Abdominal Wall Closure In The Presence Of Sepsis: Role Of Negative Suction

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Abstract

Surgical site infection is very common in patients of perforation peritonitis if the wound is primarily closed in the setting of gross abdominal contamination. Even after thorough peritoneal irrigation with normal saline, the incidence of wound infection is high. The authors have studied the effectiveness of putting a negative suction drain in the subcutaneous space in prevention of wound infection and wound dehiscence in patients of peritonitis. The patients were divided in two groups; group A, where a negative suction drain was put, and Group B, where no negative suction drain was put in the subcutaneous space at the time of closure of the abdomen after perforation and thorough peritoneal toilet. In Group A, the incidence of burst abdomen, wound infection and respiratory complications was remarkably lower as compared to Group B, where no drain was put in the subcutaneous space.

INTRODUCTION

Abdominal wall closure in the presence of sepsis presents a challenge to the surgeon. Quite often these patients present late after many hours or days of perforation. In the presence of perforation peritonitis, the gut is edematous and presence of sepsis in the peritoneal cavity causes outpouring of fluid, sometimes in the form of pus, till the infection is controlled. If, after dealing with pathology and abdominal cavity washing, tight closure of abdominal wall is done, it may lead to compartment syndrome or bursting of abdominal wound, leading to wound dehiscence in a significant number of patients. This wound dehiscence is often difficult to manage as reclosure frequently leads to compromise of chest condition and hypoxia, while, if the wound is left open, this adds the risk of nosocomial infection in the wound. Sometimes the surgeon has to resort to measures like vacuum closure system, which is very costly. In other patients where the wound is closed primarily, peritonitis may lead to purulent fluid leaking in the subcutaneous space, leading to wound infection and gapping of the wound, sometimes progressing to burst abdomen. Surgeons have tried many methods to reduce the incidence of wound infection in these patients. Negative suction in the subcutaneous space with or without irrigation with antibiotic solution has been shown to reduce the incidence of infection by evacuation of infected contents[1].

MATERIAL AND METHODS

The authors have studied 100 cases of perforation peritonitis. After taking detailed history, all the patients were investigated and routine laboratory investigations were done. Plain x-ray of the abdomen and chest were done to look for free air under the domes of the diaphragm. Nasogastric suction, correction of fluid and electrolytes was done and a combination of third-generation cephalosporin with aminoglycosides and metronidazole was started. The patients were divided in two groups, group A and group B, alternately. In group A, fifty patients of perforation peritonitis had abdominal wall closure with suturing of the sheath with continuous suture without tension at the suture line and interrupted suture at 2 or 3 places, depending on the length of incision, and the subcutaneous space was drained by a negative-suction drain (fig. 1). The drain was taken out on the 3 rd or 4 th day, or when it stopped draining fluid. In group B, fifty patients were treated with conventional closure of the sheath with interlocking continuous suture without negative suction drain. In both groups non absorbable prolene-0 suture was used for closure of the sheath. Thorough peritoneal lavage of the abdominal cavity was done in both groups with normal saline after dealing with pathology (closure of perforation). Patients who were in shock at the time of presentation or required ileostomy for surgical reasons were excluded from the study. All patients were studied postoperatively in terms of respiratory

complications, postoperative wound infection and wound dehiscence. The results obtained in both the groups were compared and analysed.

Figure 1

Figure 1: Abdominal wall closure with negative suction.

OBSERVATIONS AND DISCUSSION

The main observations of the study were:

The age of the patients ranged from 16 to 71 years. The maximum number of patients (58%) was in the age group of 20-40 years. There were 82 males and 18 females in the present study. Free air under the domes of the diaphragm was seen in 71% of cases. In group A, there were 42 males and 8 females, while in group B there were 40 males and 10 females. Peptic perforation was the commonest cause of perforation peritonitis in 52 cases, enteric perforation in 32 cases, traumatic perforation in 14 cases and tubercular perforation in 2 cases.

Figure 2

Complications in group A and Group B

Complication	Group A n=50	GroupB n=50
Wound Infection	4 (8%)	10 (20%)
Wound dehiscence	2 (4%)	4 (8%)
Respiratory complications	2 (4%)	4 (8%)
Mean wound healing time	10 days	14 days

In group-A patients, the incidence of wound dehiscence, wound infection and respiratory complications was remarkably lower. Out of 50 cases in group A, 2 patients (4%) had wound dehiscence which required resuturing of wound, 4 (8%) had postoperative wound infection and 2 patients (4%) had respiratory complications in terms of basal atelectasis. In group B, 4 patients (8%) had wound dehiscence which required resuturing, 10 patients (20%) had postoperative wound infection and 4 patients (8%) had postoperative lung complications in the form of basal atelectasis. The frequency of wound infection was significantly higher in group B patients. Mean wound healing time was 10 days in group A and 14 days in group B.

Patients requiring surgical intervention for peritonitis demonstrate a significantly increased risk for surgical-site infection and wound-healing failure. They require close monitoring for these potential complications. Surgeons have used various suture materials for closure of the abdomen varying from delayed absorbable to non-absorbable sutures.[2] The incidence of surgical-site infection increases with the degree of contamination; therefore, surgical-site infection occurs at much higher rates after operations for peritonitis and peritoneal abscess (i.e. 5-15%, compared with <5% for elective abdominal operations for non-infectious etiologies).

If the abdomen can not be closed primarily or there is danger of compartment syndrome, the vacuum pack system has been demonstrated to be effective, although the final selection for temporary abdominal closure will depend on the experience of the institution as well as the surgeon's preference. The vacuum pack system for temporary abdominal closure of the open abdomen is an effective alternative in patients with abdominal sepsis.[3]

Surgical-site infection may be expected if the wound is closed in the setting of gross abdominal contamination and lavage of the wound at the end of therapy does not reliably prevent this complication[1]. The management of abdominal wall defects in contaminated or dirty wounds continues to challenge surgeons. While the use of synthetic materials can address the physical and structural needs of abdominal wall closure, they remain problematic biologically. The associated complications of synthetic mesh closure in contaminated wounds beg for an alternative. Collagen matrix, though very costly, has also been used by some surgeons and has been claimed to provide excellent strength and suture holding[4-7].

Sometimes these wounds can be either left open and should be treated with wet-to-dry dressing changed several times a day. But open treatment of the wound increases the chances of nosocomial infections in the wound. Employment of a negative suction drain in the subcutaneous space also

reduces the chances of wound infection and complications in these patients by draining the infected secretions from the subcutaneous space. In the literature it is also reported that closure of abdominal incisions with subcutaneous, closed-suction catheters intermittently irrigated with antibiotics resulted in decreased wound infection rates[1].

Presence of infected fluid and microorganisms in the subcutaneous space leads to invasion of tissues by bacteria and these microorganisms consume the nutrients and oxygen that would otherwise be directed towards the tissue repair. They also release enzymes that break down protein, which is an important component in wound repair. Negative suction improves the healing capacity of the wound by reducing its bacterial load. Numerous studies have been conducted to determine the effects of negative pressure on wound healing.[8-10] These studies have shown that controlled negative pressure assists in wound healing by: providing a moist and protected environment, reducing peripheral edema around the wound, stimulating circulation to the wound bed, decreasing bacterial colonization, increasing the rate of granulation tissue formation and epithelisation.[11] Any increase in circulation and oxygenation to the compromised tissue improves the area's resistance to infection, allowing healing to progress.[12-14]

Negative pressure wound therapy (NPWT) was developed in the 1990s by researchers at Wake Forest University School of Medicine, Winston-Salem, NC. The concept was based on the mechanics of physics. The application of controlled sub-atmospheric pressure causes mechanical stress to tissues. Mitosis is stimulated, new vessels are formed, and the wound is drawn closed.[15] The degree of pressure to the wounded tissue is small, but when all areas of the wound work together in an effort to close toward the center point, the effect of negative pressure becomes impressive and results in quicker healing and resolution.

Hence the author recommends that negative suction drains should be put in the subcutaneous space in all cases of peritonitis after closure of the sheath and it reduces the chances of wound complications in these patients without adding nosocomial infection.

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