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Research Article

Early enteral feeding by naso-enteric tube in patients with perforation peritonitis

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ABSTRACT

Background: This study was conducted to assess the feasibility, benefits and complications of early naso-enteral feeding in a patient undergone laparotomy for perforation peritonitis.
Methods: This is a randomized prospective study of one year duration. Patients were randomly put into Test Group (TG) and Control Group (CG). In test group naso-enteric tube was placed intra-operatively by nasal route and advances to duodenum or jejunum. This tube was used for feeding. Another ryles tube was also placed through other nostril in stomach (naso-gastric) for decompression. In post-operative period test group was started early enteral feeding (24 hours after surgery) via naso-enteral tube placed intra-operatively. Control group patients were managed with the conventional regimen of intravenous fluid administration and started oral feed once they passed flatus. The groups were compared for incidence of complications, biochemical measurements, nutritional status, duration of hospital stay and mortality.
Results: Thirty-seven (80.43%) patients well tolerated early naso-enteral feeding. In test group average time for appearance of bowel sounds, passage of flatus and passage of motion was 2.28 ± 0.68 days, 2.78 ± 0.59 days and 3.52 ± 0.69 days respectively while in control group it was 2.73 ± 1.06 days, 3.30 ± 1.40 days and 4.18 ± 1.74 days respectively. The difference was significant between two groups ($P < 0.05$). In our study, three (6.5%) patients had wound infection in test group while it is six (13.63%) in control group. Average hospital stay in test group was 8.54 ± 2.91 days while it was11.10 ± 3.40 days in control group ($P < 0.05$). Average Ryles tube aspirate was significantly lower in post-operative days in test group patients as compared to control group ($P < 0.05$). Average protein and calorie intake post-operatively was comparatively higher in test group as compare to control group patients and was found significant ($P < 0.05$).
Conclusions: Early post-operative naso-enteral feeding (24 hours after surgery) after laparotomy for perforation peritonitis is well tolerated, safe, effective in decreases septicemic and other complications and improved wound healing, leading to shorter hospital stay and beneficial to patients.

Keywords: Perforation, Peritonitis, Early feeding

INTRODUCTION

"To feed or not to feed" after laparotomy, is a research question posed by several randomized clinical trials. The traditional post-gastrointestinal surgical approach during which an intestinal anastomosis has been performed is to withhold enteral feed - that is, a period of starvation ("nil by mouth") for several days. Stomach is decompressed with a naso-gastric tube and intravenous fluids are given, starting with oral liquid to semi-solid and solid feeding

being introduced gradually as gastric dysmotility resolves.[1] Patients allowed orally only when there is evidence (passage of flatus or bowel movements) that postoperative ileus has been subsided. Rationale of keeping nil by mouth is to prevent postoperative nausea and vomiting and to protect the anastomosis, allowing it time to heal before being stressed by food.[2,3] It is, however, unclear whether deferral of enteral feeding is beneficial.

Pre-existing malnutrition has been shown to be a major clinical problem in surgical patients.[4] Malnutrition is associated with tissue wasting and impaired organ function, which leads to increased morbidity and extended hospitalization.[5,6]

Nutritional depletion is an independent determinant of serious complications after major gastro-intestinal surgery.[7]

Rationale of early feeding is that the postoperative dysmotility predominantly affects the stomach and colon, with the small bowel recovering normal function 4-6 hours after laparotomy.[1] Thus preserving small bowel peristaltic activity and absorptive capacity. Also ability of small bowel to withhold large quantity of upper GI secretions (approx. 3 lit/day) during the period of ileus is well tolerated.

Experimental data in both animals and humans suggest that enteral nutrition is associated with an improvement in wound healing.[8]

Enteral nutrition when compared with total parenteral nutrition is safe, convenient, cost-effective, prevents gastro-intestinal atrophy, attenuates injury stress response, maintains immune competence, preserves normal gut flora and gut integrity, and has minimal complications.

In this study, we performed a randomized trial to assess the feasibility, benefits and harms of early post-operative enteral feed.

METHODS

This randomized prospective study was conducted in a department of general surgery, Gandhi medical college Bhopal, Madhya Pradesh over period of August 2013 to August 2014. Patients who underwent operative procedure for perforation peritonitis were included in this study

Inclusion criteria

- All patients age 17-70 years undergoing exploratory laparotomy for non-traumatic perforation peritonitis.
- All emergency and routine surgeries.

Exclusion criteria

- Patients with dementia, diabetes, known case of pre-existing renal or hepatic disease or any past major medical/surgical illness.
- Traumatic or Iatrogenic perforations.
- Patients operated elsewhere and referred to our college.
- All malignant perforations.

A written informed consent was obtained from all participants in the study after explaining the consequences. Patients, who entered the study were randomly divided into two groups - Test Group (TG) and Control Group (CG).

Test group: It comprised of patients who underwent operative procedure for perforation peritonitis and who were started early enteral feeding (24 hours after surgery) via naso-enteric feeding tube, placed intra-operatively. The feeds were standardized for all patients, and started at rate of 50 ml/hour on day one followed by 80 ml, 100 ml, 150 ml, 200 ml on day two, three, four and five respectively. In case of abdominal distension, nausea, vomiting, abdominal cramps, severe diarrhea and intolerance, feeds were withheld for six hours and again re-started at slower rates. If any of the above still persists, feeds withheld for another six hours, then restarted at slower rates and some antiemetic and prokinetic drugs were prescribed if necessary. Patients were started same oral liquid diet (as used for naso-enteric feeds) after removal of naso-enteric feeding tube.

Control group: It comprised of patients who underwent operative procedure for perforation peritonitis and who were kept "Nil by mouth" till appearance of bowel sounds and passage of flatus as done routinely. Patients were started oral liquid diet (same diet as used for naso-enteric feeds) once they pass the motion.

Nutritional status

Nutritional status was documented by anthropometry. Weight (wt.) was measured by scales in kilograms. Mid-Arm Circumference (MAC) was measured with a non-stretchable plastic tape, measure around the non-dominant arm. A random sample was drawn and lymphocyte counts and haemoglobin was recorded pre-operatively. All these were also recorded on 3rd and 7th of post-operative day and the day of discharge.

Statistical analysis

All results were subjected to statistical analysis. Demographic and clinical data from the two groups were compared and intergroup differences among the parameters were recorded and were analyzed by analysis

of variance and the Student and Chi-squared tests. Student's t-test was used for intergroup analyses and the chi-squared test was used to analyze the level of significance or differences in the incidence of complications. A P value of less than 0.05 was considered statistically significant and P value of less than 0.001 was considered highly significant.

Feeding schedule

Feeding starts at 50 ml on day 1 and gradually increased to 80 ml, 100 ml, 150 ml, and 200 ml on day 2, 3, 4, & 5.

Table 1: Energy and protein contents[9] of standard feed.

Contents	Quantity	Energy (K.Cal)	Protein (grams)
Milk (Tonned)	550 ml	370	17.6
Cereals (Cooked dal)	4 Cup (Medium size)	400	28
Rice (Cooked)	2 Cup (Medium sized)	340	7.5
Hen eggs (Raw)	4 (Medium sized)	280	24
Protein powder	30 gm	105	9.6
Cerelac powder	50 gm	205	7.5
Fruit juice (Mixed)	300 ml	600	12
Sugar	30 gm	240	-------
Dextrose 50%	150 ml	300	-------
Plain water	-------	------	-------
Total		2840	106.2

Plain water is added to make the quantity to 2 litres.

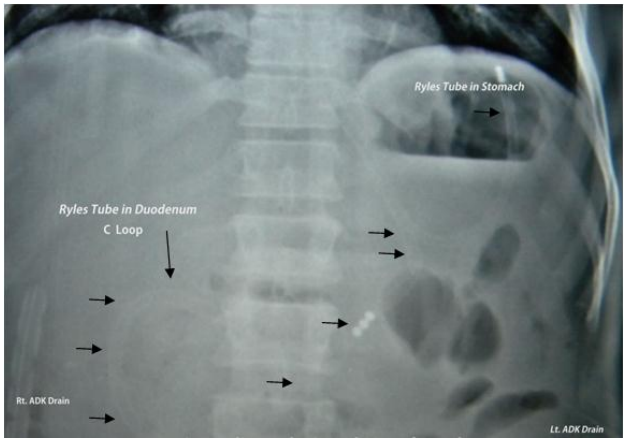

Figure 1: Naso-enteric feeding tube in duodenum 3rd part.

RESULTS

All patients were randomly divided into two groups - Test Group (TG; n=46) and Control Group (CG; n=44). The following observations were made:

Table 2: Age wise distribution of the cases in studied groups.

Age group	Test group (n=46)	Control group (n=44)
<20	2 4.3%	1 2.3%
20-29	10 21.7%	6 13.6%
30-39	6 13.0%	10 22.7%
40-49	11 23.9%	13 29.5%
>50	17 37.0%	14 31.8%
Mean ± SD	42.11 ± 15.15	42.45 ± 12.93

t=0.116; P >0.05

Majority of the cases were more than 50 years age in both groups. The difference in mean age was not statistically significant (P >0.05).

Table 3: Sex group cross tabulation.

Sex	Test group (n=46)	Control group (n=44)
M	42 91.3%	39 88.63%
F	4 8.7%	5 11.36%

χ^2=0.56; P >0.05

M:F ratio in test group was 10.5:1 as compared to 7.8:1 in control group. The difference was not statistically significant (χ^2=0.56; P >0.05).

Table 4: Site of perforation.

Site of perforation	Test group (n=46)	Control group (n=44)
Appendicular	1 2.2%	0 0.0%
Caecal	1 2.2%	1 2.3%
Duodenal	1 2.2%	0 .0%
Ileal	11 23.9%	14 31.8%
Ileal & caecal	1 2.2%	0 0.0%
Jejunal	0 0%	1 2.3%
Gastric	31 67.4%	28 63.6%

Majority In both groups, all pre-pyloric perforations underwent omentopexy. Among eleven ileal perforation,

eight underwent exteriorization of perforation to form loop ileostomy, two underwent primary repair with proximal loop ileostomy and one underwent resection anastomosis in test group while among fourteen in control group, eleven underwent exteriorization of perforation to form loop ileostomy, three underwent primary repair with proximal loop ileostomy. There were two gangrenous caecal perforations, one in each group, both underwent resection anastomosis. In test group, there were one appendicular perforation underwent appendicectomy, one duodenal perforation underwent primary closure, one multiple ileal and caecal perforation underwent resection anastomosis. In Control group, there was one jejunal perforation underwent primary closure.

Table 5: Duration of surgery.

Duration of surgery	Test group (n=46)	Control group (n=44)
<2 hour	33	29
2-3 hours	11	14
>3 hours	02	01
Mean ± SD	109.56 ± 33.59	112.21 ± 32.33

t=0.38; P >0.05

Average time taken for surgery in both group was not significant (P>0.05).

Table 6: Post-operative monitoring.

POD	Test group (n=46)					Control group (n=44)				
	Distension	Nausea/ vomiting	Appearance of bowel sounds	Passage of flatus	Passage of stool	Diste-nsion	Nausea and vomiting	Appearance of bowel sounds	Passage of flatus	Passage of stool
0	0	0	0	1	0	0	0	0	0	0
1	6	3	04	0	0	6	3	01	0	0
2	3	3	25	14	2	2	2	05	1	1
3	1	0	17	28	21	0	0	27	13	1
4	0	0	0	4	20	0	0	07	20	13
5	0	0	0	0	3	0	0	0	5	18
6	0	0	0	0	0	0	0	0	0	5
>6	0	0	0	0	0	0	0	0	0	1
Total	10	6	46	46	46	8	5	40	39	39
Mean ± SD			2.28±0.62	2.78±0.59	3.52±0.69			2.73±1.06	3.30±1.40	4.18±1.74

POD = Post-operative day

Abdominal distension

In test group, ten patients developed distension postoperatively and four required to with-hold feeding for 6 hours, and then feeds were restarted gradually. Among this four patients, two patients later-on again develop abdominal distension, and required further with-hold of feeds. Two patients also developed nausea, vomiting and abdominal cramps along with distension on post-op day 2nd, while one pt. developed abdominal cramp on Post-op day 1st.

In control group eight patients developed abdominal distension, six on 1st and two on 2nd post-op day respectively. One patient who developed abdominal distension on 2nd post-op day, later on also develop abdominal Collection and USG guided pus aspiration done. The difference in incidence of distension among the cases of both groups was not statistically significant (P >0.05).

Nausea/vomiting

The difference in incidence of nausea and vomiting in patients of both the groups was not significant (P >0.05).

Appearance of bowel sounds

Majority of patients in test group bowel sounds appeared on 2nd post-op day (n=25; 54.34%) while majority of patients in control group bowel sound appeared on 3rd post-op day (n=27; 61.4%). The difference was significant between two groups in average time for appearance of bowel sounds (P <0.05).

Passage of flatus

Majority of patients in test group passed flatus earlier than control group with mean duration to pass flatus was 2.78 ± 0.59 days in test group and 3.30 ± 1.40 days in control group. On statistical analysis, study group

patients passed flatus earlier than control group patients significantly (P <0.05).

Passage of stool

In study group, majority of patient i.e. twenty-one (45.7%) have passed stool on 3rd post-op day while in control group majority of patients i.e. eighteen (40.9%) passed stool on 5th post-op day.

Mean time for passage of stool was 3.52 ± 0.69 days in test group compared to 4.18 ± 1.74 days in control group. On statistical analysis, test group patients passed stool earlier than control group patients significantly (P <0.05).

Table 7: Postoperative complications.

Complications	Test group (n=46)	Control group (n=44)
Pneumonitis	4	3
Wound infection	3	6
Burst abdomen	4	3
Anastomotic leak	0	0
Abdominal abscess	1	3
Septicemia	5	12
Wound dehiscence	5	6
Re-intervention	5	6
Mortality	2	5

Pneumonia

Postoperatively pneumonitis was present in four (8.7%) patient in test group and three (6.9%) patients in control group.

Wound infection

Three (6.45%) patients in test group and six (13.63%) patients in control group developed wound infection.

Wound dehiscence and Burst abdomen

Five (10.75%) patients in test group develop wound dehiscence and four (8.6%) among them later converted to burst abdomen.

Similarly in control group, six (13.8%) patients developed wound dehiscence while three (6.9%) among them land-up in burst abdomen.

Abdominal abscess

One (2.17%) patient in test group developed high grade fever on 6th POD. Similarly in control group, three (6.8%) patients developed abdominal abscess, one on 4th and two on 6th post-operative day.

All patients were taped under USG guidance.

Septicemia

Five (10.85%) patients of test group developed septicemic complications, while twelve (27.24%) patients in control group developed septicemia.

Anastomotic leak

In both groups, there was no anastomotic leak.

Re-intervention

Five (10.85%) patients in test group and six (13.63%) patients in control group required re-intervention. Among five test group patients, four developed burst abdomen and one developed abdominal abscess. Among six control patients, three developed burst abdomen and three developed abdominal abscess.

Mortality

There were 2 (4.3%) mortalities recorded in test group while 5 (11.3%) mortalities were noted in control group. These findings were statistically not significant (P >0.05).

So, the incidences of complications in both groups were comparable, (χ^2=0.53; P >0.05) except septicemia load which was more in control group and found to be significant (P <0.05).

Table 8: Postoperative hospital stay.

Postoperative hospital stay (days)	Test group (No. of patients)	Control group (No. of patients)
6	03	01
7	24	04
8	04	08
9	04	05
10	02	05
>10	07	16
Total	44	39
Mean ± SD	8.54 ± 2.91	11.10 ± 3.40

t=3.69; P <0.001

Most of the patients i.e. twenty-four (52.17%) in test group were discharged by 7th post-operative day whereas only four (9.9%) patients in control group were discharged by 7th post-operative day. Average hospital stay in test group was 8.54 ± 2.91 days while it was 11.10 ± 3.40 days in control group. The difference in postoperative stay was significant (P <0.05).

Anthropometric measurements

All the anthropometric measurements were comparable and on statistical analysis found to be insignificant on various observational periods (P >0.05 for all).

Table 9: Comparison of average (Mean ± SD) hemoglobin levels on various observational periods.

Hb (gm/dl)	Test group	Control group	Significance
On admission	10.767 ± 1.1729	10.755 ± 1.0263	P >0.05
Day 3	10.617 ± 1.1092	10.715 ± 0.9399	P >0.05
Day 7	10.674 ± 1.0939	10.649 ± 0.9792	P >0.05
On discharge	10.583 ± 1.0657	10.569 ± 0.9761	P >0.05

Table 10: Comparison of average (Mean ± SD) total leukocyte counts on various observational periods.

TLC (gm/dl)	Test group	Control group	Significance
On admission	12682.61 ± 2851.534	13312.50 ± 2701.402	P >0.05
Day 3	10757.61 ± 1857.357	10476.92 ± 2454.047	P >0.05
Day 7	8534.78 ± 1365.645	8543.59 ± 1364.357	P >0.05
On discharge	7255.43 ± 1368.869	6961.54 ± 1079.380	P >0.05

Table 11: Comparison of average (Mean ± SD) weight on various observational periods.

Weight (kg)	Test group	Control group	Significance
On admission	52.30 ± 3.079	53.15 ± 3.890	P >0.05
Day 3	51.292 ± 3.107	51.34 ± 3.757	P >0.05
Day 7	50.291 ± 3.1162	49.303 ± 3.7560	P >0.05
On discharge	49.916 ± 3.1140	48.051 ± 3.7540	P >0.05

There was no significant difference in mean weight loss among both groups, but mean difference in weight loss is more in control group (5.099) as compared to test group (2.384 kg) patients.

Table 12: Comparison of average (Mean ± SD) mid arm circumference on various observational periods.

MAC (cm)	Test group	Control group	Significance
On admission	21.624 ± 3.3269	23.782 ± 2.4450	P >0.05
Day 3	21.537 ± 3.4600	23.782 ± 2.4450	P >0.05
Day 7	21.537 ± 3.4600	23.782 ± 2.4450	P >0.05
On discharge	21.548 ± 3.4427	23.782 ± 2.4450	P >0.05

Table 13: Ryle's tube aspiration - Comparison of average (Mean ± SD) Ryle's tube aspiration on various observational periods.

Average Ryles tube aspiration (ml)			
POD	**Test group**	**Control group**	**Significance**
Day 1	727.83 ± 198.896	814.65 ± 170.982	P <0.05
Day 2	470.22 ± 189.976	595.48 ± 166.209	P <0.05
Day 3	274.13 ± 124.035	373.75 ± 167.327	P <0.05
Day 4	108.05 ± 57.586	135.50 ± 74.694	P <0.05
Day 5	51.76 ± 7.276	65.77 ± 23.353	P <0.05

On statistical analysis, Ryle's tube aspiration of test group patients is lower than control group patients significantly on all post-op days (P <0.05 for all).

Table 14: Protein intake - Comparison of average (Mean ± SD) protein intake on various observational periods.

Average protein intake (gm)			
POD	**Test group**	**Control group**	**Significance**
Day 1	27.18 ± 3.731	00 ± 0.0	P <0.05
Day 2	32.98 ± 3.879	00 ± 0.0	P <0.05
Day 3	38.84 ± 5.162	00 ± 0.0	P <0.05
Day 4	45.59 ± 6.673	00 ± 0.0	P <0.05
Day 5	51.74 ± 9.337	25.08 ± 8.260	P <0.05
Day 6	57.57 ± 11.230	29.23 ± 8.034	P <0.05
Day 7	62.43 ± 13.163	34.85 ± 7.271	P <0.05

Protein intake was higher in test group from 1st to 7th post-operative day of monitoring and was found to be highly significant (P <0.05 for all days).

Table 15: Calories intake - Comparison of average (Mean ± SD) calories intake on various observational periods.

Average energy intake (K.Cal)			
POD	**Test group**	**Control group**	**Significance**
Day 1	913.48 ± 81.055	559.07 ± 66.469	P<0.05
Day 2	1082.39 ± 138.999	568.57 ± 81.587	P<0.05
Day 3	1298.91 ± 190.732	590.00 ± 108.131	P<0.05
Day 4	1516.74 ± 252.596	603.85 ± 160.749	P<0.05
Day 5	1725.43 ± 248.978	838.21 ± 231.436	P<0.05
Day 6	1858.26 ± 237.770	1096.41 ± 192.073	P<0.05
Day 7	1977.39 ± 305.566	1277.69 ± 177.074	P<0.05

Calories intake was higher in test group from 1st to 7th post-operative day of monitoring and was found to be highly significant (P <0.05 for all days).

DISCUSSION

There is no evidence that bowel rest and a period of starvation are beneficial for healing of wounds and anastomotic integrity. Early feeding has shown to reduce the length of hospital stay, anastomotic dehiscence, wound infection, pneumonia, weight loss and intra-abdominal abscesses.[1,10-14]

Most of the clinical trials show the effect of early feeding on elective intestinal anastomosis.[13,15-18] Only few studies of early feeding were conducted in perforation peritonitis[19,20] where patients had additional problems of dehydration, high septicemic load (which even may persist few days after surgery) and may involve multiple organ dysfunctions.

Here, we conducted a prospective randomized controlled trial comparing safety, benefits and incidence of postoperative complications among patients having early naso-enteric tube feeding versus traditional feeding in perforation peritonitis.

The statistical analysis of various pre, post and intra-operative variables of the patients belonging to two groups is as following:

Age

Age of patients ranged from 18-70 years in test group with a mean of 42.11 ± 15.15 years and 18-66 years in the control group with mean of 42.45 ± 12.93 years.

According to Kaur et al.[19] the mean age was 36.16 (14.61) in test and 35.76 (14.94) in control group.

In a study by Fanaie et al.[21] mean age in study group was 66.45 years and it was 63.44 years in control group.

In our study, mean age of patients was less as compared to most of the studies. The reason is that in our study, none of the patients had malignancy or any other chronic illness (as these patients were excluded from our study)

Sex

Forty-two (91.3%) patients were male and four (8.7%) patients were female in study group. Thirty-nine (88.63%) patients were male and five (11.36%) patients were female in control group. Male and female ratio was 10.5:1 in study group as compared to 7.8:1 in control group.

A study by Kaur et al.[19] included 42 (84%) males and 8 (16%) females in test group (M:F ratio = 5.25:1) and 37 (74%) males and 13 (26%) females in control group (M:F ratio = 2.84:1).

Fanaie et al.[21] included 55 patients in each group. In study group 31 (56.36%) males and 24 (43.64%) females the ratio was 1.29:1 compared to 38 (69.1%) males and 17 (30.9% ratio 2.23:1) females in study group.

In our study, M:F ratio was higher comparative to other studies because most of the studies had taken malignant diseases which might have different sex predilections for different malignancies, but the incidence of perforation peritonitis is higher in males, even significantly more in males in central india. Also, worldwide, gastric perforations have high incidence in males, which forms the bulk of our study.

Time taken for surgery

Average time taken to complete surgery in study group was 109.56 ± 33.59 minutes and in control group was 112.21 ± 32.33 minutes. There was no any significant difference between the average time taken for surgery in both group (P >0.05)

Tsunada et al.[22] performed study average time taken in study group to perform surgery was 185 minutes (155-250) compared to control group in which time taken was 175 minutes (140-260).

According to Marwah et al.[17] duration of surgery ranged from 70-220 minutes (Mean 106 ± 42 minutes) in study group and 80-280 minutes (Mean 128 ± 36 minutes).

The incidence of complications was more in both groups, where duration of surgery was more than two hours as compared to less than two hours. Prolonged surgeries leads to more exposure of anesthetic gases, drugs, more handling of gut, increased blood loss and prolonged postoperative ileus.

As shown in our and other studies, increased duration of surgery increased postoperative morbidity but had no impact on tolerance of early enteral feeding.

Postoperative monitoring

All patients in study and control group were postoperatively monitored for nausea, vomiting, abdominal distension, passage of flatus and stool, postoperative stay and complications.

Early feeding tolerance

The tolerance was defined as patients receiving regular naso-enteric diet without developing any complications like distension, nausea, vomiting, and cramps, which need feeds to be stopped temporarily.

In test group, ten patients developed distension post-operatively and four among ten required to with-hold feeding for 6 hours, and then feeds were restarted gradually. Three other patients also developed nausea, vomiting and abdominal cramps. Two patients pulled their Ryles tube in between the feeds.

So after excluding these patients (46-9=37), the tolerance was 80.43%.

Kaur et al.[19] started naso-enteric feeding 24 hours after surgery and tube tolerance was found to be 78%.

Basse et al.[23] started oral feeding within 6 hours and tolerance was more than 90%.

According to Marwah et al.[17] the tolerance to enteral feeding after 6 hours of surgery was 88%.

Tolerance was low in patients who were fed within 4 hours after surgery.[16] Various studies[13,17,19] indicate that tolerance to feeding was 73-90% if feeding was started 6 hours after surgery. Tolerance to early feeds given 24 hours after surgery in our study is safe and well tolerated as comparable to previous studies.

Nausea and vomiting

Six (13.04%) among test and five (11.3%) patients of control group developed nausea/vomiting, the difference in incidence was not significant (P >0.05).

Stewart et al.[16] reported incidence of nausea and vomiting of 35% in study group. The increased incidence of vomiting might be because of much early feeding started 4hrs after surgery.

Lewis et al.[13] noted that incidence of nausea and vomiting after early feeding was 21% in study and 13% in control group.

Marwah et al.[17] shows nausea and vomiting in 12% of study group and 8% of control group.

The incidence of nausea and vomiting in patients started early feeding after surgery was 9.7-35% as shown by several studies and 13.04% in our study. The incidence of nausea and vomiting in control group was 8-15% in various studies and 11.3% in our study. The incidence of vomiting was more in patients who were fed early. The vomiting was due to residual effect of anesthetic gases, partial recovery of intestines and effect of drugs used postoperatively.

Appearance of bowel sounds

Average time for appearance of bowel sounds was 2.28 ± 0.62 and 2.73 ± 1.06 days in test and control group, and found to be significant (P <0.05).

In study by Marwah et al.,[17] bowel sounds appeared in significantly shorter period of time in study group mean 1.08 ± 0.6 days as compared to control group mean 2.12 ± 0.6 days.

Fanaie et al.[21] concluded that appearance of bowel sounds among two groups were similar.

After surgery, return of bowel sounds and motility usually occurs after 6-12 hours in small bowel, 12-24 hours in the stomach, and 48-72 hours in the colon.

Physiologic studies have found that, myoelectric and motor activities were not affected in operations of intestine involving resection of small and large intestines. Bowel sounds appeared earlier in patients who were fed early because of resolution of postoperative ileus and earlier appearance of bowel sounds.

Passage of flatus

Mean time to pass flatus was 2.78 ± 0.59 days and 3.30 ± 1.40 days in study and control group respectively. On statistical analysis study group passed flatus earlier than control group significantly (P <0.05).

Tsunoda et al.[22] concluded that mean days to pass flatus was 2 days in study group compared to 2.8 days in control group.

A study by Fanaie et al.[21] resulted in 1.7 days mean to pass flatus in study group and 2.4 days in control group.

According to study by Marwah et al.[17] mean time for passage of flatus was 1.32 ± 0.55 days in study group and 2.76 ± 0.87 days in control group.

The early feeding resulted in earlier resolution of gastric, small intestinal ileus and colonic dysmotility leading to earlier passage of flatus and stool.

Passage of stool

Mean time for passage of stool was 3.52 ± 0.69 days in study group compared to 4.18 ± 1.74 days in control group. On statistical analysis, study group passed stool earlier than control group significantly (P <0.05).

Basse et al.[23] conducted study in which 57 (95.5%) patients passed stool within 48 hours.

According to Fanaie et al.[21] the mean time to pass stool was 3.9 days in study group and 4.4 days in control group.

Marwah et al.[17] conducted study in which mean time to pass stool was 2.28 ± 0.89 days in study group compared to 3.92 ± 0.90 days in control group.

Small intestinal motility followed by gastric motility has been shown to return earlier than colonic motility. Majority of the patients, who were fed earlier, tolerated the gradual (increase in liquid volume) dietary advancement.

Postoperative morbidity

Wound infection

In our study, three (6.5%) in study group while six (13.63%) patients in control group develop wound infection.

The results of meta-analysis of 11 studies by Lewis et al.[13] have also shown that incidence of wound infection was 3-30% in study groups and 2-47% in control groups although not significantly less in early fed group.

Tsunada et al.[22] reported 7.5% wound infection in control group while there was no wound infection in study group.

The wound infection according to Marwah et al.[17] was 12% in study group and 20% in control group.

The wound sepsis was more in control group compared to test group and more so where time taken for surgery was more than 2 hours. Increased permeability and bacterial translocation being associated with sepsis and systemic inflammation in patients undergoing laparotomy. Early postoperative enteral feeding might have a beneficial effect on the function of the intestinal barrier in respect of permeability, bacterial translocation and subsequent development of septic complications.[25]

Anastomotic leak

In our study no anastomotic leak was noted in either group.

According to Tsunoda et al.[22] anastomotic leak was 7.5% in study group. There was no anastomotic leak in control group.

A study by Reissman et al.[18] there was single anastomotic leak in control group.

There were two anastomotic leaks in study by Basse et al.[23]

According to Petrelli et al.[24] the incidence of anastomotic dehiscence was 2.25%.

An analysis by Lewis et al.[13] the difference in both groups was not significant.

Difronzo et al.[15] stated that the incidence of anastomotic leak was 1% in study group and there was no anastomotic leak in control group.

Various studies show lesser anastomotic leaks in study group as compared to control group but most of these studies were on intestinal anastomosis. In our study, pure resection anastomosis was done only in four cases (three in test and one in control group) while majority of patients have underwent omentopexy and primary repair with/without stoma formation. Also, there was no anastomotic leak in control group; therefore the effect of early feeding on anastomosis cannot be commented in our study.

Although improved nutritional status might cause lesser wound sepsis, lesser anastomotic leak and better wound healing as noted in various other studies.

Other complications

Pneumonia, septicemia, intra-abdominal abscess, wound dehiscence, burst abdomen, and re-intervention occurred in both groups and statistically there was no significant difference in both groups.

In our study, all patients had undergone emergency laparotomy (as compared to elective surgeries in various studies), and emergency surgeries are also associated with complications like dehydration, and sepsis which may cause more complications and increased morbidity.

By comparing both groups in our study and other studies, the incidence of complications in both groups was similar and early feeding is safe regarding postoperative complications.

Nutritional status

Hemoglobin, weight, mid-arm circumference, and total leukocyte counts were comparable in both groups, and found to be insignificant on the day of admission and 1st, 3rd, 7th, post-operative day, and the day of discharge.

Average difference of weight loss is less in test group as compared to control group and found to be significant (P >0.05).

Average protein intake on post-op day 1, 4, and 7 were 27.18 ± 3.731, 45.59 ± 6.673, and 62.43 ± 13.163 in test while no protein supplemented on day 1 and 4 and it was 34.85 ± 7.271 on day 7 (once oral started) in control group.

Similarly average calorie intake on post-op day 1, 4, and 7 were 913.48 ± 81.055, 1516.74 ± 252.596, and 1977.39 ± 305.566 in test while 559.07 ± 66.469, 603.85 ± 160.749, and 1277.69 ± 177.074 in control group.

Both protein and energy intake were found significantly more in test group from day 1 onwards till 7th post-operative day.

These results were comparable to Kaur et al.[19] and Singh et al.[20]

Ryles tube aspiration

The mean Ryle's tube aspiration in test group was significantly less as compared to control group (P <0.05).

Similar results were found by Kaur et al.[19] and Singh et al.[20] in their study.

Decreased Ryle's tube aspirates in test group were probably due to early return of bowel movements leading to distal passage of bile by early resolution of post-operative ileus.

Postoperative stay

Average hospital stay in test group was 8.54 ± 2.91 days while it was 11.10 ± 3.40 days in control group. The difference in postoperative stay was significant (P <0.05).

Lewis et al13 found postoperative stay ranging from 6.2-14 days in early feeding groups and 6.8-19 days in control groups in meta-analysis of 13 randomized controlled trials.

According to Tsunada et al.[22] postoperative stay in study group was 7 days (7-40) as compared to control group it was 10 days (8-48 days).

The postoperative hospital stay in study by Marwah et al.[17] was 5.8 ± 3.09 days in study group and 10.56 ± 7.01 days in control group.

In our study, the postoperative stay was shorter in test group comparing to control group as shown by others. It was due to the fact that early feeding helps in early bowel movements, faster recovery, less post-operative complications leading to early discharge from the hospital.

CONCLUSION

Our study revealed that early post-operative naso-enteral feeding (24 hours after surgery) after laparotomy for perforation peritonitis is well tolerated, helps in resolution of ileus by early appearance of bowel sounds, which also leads to early passage of flatus and motion and decreased Ryles tube aspirate post operatively. It also decreases septicemic and other complications and improved wound healing, leading to shorter hospital stay despite of dehydration and high septicemic load pre-operatively in these patients.

Hence it is concluded that early naso-enteral feeding after laparotomy for perforation peritonitis is safe, effective and beneficial to patients. However, larger, prospective and randomized trials are needed to establish the facts observed in the present as well as previous studies.

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REFERENCES

1. Carr SC, Eddie L, Bouloss P. Randomized trial of safety and efficacy of immediate postoperative enteral feeding in patients undergoing gastrointestinal anastomosis. BMJ. 1996;312:869-71.
2. Meltvedt R, Ben Knecht. Nasogastric suction necessary after elective colon resection. Am J Surg. 1995;149:620-2.
3. Michael G. Mythen. Postoperative gastrointestinal tract dysfunction. Anesth Analg. 2005;100:196-202.
4. Hill GL, Pickford I, Young GA. Malnutrition in surgical patients: an unrecognised problem. Lancet. 1977;1:689-92.
5. Giner M. In 1995 a correlation still exists between malnutrition and poor outcome in critically ill patients. Nutrition. 1996;12:23-9.
6. Pennington C. Review article: artificial nutritional support for improved patient care. Aliment Pharmacol Ther. 1995;9:471-81.
7. Hulsewe KW, Von Meyenfeldt MF, Soeters PB. Nutrition support for the surgical patient. In: Payne-James J, Grimple G, Silk D, eds. Artificial Nutritional Support in Clinical Practice. London: Greenwich Medical; 2014: 605-616.
8. Braga M, Gianotti L, Gentilini O. Early postoperative enteral nutrition improves gut oxygenation and reduces costs compared with total parenteral nutrition. Crit Care Med. 2001;29:242-8.
9. Park K. Energy and protein contents. In: Park K, eds. Textbook of Preventive and Social Medicine. 18th ed. Jabalpur, India: M/s Banarsidas Bhanot; 2005: 438-486.
10. Keele AM, Bray MJ, Emery PW. Two phases randomised controlled clinical trial of postoperative oral dietary supplements in surgical patients. Gut. 1997;40:393-9.
11. Beier-Holgersen R, Boesby S. Influence of post-operative enteral nutrition on post-surgical infections. Gut. 1996;39:833-5.
12. Silk DBA, Green CJ. Perioperative nutrition: parenteral versus enteral. Curr Opin Clin Nutr Metab Care. 1998;i:21.
13. Lewis SJ, Egger M, Sylvester PA, Thomas S. Early enteral feeding versus "nil by mouth" after gastrointestinal surgery: systematic review and meta-analysis of controlled trials. BMJ. 2001;323:773-6.
14. Andersen HK, Lewis SJ, Thomas S. Early enteral nutrition within 24 hours of colorectal surgery versus later commencement of feeding for postoperative complications. Cochrane Database Syst Rev. 2006;(4):CD0040080.
15. Difronzo LA, Yamin N, Patel K. Benefits of early feeding and early hospital discharge in elderly patients undergoing open colon resection. J Am Coll Surg. 2003;197:747-52.
16. Stewart BT, Woods RJ, Collopy BT, Fimk RJ. Early enteral feeding after elective colorectal resection: a prospective randomized trial. Aust NZJ Surg. 1998;68:25-8.
17. Marwah S, Godara S, Goyal R. Early enteral nutrition following gastrointestinal anastomosis. Internet J Gastroenterol. 2008;7:1-5.
18. Reissman P, Tiong AT, Stephan M, Teoh TA, Cohen SH, Weiss EG, et al. Is early feeding safe after elective colorectal surgery? Ann Surg. 1995;222:73-7.
19. Navneet Kaur, Manish K. Gupta, Vivek Ratan Minocha. Early enteral feeding by naso-enteric tubes in patients with perforation peritonitis. World J Surg. 2005;29:1023-8.
20. Singh G, Ram RP, Khanna SK. Early postoperative enteral feeding in patients with nontraumatic intestinal perforation and peritonitis. J Am Coll Surg. 1998;134:142-6.
21. Fanaie SA, Ziaer SA. Safety of early oral feeding after gastrointestinal anastomosis. Indian J Surg. 2005;67:185-8.
22. Tsunada A, Shibusawa M, Takata M. Early oral feeding should resume following the resolution of gastric ileus. Hepato Gastroenterol. 2005;52:775-9.
23. Basse L, Jakobson DH, Billesbolle P, Werner M, Kehlet H. A clinical pathway accelerates recovery after colonic resection. Ann Surg. 2000;232:51-7.
24. Petrelli NJ, Cheng C, Drishall D. Early postoperative oral feeding after colectomy: an analysis of factors that may predict failure. Ann Surg Oncol. 2001;8:796-800.
25. Jemison RA, Kay AW, Ledingham IM, Mackay C. Early postoperative enteral feeding. In: Jemison RA, Kay AW, Ledingham IM, Mackay C, eds. Textbook of Surgical Physiology. 3rd ed. New York: Churchill Livingston; 1978: 254-255.

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