

An Interventional Trial using Nasojejunal Tube for Early Enteral Feeding in Critically Ill Patients with Upper Gastro Intestinal Perforation Surgeries

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Abstract: *Background:* Nutritional support is very important during inflammatory and metabolic phase assisting in the improvement of the patient outcome after surgery. Any patient who is anticipated to have no or inadequate intake should be considered for nutritional support. Nutrition support plays important role in wound healing and post operative recovery of critically ill patients undergoing emergency gastro intestinal surgery. Hence the dictum “when the gut is working use it”. Enteral nutrition through naso jejunal tube is safe, convenient, cost-effective and route of access is very easy. In this study, we determine the benefits, safety and short-term effectiveness of early enteral feeding using naso jejunal tube in patients with upper GI perforations. *Methods:* Patients undergoing operative procedure for upper GI perforation in Department of General Surgery wards of Government Kilpauk Medical College Hospital, Chennai, matching the inclusion and exclusion criteria were included in this study. 50 patients were included in the study and divided into 2 groups: A Group-Early enteral feeding, B Group-Nil by mouth. The randomization of the two groups will be done based on double blinded technique. Observations are tabulated according to the pre designed proforma. *Results:* This interventional trial compared the outcome of enteral fed group and nil by mouth group. The results were analysed and compared with other studies in literature. The appearance of bowel sounds, passage of flatus and passage of stools was earlier in early enteral fed group. The risk of wound infection and post surgical leak was less and the nutritional status of the patients also improved in study group, with the added benefit of short hospital stay. *Conclusion:* By this study it is observed that early enteral feeding is beneficial over nil by mouth patients. The practice of early enteral feeding should be adopted to lower the complication rate and reduce the morbidity of the critically ill gastro intestinal perforation patients.

Keywords: Interventional trial, Early enteral feeding, Nasojejunal tube

1. Introduction

Nutrition support plays important role in wound healing and post operative recovery [1]. Malnutrition is associated with poor wound healing in post operative patients, in particular, in patients who are critically ill undergoing emergency gastro intestinal surgery. Thus nutritional support is more essential for them.

Conventional way of feeding is to keep the patient nil per mouth during the post operative days to improve patient compliance and to protect the anastomotic site. But most experts agree that when specialized nutritional support (SNS) (enteral or parenteral feeding) is required, enteral feeding is the most appropriate method as long as gastro intestinal tract is competent [2]. That is partly because enteral feeding can supply complex nutrients that parenteral nutrition cannot supply and has beneficial effects on gastro intestinal mucosa [1].

Malnutrition can be fatal among post surgical or critically ill patients [2]. In many of them the intestines are working. Hence the dictum “when the gut is working use it”. Enteral feeding is appropriate than parenteral feeding when there is no gastric outlet obstruction, delayed gastric emptying or elevated risk of aspiration. Naso gastric feeding is the least invasive form of enteral feeding. Naso jejunal tubes are preferred to duodenal tubes, because the latter still pose reasonable high risk for aspiration [3].

There are studies which have shown that early enteral feeds have a positive effect on gut motility and thus reducing post operative complication. Gastro intestinal perforation is one common surgical emergency seen in clinical practice. Following perforation repair practice of delayed introduction

of oral feeds is followed conventionally, which may delay the desired outcome of these post operative patients. So early feeding should be encouraged. In my study early enteral feeding using nasojejunal tubes following surgical repair for gastric/ duodenal perforation against traditional method of nil per mouth is adopted as an interventional trial and recovery of those patients were assessed.

Aim of the study

The aim of the study is to determine the benefits, safety and short-term effectiveness of early enteral feeding using nasojejunal tube in patients with upper gastrointestinal (GI) perforation.

Objectives

- 1) To compare the time of appearance of bowel sounds, early passage of flatus and motion.
- 2) To observe post surgical leak.
- 3) To compare duration of hospital stay and
- 4) To compare the change in nutritional status postoperatively by measuring serum total protein and serum albumin value between early enteral feeding group and conventional group.

2. Methodology

Study Design: Interventional trial.

Study Population: Patients undergoing operative procedure for upper GI perforation in Department of General Surgery wards of Government Kilpauk Medical College Hospital matching the inclusion and exclusion criteria were included in this study.

Study Period: 6 months.

Inclusion Criteria:

- 1) Patients undergoing emergency surgeries for upper GI perforation who are critically ill.
- 2) All those above 20 years of age.
- 3) Perforation of size > 1cm.
- 4) Suspected malignant perforations.
- 5) Duration of perforation > 24 hours.
- 6) Patients who are immune compromised.

Exclusion Criteria:

- 1) Patients of dementia, other serious medical/surgical disease.
- 2) Perforations those are traumatic or iatrogenic.
- 3) Patients operated outside and referred to our college.
- 4) Paediatric age group.
- 5) Patients with previous upper gastro intestinal surgery.

Sample Size: Sample size was determined based on the study = 50.

Description: $N = [(Z_{\alpha/2} + Z_{\beta})^2 \times \{ (p_1(1-p_1) + (p_2(1-p_2))) / (p_1-p_2)^2 \}]$

Where: N = sample size required in each group,

p_1 = proportion of patients discharged on 7th post op day in test group = 0.50%^{reference},

p_2 = proportion of patients discharged on 7th post op day in control group = 0.14%^{reference},

$Z_{\alpha/2}$: This depends on level of significance, for 5% this is 1.96

Z_{β} : This depends on power, for 80% this is 0.84

K= ratio of sample size for group 2 to group =1

$N_1=22, N_2=K \times N_1=22, 10\%$ attrition rate, each group sample is rounded off to 25.

Based on above formula the sample size required per group is 25. Hence total sample size required is 50^[4]. Analysed using chi square test (P value).

Selection of Study Subjects

Patients with age above 20 years in both sex presenting with upper GI perforation at Kilpauk Medical College Hospital, Chennai-10.

Data Collection

Data of patient details, history, signs and symptoms, biochemical parameters, Length of hospitalisation and patient's outcome were noted.

- **Method:** Interventional study.
- **Ethical Clearance:** Approval obtained.
- **Consent:** Informed and written consent from all the patients.
- **Conflict of Interest:** None.

Participants:

Patients above 20 years admitted for upper GI perforation with duration more than 24hours, critically ill and underwent

surgery at Kilpauk Medical College Hospital, Chennai where included in the study.

Materials Used: Nasojejunal tube.

Methodology: Patients undergoing operative procedure for upper GI perforation in Department of General Surgery wards of Government Kilpauk Medical College Hospital matching the inclusion and exclusion criteria were included in this study.

3. Material and Methods

Data collection were done in the study area after obtaining prior permission from the Professor and the Head of the Department, Department of General surgery and the Dean, Government Kilpauk Medical College and after approval of Institutional Ethical Committee.

Each participant was given a brief introduction about the study and informed consent is obtained from all participants. The information about the study was explained to the patient in their local language clearly till they understand.

Patients admitted in the general surgery ward who fulfilled both the inclusion and exclusion criteria were included in the study. A proforma was prepared to note the findings after getting informed consent, patients willing to be included in the study were enrolled and analyzed. About 50 patients included in the study were randomly divided into 2 groups each group containing of 25 patients.

Group A-Early enteral feeding. Group B-Nil by mouth.

Test Group:

It consisted of patients who underwent surgery for perforation and who were began early enteral feeding (24 hours after surgery) via nasojejunal feeding tubes placed intra operatively. The feeds were standardised for all patients and began a rate of 50ml/hour after 24 hours, followed by 75 ml, 100 ml, 150 ml, 200 ml till fifth day. Enteral feeding consisted of initially starting clear liquids such as tender coconut water, barley water at the rate of 50 ml/hour and if the patient tolerates then started on rice kanji.



Patient with Nasojejunal Tube NJ



Tube Position on X Ray

Feeding was withheld for six hours in instances with stomach distension, nausea, vomiting, abdominal pain and intolerance, which is then started at slower rates. If any of the above complaints still persists, the feed was stopped for 6 hours, then feeding given at slower rates and if necessary, antiemetic and prokinetic medications were administered. After removal of the nasogastric tube, patients began the same liquid diet orally.

Control Group:

It includes patients of perforation surgery kept "Nil by mouth" until bowel sounds and flatus passage occurred, which will be around POD 4-7 as traditionally performed. Once they passed flatus, patients began an oral liquid diet (the same diet as used with nasogastric feeds). Then the patient detail, relevant history, patient's clinical status, biochemical investigations done serially on admission, on POD 3 and POD 7 were recorded and outcomes of both the groups were compared.

Assessment made by:

- 1) Appearance of bowel sounds.
- 2) Early passage of flatus and motion.
- 3) Post surgical leak.
- 4) Wound infection.
- 5) Hospital stay.
- 6) Serum albumin (pre op/ POD-3/ POD-7).
- 7) Total Protein (pre op/ POD-3/ POD-7).

Method of Statistical Analysis

All the relevant data will be collected and entered in micro soft excel and master chart will be framed and the data will be double checked for any errors. The data will be entered and analyzed using Statistical package for social sciences (SPSS package).

Results on continuous variables will be presented on Mean SD.

Results on categorical variables are presented in percentage. (%)

Chi-square test will be used to find the significance of study parameters on categorical scale between two groups. Student 't' test will be used to determine the significance between two group means. All analyses are two tailed and $p < 0.05$ will be considered significant.

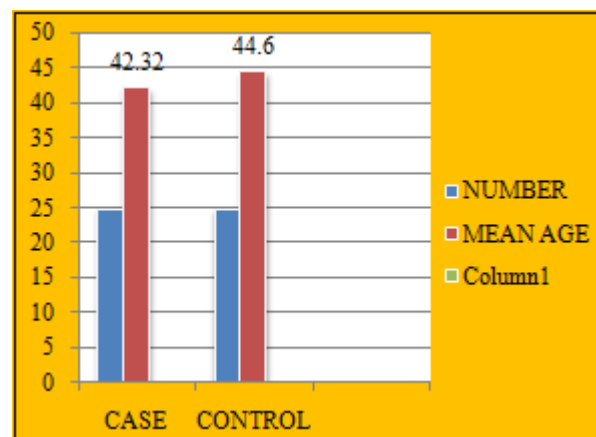
4. Results

Age Distribution

The total number of 50 patients included in our study, were divided in to 2 groups, each group containing 25 patients. This chart shows the age distribution in both the groups the mean age of the study group is 42.32 and the mean age of control group is 44.60 and the 2 groups were not statistically significant as the P value is 0.588.

Table 1

Age	Group	Mean	Standard Deviation	p Value
	Case	42.32	16.88	0.588
	Control	44.60	13.48	

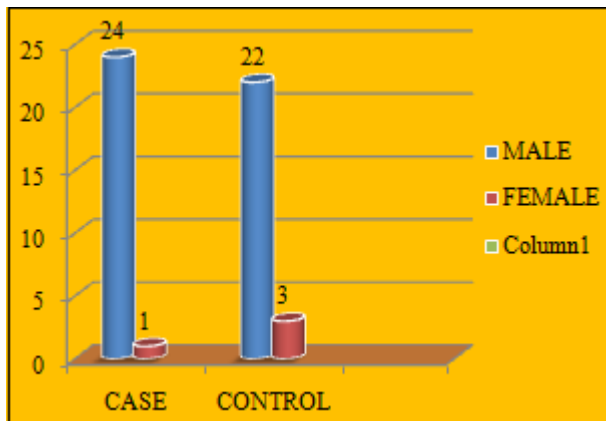


Sex Distribution

Out of total number of 50 patients, there are 4 females, 1 (4%) was started on early enteral feeding and 3 (12%) was on conventional feeding. Remaining 46 males study group had 24 (96%) patients and control group had 22 (88%) patients. The difference is not statistically significant as P value is 0.297.

Table 2: Sex Distribution

Sex	Case	Control	Total
Male	24 (96%)	22 (88%)	46 (92%)
Female	1 (4%)	3 (12%)	4 (8%)
Total	25 (100%)	25 (100%)	50 (100%)



Serial Comparision of Biochemical Parameters

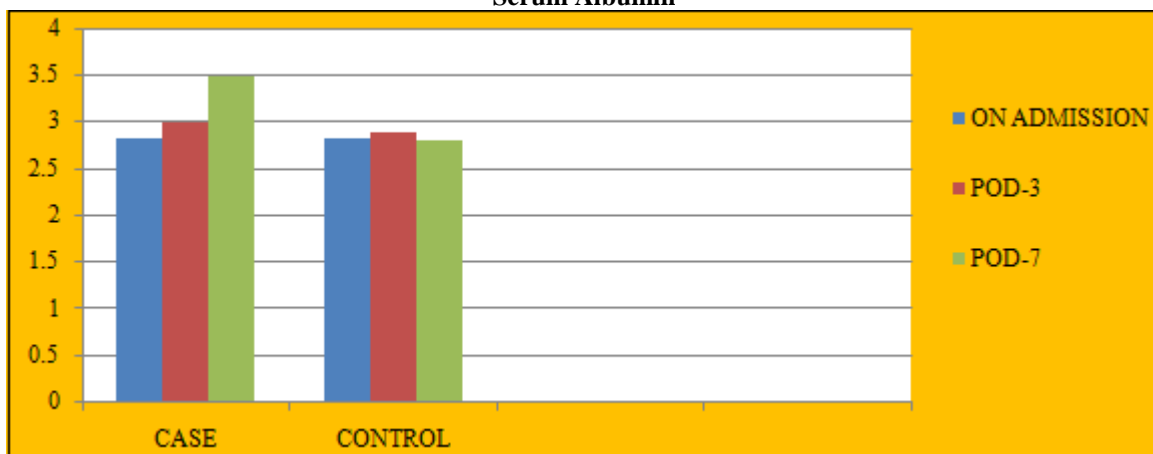
1) Serum Albumin

The mean serum albumin levels on admission among the patients started on early feeding were 2.82 gm/dl. On POD-3 the same was 2.99 gm/dl and by POD-7 it was 3.49 gm/dl. Among the control group the mean serum albumin level on admission was 2.83 gm/dl. On POD-3 it was 2.88 gm/dl and by POD-7 it was 2.79 gm/dl. The mean serum albumin on admission and on POD-3 does not show any significant difference ($P > 0.05$) among both groups. On POD-7 there is statistical significance as the P value < 0.05 .

Table 3: Serum Albumin

Serum Albumin	Group	Mean	Standard Deviation	P Value
On Admission	CASE	2.824	0.2538	0.914
	CONTROL	2.832	0.2688	
POD-3	CASE	2.992	0.3341	0.191
	CONTROL	2.880	0.2582	
POD-7	CASE	3.496	0.4087	0.000
	CONTROL	2.792	0.2737	

Serum Albumin



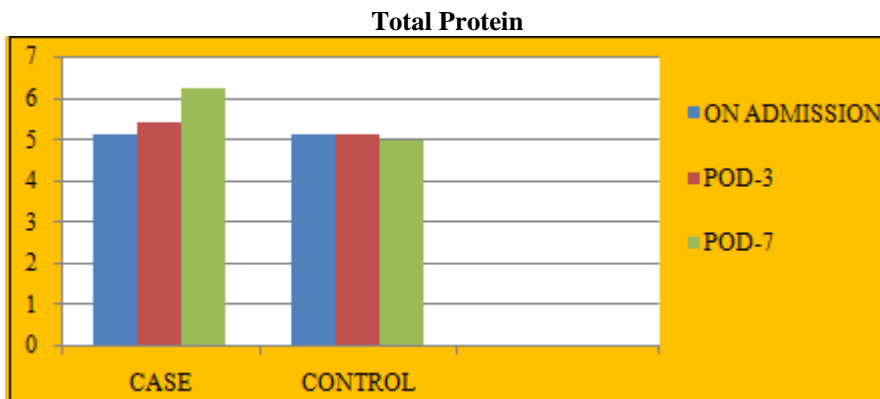
Serum Total Protein

The mean serum total protein levels on admission among the patients started on early feeding were 5.14 gm/dl. On POD-3 the same was 5.41 gm/dl and by POD-7 it was 6.27 gm/dl. Among the group B the mean serum total protein level on

admission was 5.12 gm/dl. On POD-3 it was 5.14 gm/dl and by POD-7 it was 5.0 gm/dl. The mean serum total protein on admission not showing significant difference ($P > 0.05$) among both groups. On POD-3 and POD-7 there is statistical significance as the P value is 0.02 and 0.00 respectively.

Table 4: Total Protein

Total Protein	Group	Mean	Standard Deviation	P Value
On Admission	CASE	5.144	0.4104	0.895
	CONTROL	5.128	0.4392	
POD-3	CASE	5.416	0.4723	0.028
	CONTROL	5.144	0.3720	
POD-7	CASE	6.272	0.6024	0.000
	CONTROL	5.008	0.4261	



Comparison of post operative findings

The patients among the study group had appearance of bowel sounds, passage of flatus on an average of 1 day prior and passage of stools 2 days prior to control group.

Table 5: Appearance of Bowel Sounds

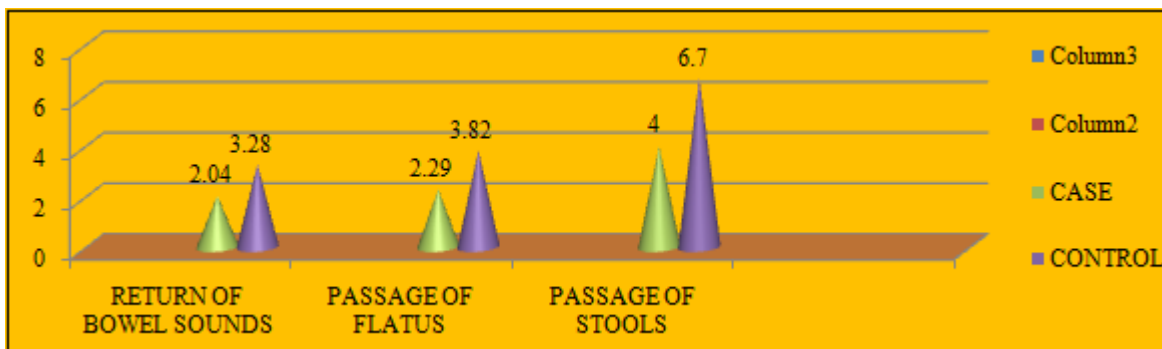
Appearance of Bowel Sounds	Group	Numbers	Mean	Standard Deviation	p Value
	Case	25	2.04	0.611	0.000
	Control	25	3.28	0.614	

Table 6: Passage of Flatus

Passage of Flatus	Group	Numbers	Mean	Standard Deviation	p-Value
	Case	24	2.29	0.464	0.000
	Control	23	3.82	0.790	

Table 7: Passage of Stools

Passage of Stools	Group	Numbers	Mean	SD	p-Value
	Case	24	4.00	0.722	0.000
	Control	23	6.70	1.020	



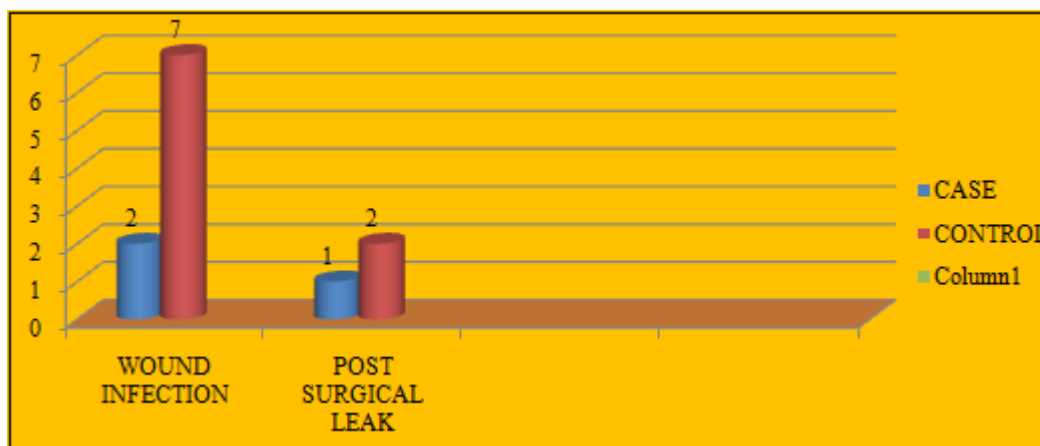
Comparison of Complications

Post Surgical Leak

Among the study group 1 patient (4%) and 2 patients (8%) in control group had post surgical leak.

Table 8: Post Operative Complications

Postoperative Complications	Case	Control	p-Value
Wound Infection	2 (8%)	7 (28%)	0.066
Post Surgical Leak	1 (4%)	2 (8%)	0.312
Mortality	1 (4%)	2 (8%)	0.552



Wound Infection

Among the study group 8% of them are with wound infection whereas among the control group 28% are with wound infection. This indicates there is significant reduction in complication among the early enteral feeders.

Comparison of Outcome

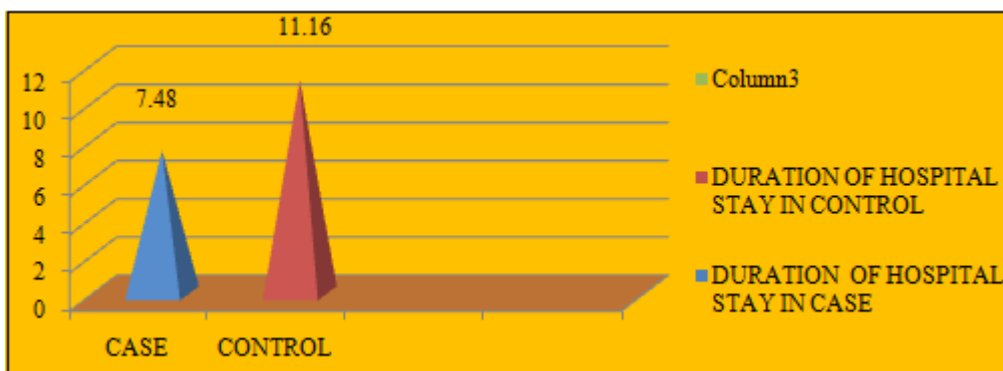
Duration of Hospital Stay

The average number of days of hospital stay in the patients initiated on early feeding was 7.4 days, whereas in the

control group was 11.1 days. Since the p value was 0.00 the difference between the two groups is statistically significant.

Table 9: Duration of Hospital Stay

Duration of hospital Stay	Group	Mean Days	Standard Deviation	p-Value
	Case	7.48	1.005	0.000
	Control	11.16	2.593	



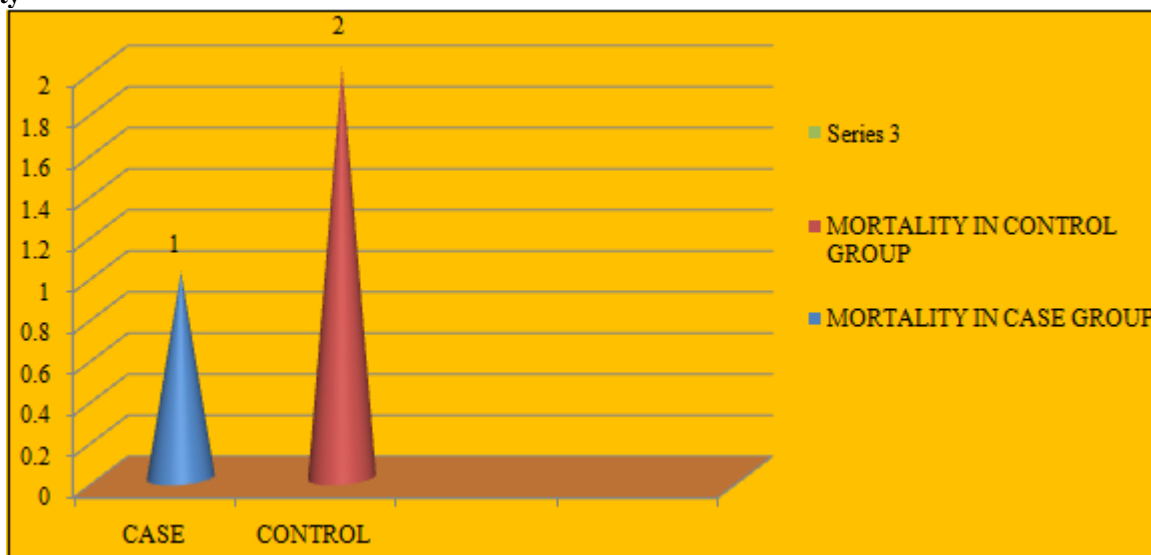
Mortality

The mortality among the study group is 4% and among the control group is 8% and thus there is no significant difference among both groups in mortality.

Table 10

Outcome	Case	Control	p-Value
Mortality	1 (4%)	2 (8%)	0.552

Mortality



5. Discussion

Nutritional support is useful during the inflammatory and the metabolic phase, assisting in the improvement of a patient’s outcome after surgery^[5].

The mean age of the participants in the study population was 42.32 and in control group is found to be 44.60 the difference between the groups was not statistically significant. Sex distribution among the both group were compared and about 4% in study group and 12% in control group were found to be females. While comparing the gender the p value was found to be 0.297 which shows that there is no statistical significance. The same findings have been observed in the study of Navneet kaur et al^[6].

Average time for return of bowel sounds was 2.04 in case group and 3.28 among control group and the difference is found to be significant (p value <0.05). Study by Marwah et

al^[7]. and Patbamiya NK et al^[4], Int. surg. J 2015, concluded the appearance of bowel sounds in study group was earlier as in our study.

In our study the mean time of passage of flatus post operatively was 2.29 days in study group and 3.38 among control group, and the p value < 0.05, hence statistically significant. Studies by Fanaie et al^[8] Marwah et al^[7] Tsunada et al^[9] revealed a statistical significance in mean time of passage of flatus. Thus early enteral feed reduces ileus and promotes colonic motility, in turn results in early passage of flatus and stools. In our study mean time of passage of stools was 4.00 and 6.70 in case and control group respectively, with p value <0.05 and hence the study is statistically significant.

Basse et al, about recovery after colonic resection yields that 95.5% of patients pass stools within 48 hours^[10]. According to Fanaie et al, mean time of passing stool was 3.9 in case

group and 4.4 days in control group [8]. Marwah et al, done study yields results as 2.28 among case and 3.92 among the control group in mean time of passing the stools [7].

In our study 2 (8%), in study group and 7 (28%) patients in control group had wound infection. The p value comes around 0.066 and is not a significant result.

Tsunda et al reported wound infection in control group and no wound infection in study group [9]. Marwah et al reported wound infection was more in control group when compared to the study group [7]. In our study 4 % of study population had post surgical leak, compared to 8% in control group with a p value of 0.312, which is not significant difference. Difronzo et al stated that instance of anastomotic leak was 1% in study group and no leak in control group [11].

In our study average days of hospital stay in study group is 7.48, while it was 11.16 in the control group. The difference in hospital stay was significant statistically. (p value 0.05). Lewis et al found post operative stay ranging from 6.2 to 14 days in early feeding and 6.8 to 19 days in control group [12].

In our study the mean serum albumin levels on admission among the patients started on early feeding were 2.82 gm/dl. On POD-3 the same was 2.99 gm/dl and by POD-7 it was 3.49 gm/dl. Among the control group the mean serum albumin level on admission was 2.83 gm/dl. On POD-3 it was 2.88 gm/dl and by POD-7 it was 2.79 gm/dl. The mean serum albumin: on admission and on POD-3 were not revealing any statistically significant difference ($P > 0.05$) among both groups. On POD-7 there is statistical significance as the P value < 0.05 .

In our study the mean serum total protein levels on admission among the patients started on early feeding were 5.14 gm/dl. On POD-3 the same was 5.41 gm/dl and by POD-7 it was 6.27 gm/dl. Among the group B the mean serum total protein level on admission was 5.12 gm/dl. On POD-3 it was 5.14 gm/dl and by POD-7 it was 5.0 gm/dl. The mean serum total protein on admission was not revealing any statistically significant difference ($P > 0.05$) among both groups. On POD-3 and POD-7 there is statistical significance as the P value is 0.02 and 0.00 respectively.

According to previous studies serum albumin levels are not the best to follow up the nutritional status in acute conditions [13]. Serum transferrin is a better indicator in acute conditions for nutritional status compared to serum albumin states Shetty et al [14].

The mortality among the study group is 4% and among the control group is 8% and thus there is no significant difference among both groups in mortality. Seung Hwan Lee et al study showed mortality of 3.9% in the study group and 12.3% in control group and his p value is significant (p value 0.031) [5].

6. Conclusion

Early enteral feeding after laparotomy for perforation is well tolerated.

Appearance of intestinal peristaltic sound is earlier in early enteral feeding group, which also leads to early passage of flatus and stools.

Mean albumin level on 7th post operative day is higher in early enteral feeding group.

Post operative major complications are evidently reduced in enteral fed group than in control group.

Mean duration of hospital stay is reduced in early enteral feeders due to less post operative pain, less complications and improvement in general well being.

Although the complication rates are lower in enteral fed group there is no significant reduction in mortality.

The practice of early enteral feeding should be adopted to reduce the treatment cost and lower the complication rate and reduces the morbidity of patients. Hence, early enteral feeding is safe, effective and feasible in post operative patients. Moreover further studies are needed with large sample size to support the above findings and to calculate the frequency, type and amount of feed to be given early post operative period.

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