Is there a role of abdominal drainage in primarily repaired perforated peptic ulcers?

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Summary

Objective: To compare the survival and post-op complications following primary closure of perforated peptic ulcer by omental patch technique in 4 groups of patients as follows: two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group.

Methods: This is a prospective case-controlled clinical study performed in the Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh, India. A total of 114 patients with perforated peptic ulcer who underwent emergency laparotomy with primary closure by omental patch technique were studied in 4 groups as mentioned above. Tube drains were used throughout the study.

Results: Mean age of patients was 45±12.7 years (range 15-75) with M:F ratio of 5:1. Clinical profile of patients matched in the 4 groups. Post-operative fever, vomiting, laparotomy wound infection, wound dehiscence and intraperitoneal collection were significantly lower in the no-drain group as compared to drain groups. There was found no significant difference between the no-drain and drain groups with respect to the post-operative abdominal distension, pain, intra-abdominal sepsis, gastrointestinal leak, adult respiratory distress syndrome and mortality. Drain-related complications were recorded in 36.8% of patients with tube drain(s).

Conclusion: Peptic perforation closure with omental patch technique is safe without prophylactic drainage and a high rate of drain-related morbidity negates the concept of the routine drainage after this procedure. One drain placement is as good as the two drain placement and sub-hepatic drain is more useful than the pelvic drain.

Introduction

Prophylactic drainage of the peritoneal cavity after gastro-intestinal (GI) surgery has been widely practiced since the mid-1800s, with the dictum of Lawson Tait, the 19th century British surgeon, “When in doubt, drain”, well known to all surgical trainees [1]. However, in the modern era of evidence-based medicine, several well-constructed prospective studies failed to show any benefit from prophylactic abdominal drainage after a variety of intra-abdominal procedures such as colo-rectal resection [2-4], open or laparoscopic cholecystectomy [5-13], radical hysterectomy and pelvic lymphadenectomy [14], retroperitoneal lymphadenectomy [15], liver resection [16-19], pancreatic resection [20-22], or gastrectomy [23, 24]. Moreover, surgically placed drains are not without risk of complications [3, 15, 25-29]. To the best of our knowledge, only one prospective controlled study has appeared in the English literature, which has documented that the routine use of drains is neither safe nor effective in patients of perforated duodenal ulcer treated by omental patch closure [27]. Therefore, our aim is to assess the value of intraperitoneal drainage placement in patients with perforated peptic ulcer, a frequently encountered surgical emergency in tropical countries.

Materials and methods

Patients

Patients with perforated peptic ulcer (PPU) who underwent surgery in Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh, India, formed the body of the present prospective study during a period from January 2009 to November 2010. All PPU patients who underwent primary closure by omental patch technique were included in the present study. Patients were randomly allocated before start of the laparotomy to one of the following four groups: two-drain group (control group), one-drain subhepatic group, one-drain pelvic group, and no-drain group.

Critically sick patients (pulse rate > 100/min, blood pressure < 90mm Hg (systolic), deranged arterial blood gases or deranged renal/ cardio-
pulmonary function), patients presenting after 72 hours of onset of symptoms and patients with past history of similar illness were excluded from the study. Patients with perforation >2 cm in size and patients with frank pyoperitoneum (presence of frank yellow pus in the peritoneal cavity) were also excluded from the study. Patients who died within 24 hours of emergency laparotomy were also excluded from further consideration in the study because the role of drain/no drain could not be assessed in them.

Surgical technique
At laparotomy through midline incision, liberal peritoneal lavage with 3-6 litres of normal saline was first carried out, and peptic perforation was closed by interrupted sutures of Polyglactin 910 (Vicryl®) with an omental pedicle. In all cases of gastric ulcer perforation, a biopsy from the ulcer margin was obtained for histopathological examination to rule out malignancy. Intraabdominal drain(s) were placed as per the random allocation. Abdominal wounds were closed in two layers: (1) tendinous fascio-muscular layer with monofilament polypropylene (Prolene®), and (2) skin with monofilament Nylon (Ethilon®).

Postoperative care
All patients were kept nil per orally with Ryle’s tube gastric aspiration till passage of flatus and/or bowel movement. Combination antibiotics (ceftriaxone + amikacin + metronidazole) were given to cover aerobic (Gram negative & positive) and anaerobic bacteria. Patients were assessed on at least twice daily basis for vital signs, abdominal condition and return of bowel function, with a high index of suspicion for intra-operative fluid collection or abscess. In the drainage groups, details were noted in terms of daily drainage, drain-related complications and time of drain removal.

Abdominal ultrasonography (USG) was carried out in all patients on post-op day 3-5. When collection was detected on first USG in a patient, repeat USG was done after 48-72 hours to determine decrease or increase in the collection. When collection was not detected on first USG in a patient, USG was repeated whenever intraabdominal collection or abscess was suspected on clinical grounds. If a drain was accidentally pulled out at any time in the postoperative period, check USG was carried out after 24-48 hours of the drain pull-out. Significant intraperitoneal collection was considered to be present when fluid was detected on USG at two or more than two sites/places in the peritoneal cavity. This was based on the study of Sirlin et al [30] who proposed a simple ultrasonographic method of fluid quantification by counting the number of the peritoneal recesses filled with fluid in the following manner in which each patient was assigned a fluid score of 0-5:
- **Score of 0:** no fluid
- **Score of 1:** fluid in one peritoneal recess
- **Score of 2:** fluid in two peritoneal recesses
- **Score of 3:** fluid in three peritoneal recesses
- **Score of 4:** fluid in four peritoneal recesses
- **Score of 5:** fluid in five peritoneal recesses

Gastrografin meal study was done in selected patients when gastro-duodenal leak was clinically suspected. Drains were removed after 24 hours of total/near-total stoppage of drainage. Less than 20 ml of drainage was considered as near-total or negligible drainage. Patients were regularly followed in the out-patient department after discharge from the hospital.

Non-purulent serous/serosanguinous collection without local/systemic signs of infection was labelled as the intraabdominal collection. Purulent collection (frank yellow pus) in the abdomen with or without local/systemic signs of infection was labelled as the intraabdominal sepsis.

Body of the present study
A total of 151 patients presented with perforated peptic ulcer. Critically sick patients (n=4) and patients with presentation after 72 hours of symptoms (n=17), frank pyoperitoneum (n= 8) or large perforations of >2 cm in size (n=5) were excluded from the present study. Another eleven patients after recruitment (7, 1, 1 and 2 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively) died within 24 hours of emergency laparotomy and they were also excluded from further consideration in the study. Therefore, only 114 patients formed the body of the present study after the clinical diagnosis of PPU was confirmed on laparotomy and primary omental patch closure was done. There were 19 patients in no-drain group, 12 patients in one-drain sub-hepatic group, 10 patients in one-drain pelvic group and 73 patients in two-drain group.

Statistical analysis
Student t-test and Z-test of proportion were used for the statistical analysis through the statistical software SPSS version 17.

Results
Overall mean age of the 114 patients studied in the present series was found 45 ± 12.72 years (range 15-75 years) and more than half of the
patients (57.1%) were between 30 and 50 years. Individual group mean age was 44.94 ± 15.5, 44.83 ± 25.0, 46.7 ± 17.5 and 44.94 ± 37.5 years in the two-drain group (n=73), one-drain subhepatic group (n=12), one-drain pelvic group (n=10) and no-drain group (n=19), respectively. Intergroup differences among the four groups were found not statistically significant (p>0.05). The overall male:female (M:F) ratio was 5:1. Individual group M:F ratio was 5.6:1, 3:1, 9:1 and 3:8:1 in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively. Intergroup differences among the four groups were found not statistically significant (p<0.05) but within the age group of 30-50 years which constituted the major portion of the present study, the intergroup differences among the four groups were found not significant (p>0.05).

Majority of patients (69.3%) in our study presented between 48 to 72 hours of onset of symptoms while 15.8% of patients presented between 24-48 hours of onset. Only 14.9% of our patients presented within 24 hours of onset. There was no statistical difference among the four groups (p>0.05). Pre-pyloric area was the most common site of PPU in the present study in general as well as individually in all the four groups. Pre-pyloric PPU was present in more than 75% of the total patients. Duodenal perforation was found least common constituting about 9% of total sample size as well as individually in each study groups. Majority of patients (82.5%) had perforation of ≤1 cm in size and only 17.5% of patients had perforation of 1-2 cm in size. There was no statistical intergroup differences (p>0.05) among the four groups. In majority of the patients at laparotomy (76.3%), amount of non-purulent contamination was found between 500 to 1000 ml. Intergroup differences were statistically insignificant (p>0.05) among the four groups (Table 1).

Out of 114 patients studied, 53 patients developed moderate to high grade of fever in the 1st post-operative week. The difference between no-drain and drain groups was found statistically significant (p<0.05, but there was no statistical difference among the three drain groups (p>0.05). Twenty-one patients had post-operative abdominal distension beyond 48 hours suggestive of prolonged ileus and the intergroup differences were statistically insignificant among the four groups (p>0.05). Only 8 out of 114 patients had one or two vomiting in the early post-operative period only in the two-drain and one-drain subhepatic groups. There was no instance of vomiting in the one-drain pelvic and no-drain groups (Table 2).

In the first two days after operation, 103 patients had significant diffuse abdominal pain but only nineteen patients required narcotic analgesics for relief; 12, 2, 2, and 3 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively. Intergroup differences were not found statistically significant (p>0.05). Patients who developed wound infection (n=61), continued to have localized pain in and around the wound until clearance of the infection (Table 2).

### Table 1: Pre-operative and intra-operative findings

<table>
<thead>
<tr>
<th>Pre-operative and intra-operative findings</th>
<th>Groups</th>
<th>Duration of presentation (hours)</th>
<th>Site of perforations</th>
<th>Size of perforations</th>
<th>Peritoneal contaminations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Two-drain n (%)</td>
<td>One-drain subhepatic n (%)</td>
<td>One-drain pelvic n (%)</td>
<td>No-drain n (%)</td>
</tr>
<tr>
<td>0 - 24</td>
<td></td>
<td>11 (15.1)</td>
<td>2 (16.7)</td>
<td>1 (10)</td>
<td>3 (15.8)</td>
</tr>
<tr>
<td>24 – 48</td>
<td></td>
<td>11 (15.1)</td>
<td>2 (16.7)</td>
<td>2 (20)</td>
<td>3 (15.8)</td>
</tr>
<tr>
<td>48 - 72</td>
<td></td>
<td>51 (69.8)</td>
<td>8 (66.6)</td>
<td>7 (70)</td>
<td>13 (68.4)</td>
</tr>
<tr>
<td>Pre-pyloric</td>
<td></td>
<td>56 (76.7)</td>
<td>9 (75)</td>
<td>8 (80)</td>
<td>15 (78.9)</td>
</tr>
<tr>
<td>Pyloric</td>
<td></td>
<td>10 (13.7)</td>
<td>2 (16.7)</td>
<td>1 (10)</td>
<td>3 (15.8)</td>
</tr>
<tr>
<td>Duodenal</td>
<td></td>
<td>7 (9.6)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>1 (5.3)</td>
</tr>
<tr>
<td>&lt;1 cm</td>
<td></td>
<td>60 (82.2)</td>
<td>10 (83.3)</td>
<td>8 (80)</td>
<td>16 (84.2)</td>
</tr>
<tr>
<td>1-2 cm</td>
<td></td>
<td>13 (17.8)</td>
<td>2 (16.7)</td>
<td>2 (20)</td>
<td>5 (15.8)</td>
</tr>
<tr>
<td>&lt;500 mL</td>
<td></td>
<td>10 (13.7)</td>
<td>2 (16.7)</td>
<td>2 (20)</td>
<td>3 (15.8)</td>
</tr>
<tr>
<td>500-1000 mL</td>
<td></td>
<td>57 (78.1)</td>
<td>9 (75)</td>
<td>7 (70)</td>
<td>14 (73.7)</td>
</tr>
<tr>
<td>&gt;1000 mL</td>
<td></td>
<td>6 (8.2)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>2 (10.5)</td>
</tr>
</tbody>
</table>

*Number of patients was 73, 12, 10 and 19 in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively.

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Laparotomy wound infection was observed in 61 out of 114 patients and intergroup differences were statistically significant (p<0.05). Incidence of the wound infection in the no-drain group was half of those recorded in the three drain groups. Intergroup differences among the three drain groups were found not significant (p>0.05). Partial wound dehiscence occurred in 35 out of 114 patients. Intergroup differences were found significant statistically (p<0.05). Nineteen out of 114 patients developed complete wound dehiscence but there was no instance of complete wound dehiscence in one-drain subhepatic and no-drain groups. Difference between the two-drain and one-drain pelvic groups were found significant (p <0.05) (Table 2).

Table 2: Post-operative complications

<table>
<thead>
<tr>
<th>Post-operative complications</th>
<th>Two-drain n (%)</th>
<th>One-drain subhepatic n (%)</th>
<th>One-drain pelvic n (%)</th>
<th>No-drain n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever (n= 53)</td>
<td>40 (54.8)</td>
<td>5 (41.7)</td>
<td>7 (70)</td>
<td>1 (5.3)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Distension (n=21)</td>
<td>14 (19.2)</td>
<td>2 (16.7)</td>
<td>2 (20)</td>
<td>3 (15.8)</td>
<td>NS</td>
</tr>
<tr>
<td>Vomiting (n=8)</td>
<td>7 (10.3)</td>
<td>1 (8.3)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Abdominal pain (n=103)</td>
<td>67 (91.8)</td>
<td>11 (91.7)</td>
<td>9 (90)</td>
<td>16 (84.2)</td>
<td>NS</td>
</tr>
<tr>
<td>Wound infection (n=61)</td>
<td>43 (58.9)</td>
<td>7 (58.3)</td>
<td>6 (60)</td>
<td>5 (26.3)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Partial dehiscence* (n=35)</td>
<td>28 (38.4)</td>
<td>2 (16.7)</td>
<td>4 (40)</td>
<td>1 (5.3)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Complete dehiscence* (n=19)</td>
<td>18 (24.7)</td>
<td>0 (0)</td>
<td>1 (10)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Peritoneal collection (n=37)</td>
<td>26 (35.6)</td>
<td>5 (41.7)</td>
<td>4 (40)</td>
<td>2 (10.5)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Abdominal sepsis (n=11)</td>
<td>7 (9.6)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>2 (10.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Gastro-duodenal leak (n=7)</td>
<td>4 (5.4)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>1 (5.3)</td>
<td>NS</td>
</tr>
<tr>
<td>Adult respiratory distress</td>
<td>6 (8.2)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>2 (10.5)</td>
<td>NS</td>
</tr>
<tr>
<td>syndrome (n=10)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain complications** (n=35)</td>
<td>26 (35.6)</td>
<td>6 (50)</td>
<td>3 (33.3)</td>
<td>NA</td>
<td>NS</td>
</tr>
<tr>
<td>Late post-op mortality (n=10)</td>
<td>6 (8.2)</td>
<td>1 (8.3)</td>
<td>1 (10)</td>
<td>2 (10.5)</td>
<td>NS</td>
</tr>
</tbody>
</table>

*Dehiscence of laparotomy wound; **Excluding pain, restriction of mobility and accidental pull-outs; NA = not applicable; NS = not significant.

Significant intraperitoneal collections at two sites (subhepatic space and pelvis, 3; subhepatic space and right paracolic gutter, 6; right paracolic gutter and pelvis, 4; left paracolic gutter and pelvis, 2) were seen in a total of 15 patients: 11, 2, 2 and 0 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively. Intergroup differences among the four groups were statistically significant (p<0.05). Majority of them (9 out of the 15 patients; 60%) resolved spontaneously within 5-8 days without intervention, but 3 out of 11 patients in the two-drain group required PCD while 2 out of 11 patients in the two-drain group and one of the two patients in the one-drain subhepatic group required laparotomy, peritoneal toileting and lavage with placement of large-size tubes for peritoneal drainage.

Intraperitoneal collections at more than two sites (mild, 12; moderate, 1; severe, 1) were observed in 14 patients; 10, 2, 1 and 1 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively. Intergroup differences among the four groups were statistically significant (p<0.05). All resolved spontaneously (12 out of the 14 patients; 85.7%) except for the two patients with moderate to severe collections in the two-drain group who required laparotomy, peritoneal toileting and lavage with placement of large-size tubes for peritoneal drainage.

Intraperitoneal collections were suspected clinically in 21 patients in late post-operative period.
beyond 5 days after surgery but were confirmed on USG in only 16 patients (11, 2, 1 and 2 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively). Intergroup differences among the four groups were statistically insignificant (p>0.05). Four patients had recurrent collection after percutaneous drainage (PCD) due to luminal blockage of the percutaneous catheters. Surgical interventions were needed in 9 patients (PCD 4 and laparotomy 5); 6, 1, 1 and 1 patients in the two-drain group, one-drain subhepatic group, one-drain pelvic group and no-drain group, respectively. In seven patients, collections resolved on conservative treatment including flushing of the drainage tubes.

It is of interest to note that no significant intraperitoneal collection was detected on check USG in any of the six patients in whom drain was accidentally pulled out in the postoperative period.

Frank intraabdominal sepsis was detected in 11 patients (Table 2) and the intergroup differences among the four groups were found statistically insignificant (p>0.05). In 3 patients who died in the late post-operative period, abdominal sepsis was secondary to gastro-duodenal leak and was associated with adult respiratory distress syndrome (2 patients in the two-drain group and 1 patient in the one-drain pelvic group).

In 7 patients, gastro-duodenal leak developed within 2-4 days of operation (Table 2). There was no statistical difference (p>0.05) between two-drain and no-drain groups as well as between one-drain subhepatic and pelvic groups. All patients underwent emergency laparotomy and repeat closure with triple ostomy procedure (gastrostomy, retrograde decompression catheter jejunostomy in the first loop of jejunum and feeding catheter jejunostomy in the second loop of jejunum) was carried out. Three out of these 7 patients died within 5 days of re-operation (2 patients in the two-drain group and 1 patient in the one-drain pelvic group).

Ten patients developed adult respiratory distress syndrome in the post-operative period (Table 2). Intergroup differences were statistically insignificant (p>0.05). Four of these patients (2, 1 and 1 patients in the two-drain group, one-drain subhepatic group and no-drain group, respectively) survived while 6 patients (4, 1 and 1 patients in the two-drain group, one-drain subhepatic group and no-drain group, respectively) succumbed to death.

Ten out of 114 patients expired in the late post-operative period (Table 2) after a mean of 5.0 ± 2.1 days (range 3-9 days). Intergroup differences with respect to the mortality were found not significant (p>0.05). Major cause of death in this subgroup was ARDS (adult respiratory distress syndrome) with frank wound sepsis (n=9) and intraabdominal sepsis in 6 patients (4, 1 and 1 patients in the two-drain group, one-drain subhepatic group and one-drain pelvic group, respectively). Abdominal sepsis was associated with gastro-duodenal leak in 3 patients who died (2 patients in the two-drain group and 1 patient in the one-drain pelvic group). The two patients in no-drain group who expired on 5th and 6th post-operative days did not show any significant peritoneal collection on the scheduled abdominal USG on 3rd post-operative day.

Out of 95 patients with drains, 85 patients persistently complained of significant pain at the drain sites. Three forth of these patients (n=64) belonged to the two-drain group but intergroup differences were statistically insignificant among the three drain groups (p>0.05). In the two-drain group, pain was complained more frequently at the subhepatic drain sites as compared to the pelvic drain sites; pain at both sites in 35 patients, pain only at subhepatic drain site in 20 patients and pain only at pelvic drain site in 9 patients. In the two-drain group, pelvic drain was put through the left flank of abdomen and pain was complained in 53 out of 73 patients (72.6%). However, in the one-drain pelvic group, the drain was put in the pelvis through the right flank of the abdomen and pain was complained in 9 out of 10 patients (90%). Intergroup difference between these two groups with respect to the drain into the pelvis was statistically significant (p<0.05).

Thirty-five out of 95 patients with drain had peritubal discharge/leakage with skin excoriation; 26, 6 and 3 patients in the two-drain group, one-drain subhepatic group and one-drain pelvic group, respectively. Intergroup differences were not statistically significant (p>0.05). In the two-drain group, peritubal discharge and skin excoriation was more common at pelvic drain site as compared to the subhepatic drain site (18 vs. 10 patients) and the difference was statistically significant (p<0.05).

Only 8 out of 95 patients with drain developed kinking of tube; 1 and 7 patients in one-drain subhepatic group and two-drain group, respectively. The difference between the two groups was statistically insignificant (p>0.05). Within the two-drain group, kinking was more commonly seen in the subhepatic drain tube as compared to the pelvic drain tube (6 vs. 1) and the difference was found significant (p<0.05).
Blockage of the drain tubes was noted in 21 out of 95 patients with drain; 16, 3 and 2 patients in the two-drain group, one-drain subhepatic group and one-drain pelvic group, respectively. The difference was found not significant among the three groups (p>0.05). In most instances, blockage was seen at junction of the drain tube with the tube of the collection bag. Blockage was due to fibrin flakes (n=11) and thick exudates.

Accidental drain pull-out happened in 6 out of 95 patients with drain; 1 and 5 patients in the one-drain pelvic group and two-drain group, respectively. In the two-drain group, accidental drain pull-out occurred with the right sided subhepatic drains only. Two accidental pull-outs were seen during patient transfer in the immediate post-operative period due to the staff oversight and four pull-outs were seen during patient’s ambulation in bed due to cutting-through of the anchor sutures.

Significant restriction of mobility was noted in 93 out of 95 patients with drain. Only two patients in the one-drain pelvic group did not have any problem with respect to mobility. Intergroup differences were found insignificant (p>0.05).

Mean times ± S.D. (range) of removal of abdominal drains were 4.82 ± 1.25 (2-8) days for the right drain and 6.26 ± 1.5 (3-10) days for the left drain in the two-drain group, 5.13 ± 1.33 (3-8) days in the one-drain subhepatic group and 6.44 ± 1.45 (4-10) days in the one-drain pelvic group. Subhepatic drains served well and stopped drainage earlier than the pelvic drains and removed earlier. Difference between the removal times of the subhepatic and pelvic drains was statistically significant (p<0.05) not only within the two-drain group but also between one-drain subhepatic and one-drain pelvic groups.

Mean ± S.D. (range) time of discharge from the hospital was 12.38 ± 5.14 (8-30) days in the two-drain group, 8.75 ± 2.86 (7-10) days in the one-drain subhepatic group, 11.0 ± 1.86 (7-16) days in the one-drain pelvic group and 7.47 ± 1.21 (5-15) days in the no-drain group. Intergroup differences were statistically significant (p<0.05) with earlier discharge in the no-drain group. However, there was no statistical difference (p>0.05) between two-drain group and one-drain pelvic group as well as between one-drain subhepatic group and no-drain group.

No instance of malignancy was detected on the histopathological examination of the biopsy specimens of the perforated gastric ulcer margins in any of the 104 patients (88 Prepyloric; 16 Pyloric).

Discussion
In the present study, clinical profile of the patients matched among the four groups studied (p>0.05) with respect to the age, sex (between 30-50 years), clinical presentation, site of the perforations, size of the perforations, and intraperitoneal contamination. Post-operative fever was recorded in about half of patients in the present study with significant difference between no-drain and drain groups. This finding supports the concept of “Drain Fever” as reported in 1962 by Myers [31] and can be attributed to the use of drain. But this concept always remained controversial. Pai and associates [27] did not find any statistical difference between drainage and non-drainage groups with respect to the post-operative fever.

Statistically insignificant difference in the incidences of the post-operative abdominal distension and pain between drain and no-drain groups of the present study indicates that placement of abdominal tube drains does not play any role in their causation. Presence of vomiting episodes only in the two-drain and one-drain subhepatic groups and total absence of vomiting episodes in the no-drain and one-drain pelvic groups suggests that subhepatic drain does produce gastric over-activity and/or reverse peristalsis directly through the irritation by the drain contact with the adjacent duodenum or indirectly through the irritation by the drain contact with the adjacent liver, leading to diaphragmatic irritation with resultant vomiting.

Wound infection and partial dehiscence was significantly much lower in the no-drain group as compared to the drain groups in the present study. Our observations are in agreement with the majority of other investigators [13, 32-34] who found drains to be a risk factor for wound sepsis. However, our findings do not agree with those of Pai and associates [27] who observed no significant difference in the main wound infection rates between the drainage and non-drainage groups.

Present observations indicate that placement of a pelvic drain increases the risk of complete wound dehiscence and addition of a subhepatic drain as was seen in the two-drain group increases the likelihood of developing the complete wound dehiscence. Absence of any instance of complete wound dehiscence in the no-drain or one-drain pelvic group suggests that either the drain placement should be omitted altogether or only a subhepatic drain should be used. However, Pai and associates [27] did not record any statistical difference in the complete wound dehiscence rates between drained and non-drained groups.
Incidence of single-site collection (termed minimal collection) in the present study was similar in the drain and no-drain groups. Present observation of no or mild collection in 74.6% of our patients agrees with that of 88% reported by Liu and colleagues [28] after hepatic resection. Other investigators did not highlight the distinction between different degrees of the collections. Incidence of collections at two or more than 2 sites (termed significant collection) in the present study was significantly lower than in the no-drain group as compared to the drain groups. Furthermore, one-drain groups also recorded significantly lower incidence of significant collections in comparison to the two-drain group. Our findings confirms the suggestion that drain(s) may possibly stimulate fluid collection by acting as foreign bodies and by not allowing apposition of tissue surface, therefore leaving a space which promotes continued exudation and collection. Pai and associates [27] recorded greater incidence of intraperitoneal collections in the drainage group as compared to the non-drainage group but the difference was not statistically significant. Sagar and associates [35] have shown that drains failed to allow egress of pus in patients who leaked after rectal resection. Present study confirms that intraperitoneal collections do occur in a significantly high percentage of patients (36.8%) even in presence of the tube drain(s).

Gold and colleagues [36] suggested that fluid collection within seven days postoperatively in asymptomatic patients would be of little clinical significance as was also seen in the present study. Majority of the collections occurring within 5 days (73%) in our patients of both drain and no-drain groups resolved spontaneously. In the present study, intraperitoneal collections seen in the late post-operative period beyond day 5 were not significantly different between the drain and no-drain groups but only half of these collections in either group resolved spontaneously, indicating greater inefficacy of tube drain(s) in the late post-operative period, i.e., keeping the drains for longer periods is not necessarily effective.

Incidence of intraabdominal sepsis, gastro-duodenal leak, ARDS and mortality was similar in both the drain and no-drain groups of the present study. Number of drains did not influence their incidence. Number of drains also did not correlate with the high incidence (36.8%) of drain-related complications observed in the present study.

It may be of interest to note that none of our patients with perforated gastric ulcer in any of four groups was proved to have a malignant gastric lesion. It is quite possible that this is partly a reflection of the overall marked decrease in the incidence of the gastric cancer in our region and partly a reflection of the control of *Helicobacter pylori* due to too liberal use of the proton pump inhibitors. *H. pylori* is presently regarded as a well-known aetiological factor for development of gastric carcinoma.

To conclude, the present study confirms the suggestion of Petrowsky et al [34] that peptic perforation closure with omental patch technique appears to be safe without prophylactic drainage and in view of the high local drain-related complications, routine drainage cannot be recommended after this procedure. One-drain placement is as good as the two-drain placement and subhepatic drain is more useful than the pelvic drain. Moreover, the use of drains is certainly no substitute for adequate peritoneal toilet and lavage in cases of peritonitis due to perforation of a hollow organ as emphasized by Sir Alfred Cuschieri [37].

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References