nailing for femoral fractures
20 Universal AO intramedullary nailing for tibial fractures
10 Above-The knee amputations
4 Below-The knee amputations
2 Laminectomies

Results

Eighty-six major orthopedic and musculoskeletal trauma operations were studied. The breakdown of cases studied is as in Table 1 below.

There were fifty-eight males and twenty-eight females with an age range of 15 to 75. The mean age for males was forty-eight and mean age for females was sixty. Two of the twenty hip excision arthroplasties with tube drainage had collection of hematoma, which needed evacuation due to significant postoperative bleeding. None of the ten patients who did not have tube drainage had hematoma collection even though there were significant soilage of dressings and bedspreads requiring change.

Three of the twenty Kuntscher nailings for femoral fracture had superficial wound infection with two of them occurring in the same individual who had bilateral Kunstcher nailing at the same sitting. The third patient was operated on the same day. These infections might have come about as a result in the aseptic theater techniques. These three patients belong to the undrained group. There was no deep wound infection in both the studied groups. One of the patients with ankle reconstruction had early wound dehiscence. Postoperative swelling however was present in all patients who had ankle reconstruction without drain. None of the patients in this group who had drain had postoperative swelling.

None of the patients with universal A.O. nails for tibia and femur developed any complication. No tourniquet was used in any of the patients. All intramedullary nails were inserted by open method. We did not notice any difference in intraoperative bleeding between the two groups. The same result was noted in the amputation subgroup. None of the patients had drain inadvertently stitched to the tissues. Two external migrations of the drain were seen in two femoral Kuntscher nails which necessitated change of dressings. These two patients had a turbulent postoperative period. It was noticed that these two patients have very low pain threshold despite adequate parenteral narcotic analgesia. Postoperative dressing soilage was universal in occurrence in all patients without drains. This necessitated change of dressings in the fourth postoperative hour and a second change on the twenty-four hours after surgery.

Discussion

In the past, the use of drains in orthopedic practice is seen by many surgeons as necessary to prevent hematoma[4] Until the mid-seventies, randomized controlled clinical trials on its application were far and in-between. The practice, therefore, was guided by tradition and data from retrospective studies whose outcomes were inconclusive.[4-7] The results of these controlled trials questioned the importance of drain use in major orthopedic operations.[9] Hematoma is known to be low in opsonins making it a veritable culture media for bacterial proliferation. It can impair wound healing because of increased tissue tension and reduced tissue perfusion.[5]

In our study, we noticed that none of the drained wounds had dressing soilage, whereas all undrained wounds had at least one change of dressing with the average of two changes. About six to ten standard issue pieces of gauze were soiled in undrained group. One patient who had anti-coagulation for hemi-arthroplasty and tube drainage continued to drain for a week. (Anti-coagulation is commenced a day before operation and continued to three weeks if the patient can afford). Two weeks after operation, a clotting profile done was found to be normal. The persistent bleeding from the drain was attributed to abnormal response to the anti-coagulant Clexane. It is our tradition to commence anti-coagulation a day before surgery and to continue for seven days after surgery or longer if the patient can afford it. Two patients with drained wounds had tube blockage leading to hematoma collection accounting for 0.01 percent of drained patients. None of the undrained patients developed hematoma probably because of the egress to the dressings as soilage. Skin closure was done in two layers in the femur and in single layer in the legs with interrupted stitches. Three cases of superficial infection were documented in the undrained surgical group giving an infection rate of 0.07% compared to none in drained group. We could not identify the source of the infection even though the three patients were operated on the same day. It is possible that the infection was introduced during the process of dressing change or as a result of breakdown in the theater aseptic techniques. In a study of 529 knee arthroplasties treated with or without drains followed-up for six months, the incidence of superficial wound infection was found to be 2.9% and 4.8%, respectively. The incidence of deep infection was 1.2% and 0.4%, respectively.[10] There was no difference in the duration of hospital stay between drained and undrained wounds with average number of days spent being fourteen. The range was fourteen to twenty days.

Some studies have associated the occurrence of wound dehiscence with drain usage.[11] None of our patients had wound dehiscence. There were no incidents of deep venous thrombosis documented in both drained and undrained groups. Two episodes of hematoma collection and five of dressing soilage were noticed in above the knee amputation and below the knee amputation group with drains. This is not in keeping with the trend noticed amongst the drained groups and may have occurred as a result of poor hemostatic control during the operations and operation technique of the surgeon.

Postoperative swelling was noticed in all the five patients' undrained bimalleolar ankle reconstruction. It is therefore recommended that vacuum drain with Jones dressing and limb elevation when used together will reduce the risk for significant ankle swelling. None of the drained patients had significant swelling. These swellings may be due to high pressure in the tight osteofacial compartments around the ankle being made worse by accumulating hematoma.

Two patients had external drain migration. These two patients had a very low pain threshold and were restless during their postoperative recovery. They had Kunstcher nail for femoral fractures.

One other consideration for drain use is its availability and cost in our environment. A prospective study of 415 total joint arthroplasties found the economic burden of each drain to be $100US.[12] In our practice, the average cost is N 4000 or $25US.

Although this small amount may not be seen to be significant, it adds to the burden of self-procured healthcare to people with no insurance or strong family support. Patients in this study were followed-up to the point of discharge from the hospital and this may have led to under reporting of

Table 2: Wound drainage group

Type of operation and (no)	Hematoma (no)	Tube blockage (no)	Tube migration (no)	Infection (no)	Wound-dressing soilage requiring change (no)
Excision arthroplasty of the hip (10)	2	-	-	-	-
Bimalleolar ankle fracture (5)	-	-	-		3
Kuntscher nailing (10)	-	-	-	-	-
Universal AO Nail for femoral fracture (10)	-	-	-	-	-
Above the Knee amputation (5)	2	-	-	-	5
Below the knee amputation (2)	-	-	-	-	2
Laminectomy for cord decompression (2)	-	-	-	-	-

Table 3: Complications in undrained wounds

Type of operation and (no)	Hematoma	Infection	Dressing soilage
Excision arthroplasty of the hip (10)	2	-	10
Bimalleolar ankle reconstruction (5)	-	-	-
Kuntscher nailing for femoral fracture (10)	-	3	10
Universal AO nailing for femoral fracture (10)	-	-	-
Above the knee amputation (5)	-	-	-
Below the knee amputation (2)	-	-	-
Laminectomy for cord decompression (0)	-	-	-

complications associated with drain usage or otherwise. No patient was sent home with a drain. Several meta-analytical studies have found no difference in incidents of reoperation, limb swelling, deep vein thrombosis, and reduction in range of movement, time to return to work between patients who had drain and those who did not.[13] Clinical and laboratory evidence of bacterial migration through tubes have been demonstrated earlier and bacteria my travel in as yet undescribed methods to the wound.[6]

It is a well known fact that drains compromise the host's defenses to infection and are sometimes placed near neurovascular bundles or anastomotic sites. Drains are sometimes forgotten for several days or are not secured properly leading to dislodgement or retrograde drainage into the wound. These may constitute misuse or abuse as may be determined. Drains may be used on case-to-case basis when dealing with skin grafts or chronic Osteomyelitis.[14] Based on our findings, drains may not be used lightly, especially, where proper intra-operative hemostasis and tissue handling were employed. Their use to provide "security" to improper technique should not be resorted to.

Tables 1 and 2 below provide a summary of the outcomes of drained and undrained groups for easy appreciation.

Conclusion

It is our observation that the overall outcome of the surgery was not significantly affected by the use of drains $P > 0.05$. We will recommend the use of drains for its aesthetic value in reducing the number of dressing changes after surgery and for reducing pressures around tight osteofacial compartments.

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