A Prospective, Randomized Trial of Abdominal Wound Drainage in Gastric Bypass Surgery

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A prospective, randomized trial was conducted in 194 morbidly obese patients who had gastric bypass to determine the effect of subcutaneous closed suction drainage on wound infection rates. There was no difference in the incidence of postoperative wound infection with the use of drains compared with simple abdominal closure. Organisms isolated from infected wounds were predominantly skin flora and did not differ between the two groups. Patients with wound infections had significantly prolonged hospitalizations compared with those without infections, but in the subgroup with wound infections there was no difference in hospitalization time between the drainage or control groups.

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OBESE PATIENTS who have abdominal surgery are at increased risk for development of postoperative wound infections.[1,2] Both prolonged operating time and the development of hematomas, seromas, or dead space in the subcutaneous tissue are believed to predispose to wound infection.[1,3] The theoretical advantage of wound drainage, with removal of blood and serum and the obliteration of dead space, would thus seem to make the routine use of subcutaneous drains in abdominal closure in the obese patient particularly attractive. Several retrospective, nonrandomized reports in both the general surgical[4,5] and gynecologic[6,7] literature support this contention. However, few controlled, randomized trials specifically address the question of abdominal wound drainage in clean or clean-contaminated cases.

We report the results of a prospective, randomized trial of prophylactic closed suction drainage of the subcutaneous tissue in 194 patients who had gastric bypass.

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Submitted for publication: February 2, 1987.

Materials and Methods

All patients who had gastric bypass at our institution between June 1982 and August 1986, were included in the study. All patients received identical pre- and postoperative care according to a written protocol. Patients were admitted 1 or 2 days before surgery. They received a hexachlorophene abdominal scrub 3 times per day before surgery and a hexachlorophene shower and shampoo the evening before surgery. Patients not allergic to penicillin received cefazolin, 1 g intravenously, before and after operation before June 1983, after which the dose of cefazolin was doubled.[8] Patients allergic to penicillin received either vancomycin with an aminoglycoside (2 patients) or an aminoglycoside alone (4 patients). Three patients with valvular heart disease received appropriate endocarditis prophylaxis.[9] Subcutaneous heparin, 5000 units every 8 or 12 hours depending on antithrombin III level, was begun before operation and continued until discharge.[10]

In the operating room the abdomen was prepared with chlorhexidine detergent followed by povidone-iodine solution. After the skin incision, the subcutaneous tissue was separated to the fascia by lateral traction of the wound edges to minimize bleeding and tissue necrosis.[11] The fascia was divided with electrocautery. All patients had gastric bypass as previously described[12] with retrocolic Roux-en-Y gastrojejunostomy with a 10–15 mL gastric pouch created with a double row of staples and side-to-side jejunojejunostomy made using the stapler. The gastrojejunal anastomosis was performed in two layers with nonabsorbable sutures. The

abdomen was irrigated with normal saline and the fascia closed in a single layer with interrupted, heavy nonabsorbable monofilament or synthetic absorbable suture.

Patients were then randomized into two groups. After irrigating the subcutaneous tissue with 25% povidone-iodine solution, one group had their abdominal wounds closed over a closed suction drain brought out through a separate stab incision. Wounds in the control group were closed without drains. The skin was closed with skin staples.

Drains were left to self-suction and removed when drainage was less than 30 mL/24 hours. Drains were not irrigated. Patients were discharged from the hospital when able to take one liter of fluids by mouth in a 24-hour period. Skin staples were removed approximately 2 weeks after operation at the first outpatient visit. All wounds were examined by both a surgeon and nurse practitioner with a minimum follow-up of 1 month.

Wounds were defined as infected if pus was present at the incision site. Serous drainage with negative bacterial cultures and without clinical evidence of infection were not considered wound infections. Suture sinuses were also not included in the infected group. All operations were classified as clean-contaminated.[1]

Preoperative per cent ideal body weight was calculated by dividing the preoperative weight by the mean ideal body weight for height according to Metropolitan Life Insurance Company tables (1955). Duration of operation was measured from skin incision to closure.

Results were compared using the chi-square test or Student's t test where appropriate.

Results

One hundred ninety-four morbidly obese patients had gastric bypass between June 1982 and August 1986. All patients were entered into the study. One hundred two patients were randomized to receive closed suction drains in their abdominal closure. Wounds were closed without drains in the remaining 92 patients. Thirty-day follow-up of wounds was available for all patients.

The two groups are compared in Tables 1 and 2. Risk factors previously associated with postoperative wound infection, including age, weight, preoperative hospital stay, duration of operation, additional procedures performed, diabetes mellitus, and chronic steroid use, were similar between the drainage and control groups.

There were 11 wound infections in the drainage group (10.8%) compared with 10 in the control group (10.9%). The overall rate of postoperative wound infection was 10.8% (Table 3). In addition, three patients (2 drainage, 1 control) had secondary wound infections develop after re-exploration for complications (1 anastomotic leak, 2 acute gastric dilatations). Subcutaneous drains were used in two of these three reoperations. Because these wound infections occurred after contaminated cases, they are excluded from further analysis.

There has been a decrease in the wound infection rate over the 5-year study period, from 20% in 1982 to 7.4% in 1986 (Fig. 1), although this difference is not statistically significant.

Wound cultures were available in 16 of 21 patients (8 drainage, 8 control). There was no significant difference in either the number or type of organism isolated between the two groups (Table 4). *Staphylococcus* sp. and *Streptococcus* sp. were the most common organisms isolated (76%). Six patients (2 drainage, 4 control) had more than one organism isolated. Five patients with wound infections had concomitant cholecystectomy performed at the time of gastric bypass (3 drainage, 2 control). Intraoperative bile cultures were available in

TABLE 1. *Demographic Data*

	Drainage (N = 102)	Control (N = 92)
Age (yrs)	38 ± 8	37 ± 9
Male	19	20
Female	83	72
% Preoperative ideal body weight	214 ± 36	212 ± 32
Duration of operation (min)	258 ± 64	260 ± 50
Diabetes mellitus	6	10
Chronic steroid use	1	2
Preoperative hospitalization		
1 day	18	18
2 day	70	68
≥3 days	14	6

TABLE 2. *Additional Procedures*

	Drainage (N = 102)	Control (N = 92)
No. of patients	68 (67%)	51 (55%)
No. of procedures	88	64
Liver biopsy	38	29
Cholecystectomy	20	16
Appendectomy	0	1
Bilateral tubal ligation	10	7
Ventral/umbilical herniorrhaphy	8	4
Other	12	7

TABLE 3. *Wound Infection Rates*

	No. of Patients	No. of Infections
Drain	102	11 (10.8%)
Control	92	10 (10.9%)
Total	194	21 (10.8%)

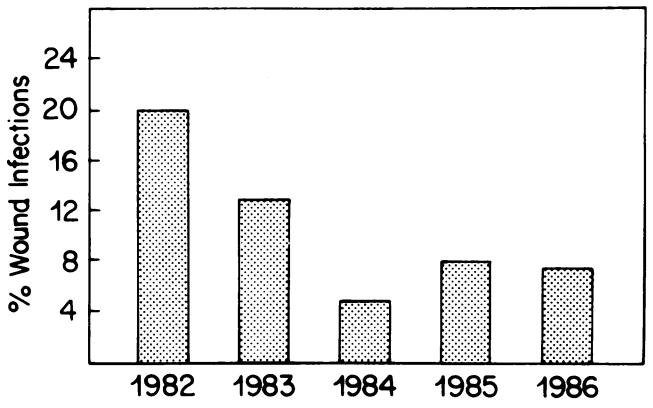

FIG. 1. Yearly wound infection rates.

three of these patients and were negative. A wound infection developed in the only patient to have incidental appendectomy and cholecystectomy. *Escherchia coli* was isolated from the appendix (bile cultures were negative), whereas wound drainage grew *Staphylococcus aureus* and *Bacteroides fragilis.*

In both the drainage and control groups, patients in whom postoperative wound infections developed had significantly longer hospital stays compared with patients without complications. The mean postoperative stay for infected *versus* noninfected patients was 17.2 ± 13.7 *versus* 8.2 ± 1.8 days ($p < 0.001$) and 12.1 ± 8.4 *versus* 8.6 ± 1.7 days ($p < 0.01$) in the drainage and control groups, respectively. Of those patients with wound infections in the two groups, there was no significant difference in either the severity of infection or the duration of postoperative stay.

Discussion

We conducted a prospective, randomized trial of closed suction drainage of abdominal wounds in 194 patients who had gastric bypass over a 5-year period at a single institution. There was no significant difference in the incidence of postoperative wound infection with the use of subcutaneous drains compared with simple abdominal closure.

TABLE 4. *Bacteriology of Infected Wounds*

Organism Isolated*	Drain	Control	Total
Coagulase (−) Staphylococcus	4	5	9 (43%)
Staphylococcus aureus	2	3	5 (24%)
Streptococcus sp.	—	2	2 (10%)
Enterobacter	2	—	2 (10%)
Bacteroides fragilis	—	1	1 (5%)
Diptheroids	1	1	2 (10%)

* More than one organism may have been isolated from a single wound infection.

The overall rate of postoperative wound infection in our study is comparable to other published reports for clean-contaminated cases[1,2] and gastric bypass procedures.[5,13-18] In a study comparing closed suction drainage with heavy nylon stay sutures to reduce wound dead space in morbidly obese patients, Kozol et al.[13] similarly found no reduction in wound infections with the use of closed suction drains.

Although both groups were comparable with respect to known risk factors for postoperative wound sepsis, the drainage group had a slightly higher number of patients with prolonged preoperative hospital stays. Of 14 patients in the drainage group hospitalized 3 or more days before surgery, wound infections developed in three patients (preoperative hospitalizations of 6, 10, and 13 days, respectively) compared with none of six patients in the control group. However, even excluding these patients, the use of subcutaneous drains did not significantly reduce the incidence of wound infections.

Several factors may account for the lack of efficacy of drains in this study. The use of subcutaneous drains in obese patients is based on the assumption that the large subcutaneous layer results in increased dead space and the accumulation of blood and serum, which in turn predispose to wound infections. However, techniques aimed at reducing the amount of bleeding and tissue trauma and necrosis, such as separating the subcutaneous fat by lateral traction and the use of electrocautery, may reduce the volume of tissue fluid accumulation and diminish the effect of drains.

Secondly, by providing a route for bacteria to get into the wound as well as out, drains may increase the risk of infection.[19-21] Although the risk is certainly less for closed suction drains than simple conduit (Penrose) drains,[22] the high percentage of skin contaminants isolated suggest that retrograde infection may still play a role.

Closed suction drains may also become obstructed with tissue fragments and fail to function properly. Although we did not routinely irrigate the drains or document patency at the time of removal, the total volume of drainage or the day of drain removal was not appreciably different between infected and noninfected wounds.

Also noteworthy is a reduction in the rate of wound infections during the course of this trial. Two factors may account for this. A preliminary review of our data revealed that increasing the perioperative dose of cefazolin in 1983 from 1 to 2 g resulted in a significant reduction in wound infections.[23] Secondly, the institution of more rigorous wound surveillance as a byproduct of this study, which has been shown by others[24,25] to lead to a reduction in wound infection rates, may have also contributed to this trend.

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