

Repair of Gastrointestinal Tract Perforation with Mattress Suture Reinforced with Free Peritoneal Patch: A Controlled Study

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Abstract

Introduction: Gastrointestinal perforations constitute one of the commonest surgical emergencies encountered by surgeons. The surgical treatment of gastrointestinal tract perforation decides the main operative procedure including eradication of underlying source of bacterial contamination by treating the underlying pathological process to decrease the degree of bacterial contamination in the peritoneal cavity and to prevent residual or recurrent infection. Closure by horizontal mattress suture reinforced with free parietal peritoneal patch is a novel method for closing gastro intestinal tract perforations.

Objectives: The study deals with comparison of conventional method vs horizontal mattress suture reinforced with free peritoneal patch for repair of gastrointestinal perforations.

Methods: Fifty patients presenting with perforation peritonitis in surgical emergency, 25 patients included in study group were treated with horizontal mattress suture reinforced with free peritoneal patch and 25 patients in control group with conventional methods of repair two years from 2015 to 2017. Patients were evaluated on regular clinical, hematological and radiological parameters during six week follow up.

Results: The highest incidence was seen in the age group of 31 to 40 years. The patients in study group showed the appearance of bowel sounds, passage of flatus and stool much earlier as compared to patients in control group. The study group also started oral feeding much earlier and the difference in two groups was found to be statistically significant ($p \leq 0.05$). Six patients in control group showed the presence of anastomotic leakage as compared to one patient in study group. Two patients in control group developed adhesions leading to intestinal obstruction as compared to none in study group.

Conclusion: It is concluded that the repair of gastrointestinal perforation with horizontal mattress suture reinforced with free peritoneal patch is a simple and easy procedure which does not require significant expertise and can even be performed in a very short time by a trained general surgeon in a seriously ill patient in an emergency situation.

Keywords: Gastrointestinal Perforation; Horizontal Mattress Sutures; Free Peritoneal Patch; Gastrointestinal Motility; Anastomotic Leakage

Introduction

Gastrointestinal perforations constitute one of the commonest surgical emergencies encountered by surgeons [1,2]. Management of these patients continues to be highly demanding despite the advances made in diagnosis and surgical therapy due to associated morbidity and mortality. The etiological spectrum of perforation peritonitis in India differs significantly from its western counterparts [3-5]. Nowadays the most common cause of perforation is perforated gastroduodenal ulcer followed by appendicitis, gastrointestinal perforation due to blunt trauma abdomen, typhoid fever and tuberculosis [6].

The surgical treatment of gastrointestinal tract perforation decides the main operative procedure including eradication of underlying source of bacterial contamination by treating the underlying pathological process to decrease the degree of bacterial contamination in the peritoneal cavity and to prevent residual or recurrent infection. Early limited surgery is still the most important step required for good results.

The aim of perforation closure is to restore continuity which is secure watertight and hemostatic adherence will prevent any leakage. Conventionally, the intestinal perforation closure is done in two layers. Although it might lead to stronger union as the site is closed in multilayer but also it can cause narrowing of lumen due to infolding of tissue leading to ischemia of margins. Exact approximation of intestinal margins can avoid narrowing of lumen.

The conventional methods of repair is associated with many complications inviting a need to find, evaluate and apply better techniques. The free parietal peritoneum patch is recent trend in closing the perforation and reinforcing the alimentary tract anastomosis. The present study was conducted to compare the efficacy of conventional methods of repair over horizontal mattress suture reinforced with free peritoneal patch.

Materials and Methods

A prospective study of 50 patients was carried out at department of surgery, Guru Nanak Dev Hospital Amritsar from June

2015 to November 2017 with the diagnosis of gastrointestinal perforation. The study compared the efficacy of horizontal mattress suturing reinforced with free parietal peritoneal patch over conventional methods for repair of gastrointestinal perforation.

The patients were randomly divided into 2 groups of 25 each: Study group (S): operated with horizontal mattress suture closure of perforation and reinforced with free parietal peritoneal patch and the control group (C): operated with conventional methods of repair (Figure 1-4).

Figure 1: Intraoperative figure of gastroduodenal perforation.

Figure 2: Horizontal mattress suture untied.

Figure 3: Horizontal mattress suture tied.

Figure 4: Free peritoneal patch applied over mattress suture.

Patients from both groups received the same standard pre and post-operative preparation and medications, including antibiotics and H₂ blockers.

The two groups were compared post surgery for appearance of bowel sounds, passage of flatus, post-operative hospital stay, incidence of superficial wound infection and intra-abdominal complications during six week follow up like anastomotic leakage, interloop adhesions, abscess formation and incidence of thrombosis and graft rejection.

Results

The two groups were comparable with respect to age which varied from 0 to 80 years. In this study perforation peritonitis in both groups has occurred predominantly in males M: F of 7.3:1. The patients in (S) group showed appearance of bowel sounds (3.20 +/- 1.041 days) and passage of flatus (3.40 +/- 1.190 days) earlier as compared to (C) group, who showed the appearance of bowel sounds in 3.80 +/- 1.384 days and passage of flatus in 3.84 +/- 1.405 days. Similarly the patients in (S) group passed stools (5.08 +/- 1.077 days) prior to patients in (C) group patients (5.56 +/- 1.158 days). The (S) group patients were started with oral feeding much earlier (3.96 +/- 0.978 days) as compared to patients in (C) group (4.64 +/- 0.995 days). The difference in two groups of patients was statistically significant (p < 0.05). Patients with horizontal suturing tolerated food and passed flatus and stool, much earlier than those with conventional methods of repair. Mean days of post-operative hospital stay in (S) group was 9.80 +/- 2.198 and in (C) group was 11.08 +/- 2.308. The difference in two groups was found to be statistically significant (p < 0.05) (Table 1).

Parameter	Study Group (S)	Control Group (C)	Significance
Postoperative appearance of bowel sounds	3.2	3.8	Significant
Passage of flatus	3.4	3.8	Significant
Initiation of oral intake	3.9	4.6	Significant
Passage of stool	5.0	5.5	Significant
Postoperative hospital stay	9.8	11.0	Significant

Table 1: Comparison of post-operative progress in (C) and (S) group.

The study also shows the presence of anastomotic leakage in 6 patients of group (C) operated with conventional methods as compared to only 1 in group (S). The difference in two groups was found to be statistically significant ($p < 0.05$). In (S) group none of cases developed adhesion formation as compared to 2 cases in group (C) operated with conventional methods. The difference in two groups was found to be statistically insignificant ($p > 0.05$). The two patients in group (C) who developed adhesions presented with pain abdomen, vomiting, constipation and distension in the abdomen. One patient was managed conservatively and the other patient was re-explored. On re-exploration, interloop adhesions were present. There was no evidence of thrombosis or abscess formation or any other complications (Table 2).

Complications	Study Group (S)	Control Group (C)	Significance
Anastomotic leakage	1	6	Significant
Wound infection	3	3	Non-Significant
Adhesion formation	0	2	Significant
Burst abdomen/wound dehiscence	2	1	Significant

Table 2: Comparison of complications in study and control group.

Discussion

Perforation peritonitis is the most common surgical emergency in India. Despite advances in surgical techniques, antimicrobial therapy and intensive care support, management of peritonitis continues to be highly demanding, difficult and complex. At the time of presentation general condition of the patients usually very much deteriorated and his outlook is very grim, he is desperate, in great agony and demands emergency surgical management. The management is quite simple but meticulous and within the reach of trained surgeon, yet not successful very often, to save the life of patient.

For a long time now there has been innovations in the field of surgery when it comes to restore the continuity of gastrointestinal tract in cases of perforation peritonitis. The aim is to seal the perforation so that the ends approximate closely without any tension, also the chances of leakage reduce to the minimum. The approximation should be hemostatic, watertight and the contents should be able to pass as soon as possible.

Keeping in view the aims and objectives of ideal sealing of perforation, a quality work has been done on experimental as well as clinical basis. Our study has proved that closure of gastrointestinal tract perforation with horizontal mattress suture reinforced with free peritoneal patch is not only technically easier but also a safer and sound approach. One of the reasons is that with the use of horizontal mattress stitch, the forces are equally distributed leading to reduced tension with better approximation, hence the chances of cut through is less. Reinforcing with free parietal peritoneal patch adds to it by being an autologous graft with better healing chances.

Both the groups were comparable with respect to age, sex, etiology and site of perforation. Maximum no of patients with perforation peritonitis were in the range of 31 - 40 years in both the groups (28%) which is in accordance with Mewara, *et al.* [7] There was

male predominance (88%) with male:female ratio 7.3:1. Similar results were reported by Mewara, *et al.* and Memon, *et al* [7,8].

The most common cause of perforation was drugs (52%) followed by enteric fever (26%). This study matches with the study conducted by Sharma, *et al* [3]. The most common site was gastroduodenum (54%) followed by ileum (32%) in both the groups which is in accordance to Mewara, *et al.* and Gupta and Kaushik [7,9].

In the present study, the patients in study group showed appearance of bowel sound in 3.20 ± 1.041 days which were found to be earlier to the patients in control group, who showed appearance of bowel sound in 3.80 ± 1.384 . Patients in study group showed passage of flatus in 3.40 ± 1.190 days while in the control group passage of flatus was delayed i.e. 3.84 ± 1.405 as compared to study group.

The oral feeding was started much earlier i.e. 3.96 ± 0.978 as compared to patients in control group (4.64 ± 0.995). The mean postoperative day of stool passed in study group was 5.08 ± 1.077 , while the mean post-operative day of passing stools in control group was 5.56 ± 1.158 . The difference in the two groups was found to be statistically significant ($p < 0.05$). All these parameters signify that early recovery was seen in study group. The results were in accordance to the study conducted by Bronwel, *et al* [10].

As early ambulation due to early recovery was seen in study group, the mean hospital stay seen in study group was 9.80 ± 2.198 as compared to 11.08 ± 2.308 days in control group. The difference in the two groups was found to be statistically significant ($p = 0.012$). Similar results were seen in study conducted by Ibrahim, *et al* [11].

One of the most debilitating complication faced after repair of gastrointestinal tract perforation is anastomotic leakage. This complication is influenced by various factors such as age, preoperative status of patient, intraoperative factors like aseptic precaution and most importantly the technique of operation. Our study showed the presence of anastomotic leakage in 1 patient of study group in contrast with 6 patients of control group suggesting the higher efficacy of horizontal mattress suture reinforced with free parietal peritoneal patch over other conventional methods. In study group the cause of perforation in the patient in whom anastomotic leakage occurred was penetrating trauma. The wound was highly contaminated owing to septicemia in postoperative period. Subsequently complicated with burst abdomen and the patient was re-explored. One of the probable factors may be the late presentation of the patient to the hospital which was there in two of the six anastomotic leakage found in the control group. The difference in two groups was found to be statistically significant.

In present study, none of the cases developed adhesion formation in the study group as compared to 2 patients in control group. The two patients in control group who developed adhesions presented with pain abdomen, vomiting, constipation and distension in the abdomen. One patient was managed conservatively and the other patient was re-explored. On re-exploration, interloop adhesions were present. Similarly concluded by YIN WY [12] demonstrating feasibility of free peritoneal graft in clinical practice with less chances of adhesion ileus.

In our study, the difference between the two groups regarding complications like superficial wound infection, burst abdomen, abscess formation and thrombosis was found out to be statistically insignificant (p.0.05). Superficial wound infection was present in 3 cases in both the groups. Burst abdomen/wound dehiscence was seen in 1 patient in study group and 2 patients in control group. There were no cases of intra-abdominal abscess formation and thrombosis in both the groups.

In the present study, out of 25 cases who were operated with horizontal mattress suture reinforced with free peritoneal patch, only 1 showed anastomotic leakage. Most of the patients showed early signs of gastrointestinal motility with enteral feeding started earlier. Incidence of intra-abdominal complications like adhesion formation was nil. Hence this novel method of closure of gastrointestinal perforation is highly successful with good results.

Conclusions

It is concluded that the horizontal mattress suture reinforced with free peritoneal patch over conventional methods is effective method for the closure of intestinal perforations, with early evidence of gastrointestinal motility with early post-operative oral intake with statistically significant difference over the control group. It was also found out to be better technique with regards to complications like anastomotic leakage. Hence, the horizontal mattress suture reinforced with free peritoneal patch is a simple and easy procedure which does not require significant expertise and can even be performed in a very short time by a trained general surgeon in a seriously ill patient in an emergency situation and probably closest to be the ideal technique than conventional methods of repair.

Conflict of Interest

Nil.

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