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RAPID COMMUNICATION

Is prophylactic placement of drains necessary after subtotal gastrectomy?

Manoj Kumar, Seung Bong Yang, Vijay Kumar Jaiswal, Jay N Shah, Manish Shreshtha, Rajesh Gongal

Manoj Kumar, Seung Bong Yang, Vijay Kumar Jaiswal, Jay N Shah, Manish Shreshtha, Rajesh Gongal, Department of Surgery, Patan Hospital, Kathmandu, Nepal
Correspondence to: Dr. Seung Bong Yang, Department of Surgery, Patan Hospital, PO Box 252, Kathmandu, Nepal. yang971@hotmail.com
Telephone: +977-1-5523855
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Abstract

AIM: To determine the evidence-based values of prophylactic drainage in gastric cancer surgery.

METHODS: One hundred and eight patients, who underwent subtotal gastrectomy with D1 or D2 lymph node dissection for gastric cancer between January 2001 and December 2005, were divided into drain group or no-drain group. Surgical outcome and post-operative complications within four weeks were compared between the two groups.

RESULTS: No significant differences were observed between the drain group and no-drain group in terms of operating time (171 ± 42 min *vs* 156 ± 39 min), number of post-operative days until passage of flatus (3.7 ± 0.5 d *vs* 3.5 ± 1.0 d), number of post-operative days until initiation of soft diet (4.9 ± 0.7 d *vs* 4.8 ± 0.8 d), length of post-operative hospital stay (9.3 ± 2.2 d *vs* 8.4 ± 2.4 d), mortality rate (5.4% *vs* 3.8%), and overall post-operative complication rate (21.4% *vs* 19.2%).

CONCLUSION: Prophylactic drainage placement is not necessary after subtotal gastrectomy for gastric cancer since it does not offer additional benefits for the patients.

Key words: Prophylactic drainage; Subtotal gastrectomy; Gastric cancer; Post-operative complications; Operative outcome

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INTRODUCTION

Prophylactic drainage of the peritoneal cavity after gastrointestinal (GI) surgery has been widely practiced since the mid-1800 s, with the dictum of Lawson Tait, the 19th-century British surgeon, "When in doubt, drain," well known to all surgical trainees. During the last two centuries, prophylactic drains have been employed to remove intra-peritoneal collections, such as ascites, blood, bile, chyle, and pancreatic or intestinal juice. In addition, prophylactic drains had their signal function to detect early complications, such as postoperative hemorrhage and anastomotic leakage[1]. Thus, prophylactic drainage gained wide acceptance as a useful method to prevent complications after GI surgery. However, surgically placed drains are not without risk: they have been associated with increased rates of intra-abdominal and wound infection, increased abdominal pain, decreased pulmonary function, and prolonged hospital stay, organ damage, and some other discomforts to the patients[2-9]. Advances in surgical techniques, anesthesia, and peri-operative patient care have consistently decreased postoperative complication rates after gastric cancer surgery, especially in better GI centers[10,11].

Sims was the first surgeon who used prophylactic drains after gynecologic operations in the last quarter of the 19th century[12]. Since that time, surgeons have routinely used prophylactic drainage of the peritoneal cavity after abdominal surgery. Theodor Billroth was convinced that prophylactic drainage of the peritoneal cavity saved many lives after GI surgery[13]. However, some other contemporaries believed that drainage of the peritoneal cavity is impossible and, therefore, prophylactic drainage is useless[14,15].

Unfortunately, the principle of drainage is not based on any scientific data, and, in general, the prophylactic value of drains in abdominal surgery remains controversial. During the last three decades, surgeons have made efforts to investigate the value of prophylactic drainage after abdominal surgery in controlled randomized clinical trials (RCTs)[16]. Despite evidence-based data questioning prophylactic drainage in many instances, most surgeons around the world continued to use drainage on a routine basis untill now. To the best of our knowledge, there is little information regarding the scientific evidences of prophylactic drainage placement in gastric cancer surgery. In this study, we, therefore, aimed at assessing the value of prophylactic drainage placement in gastric cancer surgery.

MATERIALS AND METHODS

Patients

One hundred and eight patients (69 males and 39 females; mean age: 55.62 ± 15.67 years), who underwent subtotal gastrectomy, regardless whether it was radical or palliative, or D1 or D2 lymph node dissection, at Surgical Department, Patan Hospital, Kathmandu (Tertiary Care Hospital) between January 2001 and December 2005 were enrolled in this study. In the drain group (n = 56), a tube drain was routinely placed in the right upper quadrant, while not in the no-drain group (n = 52) (Table 1). During the post-operative and four-week follow-up period, surgical outcomes and post-operative complications were compared between the drain group and no-drain group (Table 2).

Operative techniques

All surgical procedures were performed by consultant surgeons in Surgical Department, Patan Hospital, following the standard guidelines of gastric cancer surgery[17]. The operative protocols generally consisted of radical or palliative subtotal gastrectomy (resection of 70%-85% of the stomach) with D1 or D2 lymph node dissection, and a distal tumor-free margin of greater than 2 cm and a proximal tumor-free margin of greater than 6 cm. In the drain group, a single tube drain (28-F) was placed in the right upper quadrant *via* the foramen of Winslow below the hepatoduodenal ligament.

Post-operative care

Post-operative pain control was achieved by intramuscular administration of diclofenac (75 mg, bid), and/or morphine (5-7.5 mg), phenergan (25 mg) as necessary, followed by oral analgesics when the patients tolerated liquid. Drains were generally removed when the output was ascitic or serosanguinous and less than 50 mL in 24 h. Patients were allowed to sip water generally from the second or third post-operative day. Liquid diet was started after confirmation of bowel sound with passage of flatus and advanced to soft diet when the patients tolerated the liquid diet for at least 12 h. Patients were discharged from the hospital after tolerating a soft diet for at least 2 d.

Assessment of surgical outcome

Surgical outcomes were evaluated in terms of operative time, number of post-operative days until passage of flatus, number of post-operative days until initiation of soft diet, length of post-operative hospital stay, post-operative complications and mortality. Post-operative complications were defined as any adverse event that required surgical or medical intervention within four weeks of surgery, and mainly included wound infection, wound dehiscence, pulmonary infection (pneumonia), drain-related complications, fever, abdominal distention and frequent vomiting. Surgical outcomes were compared between the two groups.

Statistical analysis

Data were expressed as mean ± SD. All statistical analyses were performed using the SPSS version 13 software (SPSS Inc., Chicago, IL). Comparisons between the two groups were performed using Student's t test for continuous variables and the Chi-square test for discrete variables. A P value less than 0.05 was considered statistically significant.

Table 1 Demographics and clinical characteristics of the patients *n* (%)

Characteristics	Drain group (n = 56)	No-drain group (n = 52)	P value
Age (yr)	54.34 ± 11.23	57.54 ± 13.45	0.859
Sex (male:female)	36:20	33:19	0.864
Tumor stage			0.468
ⅠA	4 (7.14)	3 (5.76)	
ⅠB	6 (10.71)	4 (9.61)	
Ⅱ	11 (19.64)	13 (25.00)	
ⅢA	11 (19.64)	10 (19.23)	
ⅢB	9 (16.07)	10 (19.23)	
Ⅳ	15 (26.78)	12 (23.07)	
Operation type			0.284
Radical	38 (67.85)	37 (71.15)	
Palliative	18 (32.14)	15 (28.84)	
LN dissection			0.352
D1	20 (35.71)	17 (32.69)	
D2	36 (64.28)	35 (67.31)	

Table 2 Comparison of surgical outcomes between the two groups

Surgical outcomes	Drain group (n = 56)	No-drain group (n = 52)	P value
Operating time (min)	171.4 ± 42	155.6 ± 39	0.096
Passage of flatus (POD)	3.67 ± 0.57	3.52 ± 0.95	0.495
Initiation of soft diet (POD)	4.87 ± 0.72	4.82 ± 0.84	0.314
Hospital stay (POD)	9.32 ± 2.21	8.39 ± 2.35	0.402
Complications, n (%)			0.324
None	44 (78.57)	42 (80.76)	
Wound infection	4 (7.14)	4 (7.69)	
Pulmonary infection	7 (12.50)	6 (11.53)	
Wound dehiscence	2 (3.57)	2 (3.84)	
Fever	7 (12.50)	6 (11.53)	
Anastomotic leak	1 (1.78)	1 (1.92)	
Others[1]	8 (10.71)	6 (7.69)	
Drain-related complications	4 (7.14)	0	
Hospital mortality, n (%)	3 (5.35)	2 (3.84)	0.284

POD: Post-operative days. [1]Abdominal distention, nausea, vomiting.

RESULTS

Characteristics of patients

A total of 108 patients (69 males and 39 females; mean age: 55.62 ± 15.67 years, range: 30-80 years) were included in this study. There was no significant difference in the mean age of patients between the two groups (P = 0.859) (Table 1). In addition, no obvious differences were observed between the both groups in terms of tumor aggressiveness (tumor stage), surgical procedures and extent of lymph node dissection (radical or palliative, D1 or D2 lymph node dissection) (Table 1). Stage Ⅲ was found to be the most frequent gastric tumor (37.0%,

40/108), followed by stage Ⅳ (25.0%, 27/108), stage Ⅱ (22.2%, 24/108) and stage I (15.7%, 17/108), indicating that a majority of the patients had advanced cancer at the time of operation (Table 1).

Surgical outcomes

Drains were removed at an average of 5.4 (range: 3-9) d after surgery. The average amount of output from the drains was 325 mL (range: 100-700 mL; 60 mL/d) which was mostly ascitic or serosanguinous fluid (Table 2). Although the no-drain group had less operating time (156 ± 39 min *vs* 171 ± 41 min, $P = 0.096$) and post-operative hospital stay (8.4 ± 2.4 d *vs* 9.3 ± 2.2 d, $P = 0.402$) compared to the drain group, the data did not reach statistical significance. In addition, no significant differences were observed between the two groups in terms of number of post-operative days until passage of flatus, number of post-operative days until initiation of soft diet, wound infection rate, wound dehiscence rate, pulmonary infection rate, fever, abdominal distension, ascites, and vomiting. Similarly, there was no significant difference in post-operative in-hospital mortality rate between the two groups (5.4% *vs* 3.8%, $P = 0.284$). However, there were four drain-related complications (i.e., omentum coming out through the drain site after removal of the drain, continuous leakage from the drain site for more than 3 d, drain site infection). There was one anastomotic leakage in each group, which was diagnosed clinically and with the aid of ultrasound.

DISCUSSION

Our data clearly demonstrate that prophylactic drain placement is not beneficial or may even add to morbidity or cost of procedure or time and resource consumption for drain care after subtotal gastrectomy with D1 or D2 dissection. Various studies on the use of prophylactic drains in other abdominal surgery, such as hepatic resection, pancreatoduodenectomy, colorectal surgery have not advocated for prophylactic use of drains except some special conditions, because post-operative complications, such as subcutaneous abscess at the drain site, subcutaneous drain tract tumor recurrence, intra-abdominal abscess, collection, or fistula, have been reported to be caused by drains[8,17-19]. Prophylactic drainage after gastric surgery is a common practice in many institutions. Surprisingly, there lack of adequate studies on the value of prophylactic drainage after gastric surgery, despite gastric surgery constitutes a significant part of GI surgery. Thus, for subtotal gastrectomies, the value of prophylactic drainage remains unclear, and there is little information regarding the evidence-based recommendations for prophylactic drainage in these procedures. Therefore, we aimed at highlighting evidence-based values of prophylactic drainage after subtotal gastrectomy for gastric cancer.

Despite the controversies whether the post-operative complications after gastric cancer surgery are indeed associated with the extent of lymph node dissection, the current incidence of severe post-operative complications, such as anastomotic leakage, is extremely low[10]. Similarly, we found a low incidence of post-operative complications in our study, showing no significant difference in the incidence of severe post-operative complications between the drain group and no-drain group, which is in agreement with a recent study by Kim *et al*[20]. In contrast, the majority of the patients in this study had advanced cancer at the time of surgery. In this study, there were a total of five post-operative in-hospital mortalities. Interestingly, all cases, irrespective of their age, had advanced gastric cancer (stage Ⅳ = 4 and stage Ⅲ = 1), suggesting that tumor aggressiveness, not age, might be associated with post-operative in-hospital mortality.

Some surgeons experienced a high risk of pancreas-related complications after gastrectomy with D2 or more extended lymph node dissection, thereby suggesting prophylactic drainage placement in gastric cancer surgery to avoid a re-operation[21]. Moreover, some surgeons believe that prophylactic use of drains gives early information about anastomotic leakage, intra-abdominal bleeding, *etc.* However, some authors believed that drainage of the peritoneal cavity is impossible and, therefore, prophylactic drainage is useless[14,15]. In our series of patients, we found a very low incidence of anastomotic leakage (1.8%, 2/108); one in each group, which was suspected clinically and confirmed after re-exploration. Besides drainage output, anastomotic leakage can be diagnosed by radiological and clinical findings, such as features of peritonitis. It has been reported that interventional radiology-guided drainage has remarkably reduced the number of laparotomies for surgical complications, thereby supporting abdominal surgery without the prophylactic use of drains[22].

In this study, we found no obvious differences in number of post-operative days until passage of flatus and until initiation of soft diet, and length of post-operative hospital stay between the two groups, which are in agreement with a previous study[20]. Moreover, we did not observe any significant difference in operating time between the two groups, which is in contrast with a prospective study by Kim *et al*[20], who reported significantly longer operating time in the drain group. A recent study demonstrated that morbidity and postoperative hospital stay were statistically higher in the drain group of patients with total gastrectomy[8].

It is important to note that there have been reported data showing drain-related complications, such as fistula, drain site infection and pain, in abdominal surgery[17,18]. Similarly, we also found some drain-related complications, such as omentum came out through the drain site after removal of the drain, and continuous ascitic fluid leakage from the drain site for more than 3 d.

Several well-constructed, prospective studies failed to show any benefit from surgically placed closed suction drainage[8,9]. After a variety of intra-abdominal procedures, such as colorectal resection[7,23,24], closure of perforated duodenal ulceration[6], open or laparoscopic cholecystectomy[4,25], radical hysterectomy and pelvic lymphadenectomy[26], or retroperitoneal lymphadenectomy[5], there appears to be no statistical difference in the rate of complications between patients who are drained and those who are

not, suggesting at best that routine placement of intraperitoneal drains is unnecessary. In fact, many of the studies imply that peritoneal drainage may be associated with adverse effects[8,9].

In conclusion, based on these results, our study suggests that prophylactic drainage placement after subtotal gastrectomy is not necessary since it does not offer additional benefits for the patients undergoing subtotal gastrectomy regardless of D1 or D2 lymph node dissection and radical or palliative resection.

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