A COMPARATIVE STUDY OF THE FIGURE OF 8 SUTURING REINFORCED WITH FREE PARIETAL PERITONEAL PATCH VERSUS DIRECT SUTURING WITH OMENTAL PLUG/FALCIFORM PLUG IN PATIENTS WITH GASTRO-INTESTINAL PERFORATION.

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Abstract

Objectives: This present study was to compare the figure of 8 suturing reinforced with free parietal peritoneal patch versus direct suturing with omental plug/falciform plug in patients with gastro-intestinal perforation.

Methods: A detail history, clinical examinations and relevant investigations were performed to all patients. All patients were anaesthetized: After painting and draping the operation site, right paramedian incision was made. Peritoneum was opened. Whole GIT and intra-abdominal organs were examined properly. Edges of perforated site were debrided. Then, the perforation firstly was stitched by a Figure of 8 stitch with vicryl 3-0 and then a free parietal peritoneal patch taken from lateral abdominal wall was applied and held in position with interrupted/continuous seromuscular sutures. Then, central tucking was also be done to keep the patch firmly fixed.

Results: Data was analyzed by using SPSS version 26 software. One sample t test was applied. Mean and standard deviation were observed. P value was taken less than or equal to 0.05 for significant differences.

Conclusions: Reinforcement of free parietal peritoneal patch over figure of 8 suturing is effective method for the closure of gastrointestinal tract perforations, with early evidence of gastrointestinal motility with oral intake allowed on an average 4th - 5th postoperative day was significant statistical difference with regards to complications like anastomotic leakage. Hence, the figure of 8 stitch reinforced with free parietal peritoneal patch is a simple and easy procedure with less hospital stay which does not require significant expertise and can even be performed in very short time by a trained general surgeon in a seriously ill patient in an emergency situation.

Keywords: Gastrointestinal perforation, Figure of 8 stitch, parietal peritoneal patch, omental plug, direct suturing

Introduction

Perforation is defined as an abnormal opening in a hollow organ or viscus. It is derived from the Latin perforatus, meaning "to bore through." The spectrum of etiology of perforation is different between developing and developed countries [1,2].

Gastrointestinal perforation is one of the most common cause of intraperitoneal free air; its detection is important for diagnosis of life-threatening conditions in patients with acute abdomen. Gastrointestinal tract perforations can occur for various causes (peptic ulcer, inflammatory disease, blunt or penetrating trauma, iatrogenic factors, foreign body or a neoplasm); most of these perforations are emergency conditions requiring an early recognition and a timely surgical treatment [3].

The trends of cause and site of perforation has changed, previously it was perforation of terminal ileum due to typhoid perforation which was most common. But now perforations of gastro-duodenum, because of dietary

habits, are the most common forms of peritonitis. [Sinmen HP, Heinzelmann M, Largiader F (1991)] [4].

Non-specific ileal perforations are closely followed by small bowel perforations occurring in intestinal tuberculosis, mostly these are seen usually proximal to the strictures in terminal ileum. Free tubercular perforations are rare. The diagnosis of perforated tubercular peritonitis is usually not one that is made pre-operatively because of the non-specific clinical features and absence of chest tuberculosis findings on chest X ray. Even if present unless histopathological and culture confirmation doesn't occur, the diagnosis is not confirmed. The recommended treatment after source control is multi drug anti-tubercular treatment.

A variety of surgical procedures have been recommended for treatment of intestinal perforation. In moribund patients, simple drainage of peritoneal cavity under local anesthesia may be all that is feasible. Eustache JM (1953) [5] recommended the most definitive treatment for non-moribund patients has been debridement and simple

transverse closure of perforation in either one or two layers. This present study was to compare the figure of 8 suturing reinforced with free parietal peritoneal patch versus direct suturing with omental plug/falciform plug in patients with gastro-intestinal perforation.

Material AND Methods

This present study was conducted in admitted cases in Department of Surgery, Guru Nanak Dev Hospital Amritsar during a period from September 2011 to June 2012. Attendants/entire subjects signed an informed consent approved by Institutional ethical committee of Guru Nanak Dev university, Amritsar, India was sought.

The present study was enrolled a total of 50 subjects, 25 were study cases and 25 control cases. The study cases (group A) were given figure of 8 stitch reinforced with free parietal peritoneal patch. And control cases (group B) were operated with conventional methods, of either omental plug or direct suturing.

Inclusion criteria: a). Patients Presenting signs and symptoms like pain, vomiting, distension, alteration of bowel habits, fever, h/o loss of appetite and weight, dyspnoea and duration of illness. b). Physical examination included general built, and appearance, presence of anaemia, dehydration, icterus, distension, liver dullness, guarding /rigidity, hepatosplenomegaly, free fluid in the abdomen. c). Findings on P/R examination and other abnormalities. d). A thorough clinical examination was followed by haematological, biochemical and radiological investigations, e). Preoperatively, vigorous intravenous fluid therapy and plumonary physiotherapy were given. Anaemia was corrected by whole blood transfusion. Patient was kept nil orally and intermittent nasogastric tube aspiration was done to decompress the gastrointestinal tract. The urinary bladder was catheterised with indwelling catheter to monitor the urinary output. f). After proper and complete resuscitation, patient was operated upon.

Procedures:

Anaesthesia (General or spinal anesthesia): After painting and draping the operation site, right paramedian incision was made. Peritoneum was opened and intraperitoneal fluid, if present was sucked with the help of negative sucker &/or mopped out. Whole GIT and intra-abdominal organs were examined properly. After identification and isolation of perforated site, it was cleaned with the help of gauze. Edge of perorated site were debrided. Then, the perforation firstly was stitched by a Figure of 8 stitch with vicryl 3-0 and then a free parietal peritoneal patch taken from lateral abdominal wall is applied and held in position with interrupted/continuous seromuscular sutures. Then central tucking was also be done to keep the patch firmly fixed.

After satisfactory closure of the perforated site and examining the rest of the intra-abdominal organs, whole peritoneal cavity as lavaged with the help of normal saline and antibiotic like Metronidazole. The drains were placed in situ in most dependent area and the abdomen was closed in layers.

During post-operative period, input-output chart was maintained and proper medication including antibiotics were given. Ryle's Tube was removed after appearance of bowel sounds and passage of flatus. Stitches were removed at proper time and patient was discharged with advice to take medicines according to pathology of perforation, if any. Six weeks follow up was made included regular clinical, haematological and radiological examination of the patient.

Statistical Analysis

Data was analyzed by using SPSS version 26 software. All data was tabulated and percentage were calculated. One sample t test was applied. Mean and standard deviation were observed. P value was taken less than or equal to 0.05 for significant differences.

Observations

In this study, we were recorded the following observations: The mean age in the study group was 35.12+/- 14.063 years and in the control group was 37.28+/-14.747 years. The patients in both groups were found to be comparable with respect to age. The difference in mean age of the two groups was found to be statistically insignificant ($p > 0.05$).

The total no. of males and females in the Study group were 25 and 0 and in the Control group were 20 and 5 respectively. Thus, the two groups were comparable with respect to sex distribution. The male to female ratio in the two groups was found to be statistically significant ($p < 0.05$).

Table 1: Post Operative-Appearance of Bowel Sounds

Appearance of Bowel Sounds	Study Group (SG)	Control Group (CG)
< 2 days	0	0
2-4 days	24	18
> 4 days	1	7
Mean +/- S.D.	3+/-0.764	3.92+/-0.862
Significance	T= -3.994; p=0.000; HS	

Mean days of appearance of post operative bowel sounds in study group was 3+/-0.764 and control group was 3.92+/- 0.862. The difference in two groups was found to be statistically highly significant ($p < 0.001$).

Table 2: Post Operative Passage of Flatus

Days of Appearance of Flatus	Study Group (SG)	Control Group (CG)
< 2 days	0	0
2-4 days	23	18
> 4 days	2	7
Mean +/- S.D.	3.56+/-0.651	4.32+/-0.690
Significance	T= -4.006; p=0.001; HS	

Mean days of passage of flatus in the study group was 3.56+/- 0.651 and control group was 4.32+/- 0.690. The difference in two groups was found to statistically highly significant (p < 0.001).

Table 3: Post-Operative Day of Initiation of Oral Intake

Days	Study Group (SG)	Control Group (CG)
2-3 days	4	2
4-5 days	19	17
> 5 days	2	6
Mean +/- S.D.	4.32+/-0.945	5.24+/-1.200
Significance	T= -3.011; p=0.004; S	

Mean days of initiation of oral intake in study group was 4.32+/- 0.945 and control group was 5.24+/- 1.200. The difference in two groups was found to be statistically significant (p < 0.05).

Table 4: Post-Operative Passage of Stools

Days	Study Group (SG)	Control Group (CG)
2-3 days	0	0
4-5 days	18	7
> 5 days	7	18
Mean +/- S.D.	5.32+/-0.945	6.88+/-0.726
Significance	T= -6.546; p=0.001; HS	

Mean days of passage of stools in study group was 5.32 +/- 0.945 and control group was 6.88 +/- 0.726. The difference in two groups was found to be statistically highly significant (p < 0.001).

Table 5: Post-Operative Hospital Stay

Hospital Stay (in days)	Study Group (SG)	Control Group (CG)
8-10 days	20	8
10-12 days	2	9
> 12 days	3	8
Mean +/- S.D.	9.40+/-0.896	11.52+/-0.981
Significance	T= -2.994; p=0.000; HS	

The mean days of post - operative hospital stay in Study Group was 9.40+/-0.896 and in Control Group was 11.52 +/- 0.981 days. The difference in the two groups was found to be statistically highly significant (p< 0.001).

Table 6: Anastomotic Leakage

Anastomotic Leakage	Study Group (SG)	Control Group (CG)	Total
Present	1	5	6
Absent	24	30	44
Total	25	25	50

$\chi^2 = 4.26$; df = 1; p = 0.039; S

The above table shows the presence of anastomotic leakage in 1 patient of study group as compared to 5 patients of control group. The difference in two groups was found to be statistically significant (p < 0.05).

Table 7: Wound Infection

Wound Infection	Study Group (SG)	Control Group (CG)	Total
Present	4	5	9
Absent	21	20	41
Total	25	25	50

$\chi^2 = 0.136$; df = 1; p = 0.713; NS

The above table shows the presence of wound infection in 4 patients of study group as compared to 5 patients of control group. The difference in two groups was found to be statistically non-significant.

Table 8: Abscess Formation

Abscess Formtion	Study Group (SG)	Control Group (CG)	Total
Present	0	0	0
Absent	25	25	50
Total	25	25	50

P>0.05; NS

The above table shows that none of the patients developed Intra-abdominal Abscess formation. The difference in the 2 groups was found to be statistically insignificant p> 0.05.

Table 9: Wound Dehiscence / Burst Abdomen

Wound Dehiscence / Burst Abdomen	Study Group (SG)	Control Group (CG)	Total
Present	2	3	5
Absent	23	22	45
Total	25	25	50

$\chi^2 = 0.222$; df = 1; p = 0.637;

The above table shows the presence of wound dehiscence in 2 patients of study group as compared to 3 patients of control group. The difference in two groups was found to be statistically insignificant (p> 0.05).

Table 10: Adhesion Formation

Adhesion Formation	Study Group (SG)	Control Group (CG)	Total
Present	0	2	2
Absent	25	23	48
Total	25	25	50

$\chi^2 = 2.083$; df = 1; p = 0.149; NS

The above table shows that none of the patients in the study group developed adhesion formation as compared to 2 patients in the control group who developed adhesion formation and the difference in the 2 groups was found to be statistically insignificant p>0.05. Two of the patients in the control group had developed symptoms and signs of intestinal obstruction (adhesions) in the follow up period.

Table 11: Thrombosis

Thrombosis	Study Group (SG)	Control Group (CG)	Total
Present	0	0	0
Absent	25	25	50
Total	25	25	50

$P < 0.05$, NS

The above table shows that none of the patients developed Thrombosis. Patients were checked for calf tenderness and pain. The difference in the 2 groups was found to be statistically insignificant ($p > .05$).

Figure 1: Perforation in Terminal Ileum **Figure 2:** Figure of 8 Stitch (Untied) **Figure 3:** Figure of 8 stitch (Tied) **Figure 4:** Free parietal peritoneal patch reinforced over figure of 8 stitch by using silk 3-0 RBN in a continuous manner. Central tucking of the patch done.

Discussions

Perforation is the most disastrous complication of peptic ulcer and inspite of modern management it is still life-threatening catastrophe (Hugh TB, 1990) [6].

Peritonitis due to perforation of gastro intestinal hollow viscus is the common surgical emergency in India and the spectrum of disease is different from that found in the western world [7].

A total of 50 cases of intestinal perforation admitted in surgical wards of Guru Nanak Dev Hospital, Amritsar, in which 25 cases of study group were operated with figure of 8 stitch reinforced with free parietal peritoneal patch and 25 cases of control group operated with conventional methods of repair by suturing with or without omental patch were studied and evaluated for their outcome after surgery.

In the field of intestinal surgery for more than a century ago, surgeons have been trying to evolve some ideal method of restoring continuity of severed ends of intestine. The aim has been to made a sound joining of the bowel, through which the contents will pass as soon as possible. The joining should be initially secure, watertight and haemostatic. Surgeons all over have been struggling to overcome the main complication of anastomotic leakage.

With the aim of achieving the goal of an ideal anastomosis, good amount of experimental as well as clinical work has been done. Our study has proved that closure of gastro intestinal tract perforation with figure 8 stitch reinforced with free parietal peritoneal patch comes nearest to the ideal, than any other technique because with figure of 8 stitch, the pressure at 1 point is divided into 2 directions and hence pressure is exerted on 4 points instead of 2 points so there are less chances of cut through, moreover its more hemostatic and approximation is more water tight. Addition of free parietal peritoneal patch helps in

better healing as parietal peritoneal healing, unlike other wound healings, occurs not from the edges but by the development of new mesothelial cells throughout the surface of the defect. In this way, large defects heal as rapidly as small defects.

The present study was taken up with the aim of evaluating the closure of gastro intestinal tract perforation with figure of 8 stitch reinforced with free parietal peritoneal patch. In this study, 25 study cases were given figure 8 stitch reinforced with free parietal peritoneal patch and 25 control cases were operated with conventional methods of repair, suturing with or without the use of omental patch. The cases were studied at different postoperative intervals. Study was made as to observe the postoperative day of appearance of bowel sounds, day of passage of flatus, incidence of superficial wound infection and incidence of intra-abdominal complications like anastomotic leakage, interloop adhesions, abscess formation and incidence of thrombosis and graft rejection.

In this study, the patients in study group showed appearance of bowel sounds (3.00 ± 0.764 days) and passage of flatus (3.56 ± 0.651 days) one day less as compared to patients in control group, who showed appearance of bowel sounds in 3.92 ± 0.862 days and passage of flatus in 4.32 ± 0.690 . Similarly, the patients in study group passed stools (5.32 ± 0.945 days) one day earlier to those patients in control group (6.88 ± 0.726 days) and these patients were started with oral feeding much earlier (4.32 ± 0.945 days) as compared to patients in control group (5.24 ± 1.200). The difference in two groups of patients was statistically significant ($p < 0.05$). The results of our study are in accordance with the study conducted by Brownwel (1967) [8] in 2 groups of patients. Patient s with serosal patch tolerated food and passed flatus and stool 24 hours earlier than those with conventional methods of repair.

Singh and Singh (1975) [9] did experiments of serosal patch and conventional simple suturing in dogs. Dogs with patch passed stools on 2nd or 3rd post-operative day whereas in cases with suturing, passage of stools occurred on 3rd or 4th post-operative day. On the whole, cases with patch passed stools 24 hours earlier than the suturing cases. With regards to post-operative hospital stay, patients in the study group were discharged on an average of 9.40 ± 0.896 days in contrast to the patients in control group which were being discharged on an average of 11.52 ± 0.981 days which is approximately 2 days later than those of study group. The difference in two groups was found to be statistically highly significant ($p < 0.001$).

The previous methods of closure of gastrointestinal tract perforations with conventional-methods were associated with many complications especially anastomotic leakage. Our study showed the presence of anastomotic leakage in

1 patient in study group in contrast with 5 cases of control group operated with conventional methods suggesting the higher efficacy of figure of 8 stitch reinforced with free parietal peritoneal patch over other conventional methods.

The difference in two groups was found to be statistically significant ($p < 0.05$). The anaemia-hypoproteinemia complex probably have played a role to some extent in the incidence of leakage from the operative site and the high morbidity rate due to septicemia, owing to the body's poor mechanism. One of the reasons probably was a late presentation of the patient to the hospital. This may in turn contribute to leakage due to septicemia.

Similarly, the 2 cases in study group were having pre-existing cardiac disease which complicated the post-operative risk on account of poor cardiac reserve and anaesthetic side effects as body's cardiac reserves were compromised to tolerate the surgical stress. Though the operative anastomosis was functional as demonstrated by normal passage of flatus, appearance of bowel sounds and passage of stools but still cardiovascular risk factors were responsible for failure of recovery in them. These patients expired for reasons not related to surgery or its complications.

In our study, study group developed superficial wound infections in 4 patients in contrast with control group where 5 patients developed superficial wound infections. The difference in the two groups was found to be statistically insignificant ($p > 0.05$). In the study group wound dehiscence/burst abdomen was seen in 2 patients whereas 3 patients in the control group had wound dehiscence /burst abdomen.

This is in accordance with the study conducted in 1970 by Sepaha et al, [10] in which 60 cases of enteric perforation were analyzed. One of the following operations were performed suturing with drainage, suturing without drainage, resection with drainage or suturing with omental patch, insertion of drain under local anaesthesia. Post operatively, 15% cases developed anastomotic leakage. In our study, out of 25 study cases who had been given the figure of 8 stitch reinforced with free parietal peritoneal patch, only 1 case developed anastomotic leakage as compared to 5 cases in the control group and there was no case who developed any intra-abdominal complication like abscess formation. The results of our study are in accordance with the study conducted for valuation of use of peritoneal patch in seromuscular defects of bowel with impending perforation following trauma or enteroclysis and in this study, free parietal peritoneal patch graft was used as an alternative to serosal patch repair or resection to cover the defects of colon, rectum, duodenum, or small bowel in 30 consecutive patients. Use of direct serosal patch was associated with anastomotic leakage, fistula

formation and adhesion formation whereas patients who were operated with peritoneal patch didn't develop any complications. All patients with free peritoneal patch graft recovered uneventfully with no untoward effects determined even after long term follow up [11].

The results of our study are further in accordance with the study conducted in Japan by Akira et. al to evaluate the use of free peritoneal patch on protection against intestinal tract anastomotic leakage in mongrel dogs weighing 8 to 10 kg. Free peritoneal patch taken from anterior abdominal wall was found to be effective in preventing anastomotic leakage of alimentary tract when applied with "smooth side out" than with "Smooth side in" [12].

Regarding the development of thrombosis, no such case in our study developed such complications. The patients were being examined for calf tenderness. This is in accordance with the study conducted by Salimi et al for inferior Vena Cava reconstruction using flap of parietal peritoneum. The specimens were completely endothelialized. No infection or other problem for example, thrombosis identified because the use of autologous material is associated with lower thrombosis rate and greater resistance to infection than prosthetic material [13].

In our study none of the cases developed adhesion formation in the study group as compared to 2 cases in the control group who were operated with conventional methods who developed adhesions marked by signs and symptoms of intestinal obstruction. One patient was managed conservatively whereas the other was re-explored who was found to have interloop adhesions. The results of our study with regards to Adhesion formation (obstruction) and thrombosis are in accordance with the study conducted for reconstruction of portal vein using parietal peritoneal patch. There was no evidence of thrombosis or adhesion formation or any other complications [14].

The free parietal peritoneum has also used as substitute for ureteral mucosa in ureteral avulsion during ureteroscopy, [15] in middle hepatic vein repair, in portal vein reconstruction, in inferior vena cava reconstruction, in patch urethroplasty in rabbits [13,14,16].

In the present study, out of 25 cases who were given figure of 8 stitch reinforced with free parietal peritoneal patch, only 1 of the 25 cases showed anastomotic leakage. There was no intra-abdominal complication like adhesion formation leading to obstruction. Incidence of intra-abdominal complication was nil. Hence the closure of gastrointestinal tract perforation with figure 8 stitch reinforced with free parietal peritoneal patch is highly successful with good results.

Conclusion

This study concluded that the reinforcement of free parietal peritoneal patch over figure of 8 suturing is effective method for the closure of gastrointestinal tract perforations, with early evidence of gastrointestinal motility with oral intake allowed on an average 4th - 5th postoperative day was significant statistical difference with regards to complications like anastomotic leakage. Hence the figure of 8 stitch reinforced with free parietal peritoneal patch is a simple and easy procedure with less hospital stay which does not require significant expertise and can even be performed in very short time by a trained general surgeon in a seriously ill patient in an emergency situation.

A plea is therefore made for the adoption of reinforcement of free parietal peritoneal patch over figure of 8 suturing for closure of gastrointestinal tract perforation as a routine.

References

1. Dorairajan LN, Gupta S, Deo SV, Chumber S, Sharma LK. Peritonitis in India – A decade's experience. *Trop Gastroenterol* 1995;16:33-8.
2. Jhobta RS, Attri AK, Kaushik R, Sharma R, Jhobta A. Spectrum of perforation peritonitis in India – Review of 504 consecutive cases. *World J Emerg Surg* 2006;1:26.
3. Coppolino et al.: Gastrointestinal perforation: ultrasonographic diagnosis. *Critical Ultrasound Journal* 2013 5(Suppl 1):S4.
4. Simmen HP, Heinzelmann M, Lariader F, Gastrointestinal Perforations *Indian Journal Surgery* 1991; 53: 189-93.
5. Eustache JM, Kreis DJ. Typhoid Perforation of the intestine. *Arch Surg* 1983 ; 118: 1269-71
6. Hugh TB (1990) Perforated peptic ulcer. In Schwartz S-Ellis HA, eds *Maingots Abdominal Operations*. (9th edtn) Appleton & Lange, Connecticut, USA. p: 627-645.
7. Adesunkanmi AR, Badmus TA (2006) Pattern of Antibiotic therapy and clinical outcome in acute generalized peritonitis in semi urban and rural Nigerians. *Chemo therapy* 52: 69-72.
8. Brownwell AW. Single layer open gastrointestinal anastomosis. *Ann. of Surgery*. 1967; 165: 925.
9. Singh B, Singh J. The Australian, New Zealand Jr. of Surg. 1975; 45: 102.
10. Sepaha GC, Khandekar JD, Chabra ML. Enteric Perforation : A study of 60 cases. *J.I.M.A.* 1970; 54 (12) : 558 -61.
11. Yin WY. Free peritoneal graft for repair of seromuscular defect of bowel: From experiment to clinical practice. 2005 : 125 : 3-8.
12. Akira Yaeta, Truhisa Nakamura, Keizosugimach and kiyoshi. Use of peritoneal patch in reinforcing alimentary tract anastomosis. *Surgery today* 2006; 56-63.
13. Salimi F, Hodjati H, Monabbati A, Keshavarzian A. Inferior vena cava reconstruction with a flap of parietal peritoneum : An Animal study. *Archives of Iranian Medicine*. 2009; 12 (5) : 448 -53.
14. Elsevier B.V. Reconstruction of Portal vein using peritoneal patch graft. *The American Journal of Surgery*. 2009 ; 181 [3] : 247-50.
15. Jing Yi Jeng, xiashujie, Sun Hongbin, Xu Yaoting, et al. *Journal of Endourology*. April 2008; 22 [4] : 729-34.
16. L. Nani, S valla science, G. Fadda, L. Perreli. *The Journal of urology* 2009; volume 165: 578-80.