PREVENTION OF POST-OPERATIVE WOUND INFECTION IN ABDOMINAL OPERATIONS

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ABSTRACT

One hundred patients undergoing abdominal surgery were included in this prospective study. The role of local application of Betadine, use of synthetic sutures, and use of low pressure subcutaneous suction drainage were evaluated in preventing post-operative wound infection. The infection rate was 15 per cent with Betadine, 15.4 per cent with prolene, 20 per cent with subcutaneous suction drainage and 30.8 per cent in the control group.

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KEY WORDS : Surgical wound infection; Betadine; Sutures; Infection control.

Introduction

Despite the amazing advances made by medical science, post-operative wound infection lingers as a potential killer. Remarkable life-saving discoveries have been made but infection causing organisms have also been successful in combating antibiotics. The cost of an infected operation needs to be analyzed in terms of morbidity and mortality and not only in terms of monetary costs. The concepts conceived to solve the problem of surgical infection have depended on the state of knowledge concerning bacteria and bacterial disease. The present day methods of aseptic or sterile techniques concentrate on the simple philosophy that if there are no bacteria there can be no bacterial infection. It follows that infection may be prevented by reducing to a minimum the number of bacteria gaining access to the tissues and so assist the patient's natural antibacterial mechanisms to deal with them [1]. Various antiseptics have been applied locally at the site of operation, in addition to employing standard antiseptic measures in operation theatres and wards, to prevent wound contamination and thereby wound infection. In controlled clinical trials the use of Betadine was found to be associated with a significant reduction in wound sepsis rate after appendicectomy and abdominal surgery [2]. Alexander et al [3] in their trials found monofilament synthetic sutures like prolene to be superior to multi-

filament sutures in contaminated wounds. Subcutaneous collection of blood and serum predisposes to increased wound sepsis, therefore removal of collections by low pressure suction may decrease incidence of post-operative wound infection. The aim of this study was to compare efficacy of the use of Betadine, synthetic sutures, and low pressure suction drainage in preventing wound infection after abdominal operations.

Material and Methods

Eighty eight consecutive patients undergoing clean and potentially-contaminated abdominal operations at Command Hospital (SC) Pune during April 1992 to April 1995 were taken on trial and randomly allocated to the following groups:

1. Group I - Betadine 5 per cent was used topically in the wound before skin closure.
2. Group II - Synthetic sutures (prolene or vicryl) were used to close the abdomen.
3. Group III - Low pressure subcutaneous suction drainage was used.
4. Group IV - Control group where Betadine was not used, wounds were closed with silk, and no low pressure suction was used.

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In Group I, topical 5 per cent Betadine was used for skin preparation after the application of 5 per cent savlon. Betadine was applied onto the subcutaneous tissues before skin closure. After the skin had been sutured Betadine was applied to the wound edges and covered by sterile gauze. In Group II, the incisions were closed with continuous 'I' prolene or vicryl. In Group III, the Romovac low pressure suction drainage device was used. During wound closure, the perforated tube was inserted into the subcutaneous space by means of a special trocar through the wound flap and sutured in position. The suction container was compressed and attached to the perforated tube by a connecting tube after the wound had been dressed. The Romovac was generally removed after 48 to 72 hours when the drainage was insignificant.

The surgical wounds were classified, depending upon the diagnosis and nature of surgery performed, as :

1. Clean : When no infected viscus had been opened.
2. Clean-contaminated : No apparent contamination was seen, but colonized hollow viscus was opened.
3. Contaminated : When spillage from infected viscus or perforated viscus had occurred.

All wounds were inspected on the third and tenth post-operative days. Pointers to infection were erythema, stitch abscess, serous or seropurulent discharge, frank purulent discharge, and wound gaping. After assessment for infection, the wounds were classed as under :

1. Non-infected.
2. Minor infection - Scanty or serous discharge, or stitch abscess.
3. Major infection - Copious purulent discharge.

Results

A total of 88 cases were assessed. There was no important difference regarding the male-female ratio, age range and mean age as shown in Table 1. The number and types of operation in various groups (clean, clean-contaminated and contaminated) is shown in Table 2. The incidence of wound infection in various subgroups is shown in Table 3.

The lowest incidence of infection rate (8.3%) was obtained in the clean wound category in which Betadine was used though this was not statistically significant when compared to control group (23.5%). However, the odds ratio was 0.40 per cent and the preventive fraction for Betadine was 60 per cent.

In the contaminated wound category there were 3 cases studied in each group except group III. The incidence of wound infection was found to be 33.3 per cent in the Betadine and prolene group and 66.6 per cent in the control group. The difference was significant though the number of cases in this category were very few.

Of the 19 patients who developed wound sepsis as per the parameters decided above, culture was positive in only 9 cases and all these 9 cases were grouped under the major infections where there was copious pus discharge. In 7 of these cases the same organisms were grown in pre-operative and

TABLE 1
Distribution of variables in various groups

Patients	Betadine prolene	Synthetic Vicryl	Sutures subcutaneous suction drainage	Low pressure	Control
Total patients	20	17	5	20	26
Male	16	11	2	14	19
Mean age (years)	31	42	42	31	37
Range (years)	12-54	14-70	38-45	17-59	18-67
Female	4	6	3	6	7
Mean age (years)	40	38	34	41	32
Range (years)	22-50	2-55	28-40	26-50	20-60

TABLE 2

Classification of patients into categories by type of surgical wound

Type of wound	Betadine	Synthetic Prolene	Suture Vicryl	Low pressure Subcutaneous suction drainage	Control	Total
Clean						
Cholecystectomy	2	8	1	4	7	22
Appendicitis	9	—	—	7	8	24
Incisional hernia	—	2	3	2	—	7
Ventral hernia	—	3	—	3	—	6
Miscellaneous	1	—	1	1	2	5
Total	12	13	5	17	17	64
Clean contaminated						
Gastric surgery	4	1	—	1	3	9
Choledochojejunostomy	1	—	—	1	—	2
Pancreatico-jejunosomy	—	—	—	—	3	3
Total	5	1	—	2	6	14
Contaminated						
Ileocolorectal	3	1	—	—	2	6
Perforated appendicitis	—	2	—	1	—	3
Liver abscess exploration	—	—	—	—	1	1
Laparotomy	—	—	—	—	—	—
Total	3	3	—	1	3	10
TOTAL	20	17	5	20	26	88

TABLE 3

Incidence of wound infection

Group infect	Wound category	Total cases	Not infected	Minor infection	Major infection	Total infection	Percentage of infection
Betadine	Clean	12	11	1	0	1	8.3
	Clean contaminated	5	4	0	1	1	20.0
	Contaminated	3	2	0	1	1	33.3
	Total	20	17	1	2	3	15.0
Prolene	Clean	13	11	2	—	2	15.4
	Clean contaminated	1	1	—	—	—	—
	Contaminated	3	2	—	1	—	33.3
	Total	17	14	2	1	3	17.6
Vicryl	Clean	5	4	—	1	1	20.0
	Clean contaminated	—	—	—	—	—	—
	Contaminated	—	—	—	—	—	—
	Total	5	4	—	1	1	20.0
Low pressure subcutaneous suction drainage	Clean	17	15	1	1	2	11.8
	Clean contaminated	2	1	1	—	1	50.0
	Contaminated	1	—	—	1	1	—
	Total	20	16	2	2	4	20.0
Control	Clean	17	13	2	2	4	23.5
	Clean contaminated	6	4	1	1	2	33.3
	Contaminated	3	1	1	1	2	66.7
	Total	26	18	4	4	8	30.8

post-operative discharge cultures. *E. coli* was the commonest organism being present in 5 cases. Mixed growths were obtained in 2 while *Staphylococcus* and *Proteus* were isolated in one case each. In pre-operative cultures too, *E. coli* was the commonest organism isolated.

The average duration of stay in the hospital post-operatively for control group was 18 days compared to 12-14 days in the other groups.

Discussion

Infections are of great interest to surgeons who not only operate to treat infection but also because surgery is often complicated by infections. Topical povidone iodine has been listed as an ideal antimicrobial agent considering the criteria that it is non-toxic, non-allergenic, is well-tolerated by the tissues, and has a almost complete spectrum of antibacterial and sporicidal activity without natural or acquired bacterial resistance. Several studies conducted have shown povidone iodine to be an efficient local disinfectant in reducing the incidence of wound infection [2,4]. Connel and Russelot [5] found it to be a highly effective degerming agent. Grady and Lee found it effective in abdominal surgery [6]. In 1983 Bapat et al used Betadine for peritoneal lavage [7]. Gravett et al found 1 per cent povidone iodine useful in decreasing the infection rate from 15.5 per cent to 5.4 per cent [8]. Goldenheim found povidone iodine effective against methicillin-resistant *Staphylococcus aureus* in in vitro studies [9]. In the present study the overall wound infection using Betadine was 15 per cent as compared to 30.8 per cent in the control group.

There are several reports stating the superiority of synthetic non-absorbable monofilament sutures over other sutures in contaminated wounds [10]. Polypropylene (prolene) and polygalactin cause minimum foreign body reaction, are non-capillary, have good tensile strength, good knot retention and a smooth surface: all the attributes that go to make a good suture material. Overall a significant

reduction in wound infection was noted with these sutures in our study. It was 17.6 per cent with prolene and 20 per cent with vicryl compared to control group of 30.8 per cent.

Morris found that suction drainage was associated with a faster rate of wound healing and a reduction in incidence of wound infection in radical mastectomy [11]. In the present study, overall wound infection of 20 per cent was noted in this group compared to 30.8 per cent in control group.

It is clear from our findings that 5 per cent Betadine is effective in reducing post-operative wound infection. The use of synthetic monofilament sutures and low pressure suction drainage was also very encouraging.

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