DOI: 10.7860/JCDR/2015/8293.6577

Original Article

Surgery Section

Is Prophylactic Drainage of Peritoneal Cavity after Gut Surgery Necessary?: A Non-Randomized Comparative Study from a Teaching Hospital

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ABSTRACT

Introduction: Prophylactic use of intra-peritoneal drain is commonly practiced by surgeons in the hope of early detection of complication and reducing mortality and morbidity. The aim of the study was to determine evidence based value of prophylactic drainage of peritoneal cavity in cases of secondary peritonitis and resection and anastomosis of small and large bowel.

Materials and Methods: One hundred and seventy one (171) cases were included in the study from March 2012-May 2013 that underwent laparotomy for peptic ulcer perforation (PUP), simple and complicated acute appendicitis (appendicular perforation with localized/generalized peritonitis), small bowel obstruction (SBO) and sigmoid volvulus, traumatic and non-traumatic perforation of small and large bowel. Appropriate management was done after resuscitation and investigation. After completion of operation peritoneal cavity was either drained or not drained according operator's preference. They were divided into drain and non-drain groups. Surgical outcome and postoperative complications ≤30 days of operation was noted and compared between two groups.

Results: No significant difference was observed between drained group and non-drained group in terms of age (32.08±15.99 vs. 35.57 ± 16.42 years), Sex (76M: 42F *vs.* 40M: 13F), weight 50.9 ± 11.75 vs. 48.4 ± 16.1 kg), height (1.6 ± 0.13 vs. 1.5 ± 0.18 Meter), BMI (20 ± 4.7 vs. 20 ± 7.2), ASA score (p= >0.05). However there was significant difference was observed between drained group and non-drained groups in terms of length of hospital stay (9 ± 4 vs 5 ± 3.4 days), operative duration (115.6 ± 41.0 vs. 80 ± 38.1 minutes), infection rates in dirty wound (40.0% *vs* 12.5%) and overall postoperative complications (35.85% *vs*16.11%).

Conclusion: Based on these results, present study suggests that prophylactic drainage of peritoneal cavity after gastrointestinal surgery is not necessary as it does not offer additional benefits for the patients undergoing gut surgery. Moreover, it increases operative duration, length of hospital stay and surgical site infection (SSI).

Keywords: Appendicitis, Laparotomy, Peritonitis, PUP, Resection and anastomosis of bowel

INTRODUCTION

Drain provides an exit for fluids, pus, blood or necrotic debris that interferes with wound healing or may be a source for bacterial proliferation. Intra peritoneal drainage is done using polyvinyl chloride (PVC) or red rubber tube drain with multiple perforations at the tip. It is placed through a stab wound near the operation site or in natural abdominal fossae (hepato-renal pouch or pelvis), where there is maximum chances of fluid collection. Drain enables fluid to escape by gravity and capillary action. A stitch is used to prevent migration or pull out of drain from abdominal cavity. The drainage is often prophylactic [1].

Surgeons are using prophylactic drainage of peritoneal cavity on regular basis after abdominal surgery since its benefit was demonstrated by Sim's [1]. But it was not accepted by all surgeons. Surgeons who were in favour, argue that drainage of peritoneal cavity can detect early complications and helps in saving many lives while as those who were not in favour argue that drainage of peritoneal cavity is not possible. Therefore it is useless [2-4].

Unfortunately, the principle of prophylactic drainage is not based on any scientific data. So, value of general use of the prophylactic drains in abdominal surgery remains controversial. Several randomized control trials were done to establish the value of prophylactic drainage after abdominal surgery [4]. The results of these studies revealed that that use of prophylactic drainage of peritoneal cavity is not beneficial in many situations. In spite of evidence, most of the surgeons are still using prophylactic drainage of peritoneal cavity after gastrointestinal surgeries on routine basis [5]. These surgeons still adhere to the old concept of Lawson Tait "when doubt drain".

Prophylactic drainage of peritoneal cavity after secondary bacterial peritonitis due to non-traumatic and traumatic gut perforation and resection and anastomosis of small and large bowel is common practice in our institute. Surprisingly there is paucity of the studies regarding the value of use of prophylactic drain. Thus the role of prophylactic drainage remains unclear and controversial in these procedures. Therefore the aim was to highlight the evidence based usefulness of the prophylactic drainage of peritoneal cavity after operation in cases of secondary bacterial peritonitis.

MATERIALS AND METHODS

One hundred seventy one cases were included in the study who were operated in different units of the surgical department at Universal medical college of medical sciences (UCMS) Bhairahwa, Nepal during March 2012- May 2013. Drain placement was operator's preference. The cases were operated by surgeons and residents. There are three units in the department. Unit I and II surgeons (first group) advocating liberal use of prophylactic drain in laparotomy whereas surgeons of unit III (second group) do not advocate prophylactic use of drain after laparotomy. All non-diabetic cases operated for gastrointestinal diseases either on elective or emergency basis by these surgical units were included, except cases that died within 48 hours after surgery (were excluded from the study).

The cases were of peptic ulcer perforation (PUP) with generalized peritonitis, simple and complicated appendicitis, small and large bowel obstruction, traumatic and non-traumatic perforation and peritonitis. The causes of small bowel obstruction were postoperative adhesion, tuberculosis stricture and adhesion, and volvulus. The

etiologies of large bowel obstruction (LBO) were sigmoid volvulus, traumatic or spontaneous perforation.

Management was done as per disease. PUP cases were managed with exploratory laparotomy with Roscoe Graham's omental patch repair with peritoneal lavage with or without peritoneal drainage. Simple and complicated appendicitis were managed by appendicectomy, with or without peritoneal lavage and drainage. Cases of small bowel obstruction were managed by adhesinolysis, volvulus de-rotation, stricturoplasty and resection and anastomosis (if gangrene/impending perforation) while cases of small bowel traumatic and non-traumatic perforation were treated by primary closure, wedge resection or resection and anastomosis with or without peritoneal drainage. Cases of LBO, traumatic and non-traumatic perforation and generalized peritonitis were managed by resection of primary anastomosis (volvulus sigmoid), colostomy with or without peritoneal cavity drainage. They received similar postoperative antibacterial protocol and other treatment (nil per orally, intravenous fluid, analgesics). These cases were grouped into no- drain and drain group. The details of the cases operated are given in [Table/Fig-1]. The data's of the cases were collected and following observations were made

RESULTS

Total 171 patients were included in the study. Of all the cases 116 were male and 55 were female. Mean age was 32.08±15.99 and 35.57 ± 16.42 years in no-drain and drain groups respectively which ranged from 8-70 years. There was no significant difference (p>0.05) in the mean age, sex ratio, weight, height, BMI and ASA score between the patients of both groups [Table/Fig-2].

Diagnosis	No-drain group	Drain group
Secondary Bacterial Peritonitis (N= 139)		
Diffuse peritonitis (n=73)	17	13
Peptic ulcer perforation	07	03
Traumatic /non- traumatic Small bowel perforation	01	02
Traumatic and non-traumaticLarge gut perforation	20	10
Appendicular perforation		
Localized peritonitis (n=85)	34	09
Simple acute appendicitis	28	14
Complicated acute appendicitis (gangrene/perforation)		
Small and large bowel obstruction (n=13)	11	02
Total	118	53
	171	

[Table/Fig-1]: Aetiological distribution of the cases in control and study group

Characteristics	No- drain group (n=118)	Drain group (n=53)	p
Age (yrs.)	32.08±15.99	35.57 ± 16.42	*NS*
Sex (M:F)	76 : 42	40 : 13	*NS*
Weight (kg)	50.9 ± 11.75	48.4 ± 16.1	*NS*
Height (Meter)	1.6 ± 0.13	1.5 ± 0.18	*NS*
BMI	20 ± 4.7	20 ± 7.2	*NS*
ASA score			
ASA 1	103	40	*NS*
ASA ≥2	15	13	

[Table/Fig-2]: Chracteristics of the control and study group (N=171)
Zc values of age, weight, height, BMI are 1.27, 1.1, 0. 4, 0.0 and X^2 value of sex and ASA score are 3.74 and 3.01 respectively

SURGICAL OUTCOME

The amount of drainage ranged from nil to 100 ml/day with an average of 30 ml. The amount of drainage varied with the type of surgery, amount of peritoneal cleansing, irrigation fluid left in peritoneal cavity and peritoneal inflammation. Mostly it was serous or watery but occasionally purulent, sero-sanguineous or bilious drainage was also observed. Most of the drains were removed between 3rd-5th postoperative days.

No-drain group had less operating time, less postoperative hospital stay as compared to drain group. This difference is statistically

Characteristics	No drain group (n=118)	Drain group (n=53)	p
Hospital stay (days)	5 ± 3.4	9 ± 4	*<0.001*
Operative duration (min.)	80 ± 38.1	115.6 ± 41.0	*<0.001*
Wound: n(SSIs)			
Clean-contaminated	11 (4)	02 (0)	*NS[1]*
Contaminated	25 (5)	16(5)	*NS[2]*
Dirty	82 (10)	35(14)	*<0.001*
Complications: n, (%)			<0.01
None	99 (83.89)	34 (64.15)	
Wound infection	19 (16.11%)	19 (35.85%)	
Pulmonary infection	-	-	
Wound dehiscence	1	1	
Post- operative fever	2	4	
Anastomotic leak	1	1	
Others (Intestinal obstruction)	Nil	1	
Drain related complications	No	Omentum is pulled, discharge drain and site infection	

[Table/Fig-3]: Comparison of surgical outcome between two groups (N=171)
Zc values of hospital stay and operative duration are 10.25,5.93 whereas X^2 values of clean contaminated, contaminated, dirty wound and complication are2.68,0.65,12.64,9.64 respectively, NS-Not significant

significant (p<0.001). The overall incidence of SSI was 22.2%. SSIs rates in no-drain and drain groups were 36.36% and 0.0% in clean-contaminated, 20% and 31.25% in contaminated and 12.2% and 40% in dirty wound respectively [Table/Fig-3]. The SSI rates in dirty wounds with drain were more than three times than no-drain. The difference in SSIs rates in clean-contaminated, contaminated wounds were statistically not significant whereas it was statistically significant (p<0.001) in dirty wound. In addition, following observations were also made; anastomotic leak and wound dehiscence one in each group. Cases of anastomotic leak in both groups were suspected clinically (non- settled abdomen, discharge from wound site) and confirmed by USG. Postoperative pyrexia has 2 cases in no-drain and 4 cases in drain group respectively. There was no case of postoperative pulmonary infection in either group. However, drain related additional complication like omentum coming out during removal of drain, discharge from drain wound after drain removal and drain site infection were frequently observed with patients of drain group.

DISCUSSION

Prophylactic drainage of peritoneal cavity is commonly used to remove intra peritoneal collections like blood, bile and intestinal contents. The use of prophylactic drainage after gastrointestinal surgery was a common teaching during surgical residency programme that has passed through generations of the surgeons and it became rule of thumb. Surgeons have adopted this rule after Lawson Tait [6] who advocated 'when doubt drain' the peritoneal cavity after GI surgery. The aim of prophylactic drainage of peritoneal cavity is to detect early postoperative complication after GI surgery. However, surgically placed drain is not without risk. The result of various studies has shown that prophylactic drainage of peritoneal cavity is associated with increased rate of complications [7-11].

Data of the present study clearly demonstrates that prophylactic placement of intra peritoneal drain is not beneficial. It does not only increases hospital stay and duration of operative procedure but also increases wound infection rate, postoperative fever, intestinal obstruction and drain related complication like pulling of omentum, discharge from drain wound and subcutaneous infection. These finding were in agreement with previous studies [4,8-17].

It is always debated that non-drainage of peritoneal cavity may lead to more complication like intra peritoneal abscess and delay in diagnosis of anastomotic leak which increases morbidity and mortality. So use of drain is justified. But present study did not observe intra peritoneal abscess in no-drain group, suggesting that drain is not necessary to prevent intra peritoneal abscess formation. Good surgery and proper peroperative peritoneal lavage will help in prevention of intra peritoneal abscess rather than prophylactic

drainage of peritoneal cavity. One case of anastomotic leak was observed in each group. In both cases, the leak was suspected clinically, on the basis of deterioration in general condition with toxic features, signs of peritonitis, increase purulent or fecal discharge from incision and confirmed by ultrasonography and re-exploration. Both cases recovered after re-laparotomy. So, there is no question that only drain gives signal of leak and helps in early diagnosis, even an alert and experienced surgeon can suspect clinically with equal effectiveness as done in this study. Moreover, easy availability of non-invasive radiological investigation like ultrasonography, clinically suspected (such as features of peritonitis) cases can be confirmed very early without drain. These cases can also be managed by interventional radiology guided drainage without doing re-laparotomy. This procedure has markedly reduced the number of re-laparotomies for surgical complications, thereby supporting abdominal surgery without prophylactic drains [13].

Drain is associated with some specific complications like: drain site pain and infection, pulling out of omentum through the drain wound during removal of the drain, fluid leakage from drain site for 2-3 days and intestinal obstruction. These observations are consistent with previous reports [18]. The present study also observed one case of small intestinal obstruction (IO). This case belongs to drain group. IO developed on 7th postoperative day and after removal of drain. This case underwent exploratory laparotomy with modified Graham's omental patch repair. IO was confirmed by skigram of abdomen. This suggests IO is of adhesive in nature as it occurred after removal of drain. These adhesions might have promoted by intra-peritoneal drain. Patient was put on conservative treatment. He improved minimally and was discharged on personal request. So, we could comment about the further course of treatment of this patient. This finding is consistent with earlier reports in which the intestinal obstruction was observed using drain in peptic ulcer perforation peritonitis [10,18]. These observations support that abdominal surgery without drain can avoid these complications.

There was increase length of postoperative hospital stay, duration of operation, and rate of wound infection in drain group in the study and the difference is statistically significant ($p<0.001$), which is in agreement with a previous studies [7-11,18].

It is believed by majority of surgeons that peritoneal drain will help in draining out all the infective material from the dirty category of abdominal surgeries and decrease SSI. However, the present study revealed that SSI rates were significantly ($p<0.001$) higher (No-drain *vs.* Drain: 12.5% *vs.*40%) in drain group with dirty wound. One case of wound dehiscence was also observed in dirty wound with drain. These complications further suggest that that drain is not beneficial even in dirty category of abdominal surgeries. Proper and through peritoneal lavage are doing equally good as observed in this study. This finding is in agreement with previous studies [12-16,18].

Postoperative fever and chest infection was not a regular feature in the study. Postoperative fever was observed in 2 and 4 cases in no -drain and drain group respectively. This is not in agreement with earlier studies as they have reported a higher rate of postoperative fever [12-17]. This may be because of regular use of paracetamol intravenously as pain killer in the cases of present study. Chest infection was not observed in either group. This is not in agreement with previous study where they have reported a higher incidence of chest infection in drain group [8-14]. 1{ASA-1 vs. ASA-2: 131(82.9%) vs. 27(17.1%)}.

Even several well-constructed prospective studies also have failed to show any benefit from surgically placed prophylactic drainage in secondary bacterial peritonitis due to peptic ulcer perforation [12,18] simple acute and complicated appendicitis [13-16]. This suggests at best that routine placement of intra peritoneal prophylactic drain is unnecessary.

CONCLUSION

The observation of this study suggests that prophylactic drain placement after gastrointestinal surgery for secondary bacterial peritonitis is not necessary, as it does not offer any additional benefit. Moreover, it increases operative duration, length of hospital stay and SSI.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Dec 24, 2013**
Date of Peer Review: **May 12, 2014**
Date of Acceptance: **Jul 03, 2015**
Date of Publishing: **Oct 01, 2015**