

**EARLY ENTERAL FEEDING AND DELAYED ENTERAL FEEDING- A COMPARATIVE STUDY**

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**ABSTRACT**

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**BACKGROUND**

Nutrients form the fuel for the body, which comes in the form of carbohydrates, proteins and lipids. The body is intended to burn fuels in order to perform work. Starvation with malnutrition affects the postoperative patients and patients with acute pancreatitis. There is an increased risk of nosocomial infections and a delay in the wound healing may be noted. They are more prone for respiratory tract infections. Enteral Nutrition (EN) delivers nutrition to the body through gastrointestinal tract. This also includes the oral feeding. This study will review the administration, rationale and assess the pros and cons associated with the early initiation of enteral feeding.

The aim of this study is to evaluate if early commencement of enteral nutrition compared to traditional management (delayed enteral feeding) is associated with fewer complications and improved outcome-

- In patients undergoing elective/emergency gastrointestinal surgery.
- In patients with acute pancreatitis.

It is also used to determine whether a period of starvation (nil by mouth) after gastrointestinal surgery or in the early days of acute pancreatitis is beneficial in terms of specific outcomes.

**MATERIALS AND METHODS**

A prospective cohort interventional study was conducted using 100 patients from July 2012 to November 2012. Patients satisfying the inclusion and exclusion criteria were included in the study. Patients admitted in my unit for GIT surgeries or acute pancreatitis constituted the test group, while patients admitted in other units for similar disease processes constituted the control group.

**RESULTS**

Our study concluded that early enteral feeding resulted in reduced incidence of surgical site infections. When the decreased length of stay, shorter convalescent period and the lesser post-interventional fatigue were taken into account, early enteral feeding has a definite cost benefit.

**CONCLUSION**

Early enteral feeding was beneficial associated with fewer complications and was cost-effective in the study.

**KEYWORDS**

Early Enteral Feeding, Gastrointestinal (GIT) Surgeries, Acute Pancreatitis.

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**BACKGROUND**

The human body is a well-oiled machine intended to burn fuel in order to perform work.

Starvation can adversely affect patients admitted in the surgical wards more so in the postoperative patients and patients with acute pancreatitis. Those who are kept nil by mouth for extended periods or have not begun eating by 14

days postoperatively have a significantly higher mortality rate than those who receive nutrition support very early. This coupled with the fact that malnutrition prevailed among many of the patients admitted in our tertiary health center (most of them belonging to the lower socioeconomic status), the ramifications of these are overbearing. They eventually lead to a poor outcome. Worldwide studies show that 30% to 50% of hospitalised patients are malnourished, a condition associated with longer hospital stays, higher costs and increased morbidity and mortality. Patients with malignancies, chronic heart failure or in an immunocompromised state are at particularly high risk. Suppressed immune function can increase risk for nosocomial infections and delayed wound healing.<sup>1,2</sup> Decreased muscle function can lead to reduced cardiac function and greater difficulty in weaning patients from

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ventilators. It can also increase susceptibility to respiratory tract infection.<sup>3</sup> Appropriate use of nutritional support can greatly benefit patients in the surgical wards.

Enteral Nutrition (EN) means using the GIT to deliver nutrition to the body. In the strictest of the definitions, this means that tubes are used at some level in the gastrointestinal tract for feeding the patient. In this study, oral feeding is also incorporated in the definition as in the broader sense this route also uses the gastrointestinal tract for nutrition. This study will review the administration, rationale and assess the pros and cons associated with the early initiation of enteral feeding.

**MATERIALS AND METHODS**

The following study was conducted in Kilpauk Medical College and Hospital. It is a prospective cohort interventional study. The source of the study being patients admitted in general surgery for either gastrointestinal surgeries or acute pancreatitis. The period of longitudinal observation was from July 2012 to November 2012. Inclusion and exclusion criteria were drawn up and only those patients satisfying both these criteria were included in the study. Patients admitted in our unit for GIT surgeries or acute pancreatitis constituted the test group, while patients admitted in other units for similar disease processes constituted the control group. The sample size of the study was fixed at 100, the breakdown of which is as follows-

- Test Group (TG)- Patients were pooled from my unit (25 patients undergoing GIT surgeries + 25 patients diagnosed with acute pancreatitis).
- Control Group (CG)- Patients were pooled from neighbouring units (25 patients undergoing GIT surgeries + 25 patients diagnosed with acute pancreatitis).

**Criteria for Patients Undergoing Gastrointestinal Surgeries-**

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Patients undergoing gastrointestinal surgery.</li> <li>• 12 years or older.</li> <li>• Informed written consent.</li> </ul>	<ul style="list-style-type: none"> <li>• Relaparotomies.</li> <li>• Patients with renal failure.</li> </ul>

**Criteria for Patients with Acute Pancreatitis-**

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Diagnosis of acute pancreatitis.</li> <li>• Informed written consent.</li> <li>• 12 years or older.</li> </ul>	<ul style="list-style-type: none"> <li>• &gt;48 hours of the onset of symptoms.</li> <li>• Severe, chronic pancreatitis.</li> <li>• Post-ERCP pancreatitis.</li> <li>• Pregnancy, malignancy, patients with renal failure.</li> </ul>

**Data Collection**

Patients admitted in the General Surgery who fulfilled both the inclusion and exclusion criteria were included in the study. A proforma was prepared to record the findings. The

patients and the attenders were explained about the study and informed written consent was sought from all of them.

In the test group with patients undergoing GIT surgeries, enteral feeds were started within 24 hours of the procedure. On the first postoperative day, nasogastric feeding was initiated with clear liquids at the rate of 30 mL/hr., around 200 mL of this feed was continued. Clear liquids consisted of tender coconut water and barley water. Subsequently, the proposed diet was started in these patients at the rate of 30 mL/hr. Around 500 mL of this diet was fed intermittently. The diet proposed by the nutritionist was that of a "rice congee." This was found to have many advantages. It was accepted by all the patients, it was easy to prepare and it was cost-effective. Moreover, the scarcity of fat in this preparation makes it ideal to be used among patients with acute pancreatitis.

Starting from the second postoperative day in patients with nasogastric tube and who had volitional control, the tube was removed and patients were fed orally. The same diet was continued, albeit at a rate of 60 mL/hr. around 1500 mL of diet was given on the second day. Subsequently, the patients were switched on to an acute special diet, the details of which are given in the table.

In the patients with acute pancreatitis within the test group, a similar protocol was followed. For the first two days, nasogastric feeding was initiated with the "rice congee" diet and subsequently switched over to oral feeds at first with the same diet and later with an acute special diet.

In the control subjects, oral/nasogastric feeding was initiated after the initial period of postoperative ileus in the postop patients or after the period of paralytic ileus in the case of patients with acute pancreatitis. The resolution of the ileus was defined as the return of bowel movements without abdominal distension or vomiting. This was ascertained both subjectively (passage of flatus) and objectively (return of bowel sounds on auscultation).

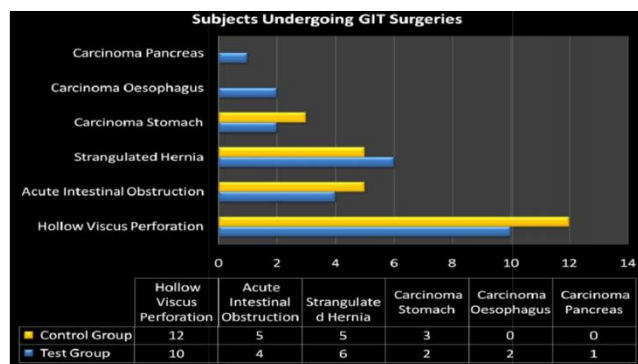
A note to be made here is that in all the test group subjects, adequate hydration was maintained with intravenous fluids after subtracting the fluid intake through the diet; while in the control subjects, fluids were given based on the weight of the patient.

For the postoperative patients, examination and dressing of the surgical wound was done for the first time on the second postoperative day. Sutures if any were removed by the tenth POD. A single dose of antibiotic was administered for the elective cases 30 minutes before the time of induction, while a course of antibiotics were given for the emergency cases, as most of them had frank peritonitis. No antibiotics were given for the patients with acute pancreatitis.

**RESULTS**

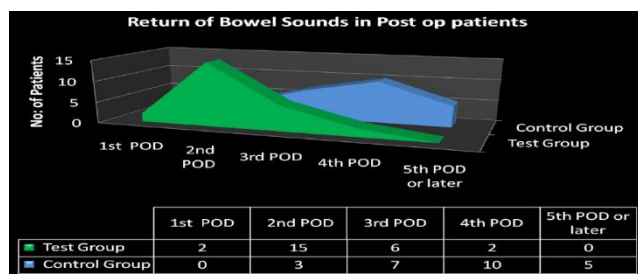
All the relevant data were collected and analysed using SPSS (Statistical Package for Social Sciences) V.20. Independent 't' test and Chi-square test were calculated for analysis of the data. A 'p' value of <0.05 was regarded as a significant test value while 'p' >0.05 was considered not significant.

The average age of the patients undergoing GIT surgeries was 33.2 in the test group and 33.4 in the control group. The average age of the patients with acute pancreatitis was 38 in the test group and 37.8 in the control group.

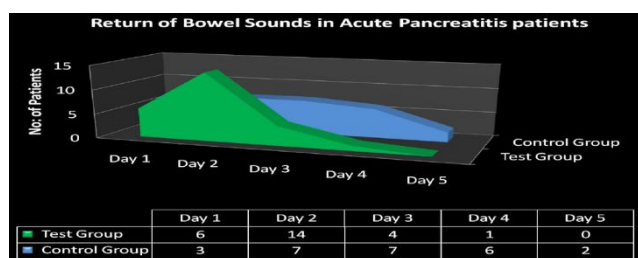


**Graph 1. Breakdown of Patients Undergoing GIT Surgeries**

The most common cause for GIT surgeries (besides acute appendicitis, which was excluded from the study) was hollow viscous perforation. Acute intestinal obstruction and strangulated hernia were the other common causes. Both the test and control groups were comparable in the distribution of the disease process,  $p = 0.04$ .



**Graph 2. Return of Bowel Sounds in Patients Undergoing GIT Surgeries**



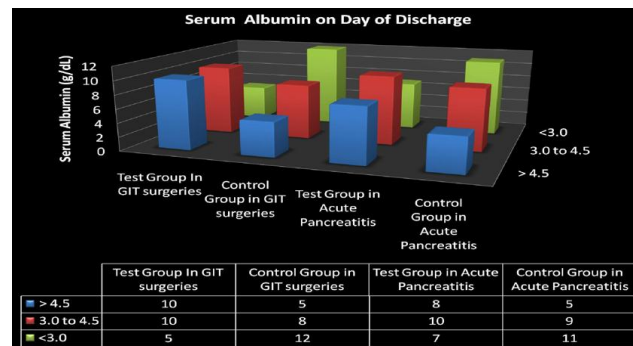
**Graph 3. Return of Bowel Sounds in Patients with Acute Pancreatitis**

Bowel sounds returned between second and third POD among the test group patients undergoing GIT surgeries; mean was 2.3 days ( $p=0.03$ ). Among the control group, it was between third and fourth POD; mean = 3.4 days, ( $p=0.02$ ).

In patients with acute pancreatitis, mean return of bowel sounds was 1.8 days in the test group ( $p=0.02$ ); among the control group, mean was 2.9 days ( $p=0.01$ ).

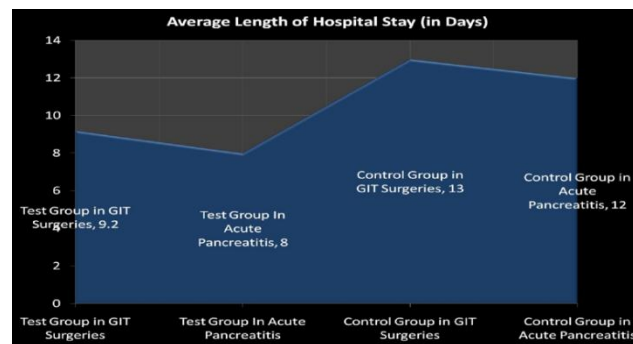
**Serum Albumin**

Serum albumin is a useful indicator of acute changes. In fact, the 30-day risk of mortality is often gauged by the serum albumin level. In the study, serum albumin was measured at the time of admission on the fifth post-intervention day and at the time of discharge.



**Graph 4. Serum Albumin on Day of Discharge**

The test group patients in both GIT surgeries and acute pancreatitis and higher serum albumin levels on the day of discharge when compared with control group. The graph depicted below substantiates it. The values were statistically significant.



**Graph 5. Length of Hospital Stay**

The average length of stay in the test group in GIT surgeries was 9.2 days while in its control group, it was 13 days ( $p=0.03$ ). The average length of stay in patients with acute pancreatitis was 8 days in the test group and 12 days in its control group ( $p=0.02$ ).

**DISCUSSION**

For a long time, the functional status of the gastrointestinal tract was assessed in the surgical wards by the onset of bowel movements. The traditional teaching was "don't flog the tired horse"; comparing the adynamic bowel to an overworked stressed horse. As long as paralytic ileus persisted and the patient had not passed flatus, it was considered ideal to keep him nil by mouth. But this concept, like several others in the management of patients with acute pancreatitis and those in the postoperative period is more empirical than evidence based.

### Causality Dilemma of Paralytic Ileus

The traditional method of initiation of enteral nutrition was to begin when the bowel movements have started or the patient had passed flatus. Patients were maintained on dextrose-containing IV fluids and kept NPO for up to 7 days until evidence of bowel function returned. But, collective data suggests that the presence of bowel sounds and the passage of flatus or stool are not absolute prerequisites for initiation of enteral nutrition. In fact in this study, the mean return of bowel sounds in the test group undergoing GIT surgeries was 2.32 days (control group - 3.4 days) while among the patients with acute pancreatitis it was 1.8 days (control group - 2.9 days), both achieved statistical significance. This brings us to a causality dilemma - "which situation leads on to the other? Should enteral feeding be delayed until the bowel starts functioning or does early feeding cause the bowel to resume its function normally?." Clearly, the results in the study show that early enteral feeding does at some level hasten the normal bowel function.<sup>4</sup>

A point that must be stressed at this juncture is that an ileus must be distinguished from more ominous conditions such as an obstruction. A prolonged ileus maybe the result of intraabdominal pathology.

Western literature is repleted with studies that show that healthy patients without malnutrition undergoing uncomplicated surgery can tolerate 10 days of partial starvation (i.e., maintenance intravenous fluids only) before any clinically significant protein catabolism occurs. But, in a public health system in a developing nation like ours, malnutrition is the norm. Patients are more often than not are undernourished and present in a late stage of the disease process. Earlier nutritional intervention is likely indicated in these patients with poorer preoperative/pre-interventional nutritional reserves. The attempt here is to decrease the amount of catabolism and protein breakdown, something that cannot be certainly don't with delayed initiation of feeding. The basic feature is that with enteral feeding the liver gets the first pass at the nutrients and thus promotes appropriate and economic processing of proteins.

### Protecting the Anastomosis the 'Wrong Way'

A very frequent argument for delayed initiation of enteral feeding is that a newly constructed anastomosis must be rested before food passes through it.

But, it must be reiterated that the gut secretes and reabsorbs approximately 7L fluid irrespective of oral intake; so "protecting the anastomosis" is based on a false premise. The anastomosis remains secure and is not put to any increased risk of leakage with early enteral feeding. This is aptly made out in the study where not a single case of anastomotic dehiscence occurred in the test group. Moreover, when EN is compared with parenteral nutrition, it has additional benefits such as-

- Preventing gastrointestinal mucosal atrophy,
- Attenuating the injury stress response,
- Preserving the normal gut flora, and

- Preventing microbial translocation from the gut to the blood stream by its specific trophic effects.<sup>5</sup>

Furthermore studies have delineated that the prompt administration of nutrition enterally promotes the restoration of GI mucosa integrity in malnourished patients. This is because with TPN, the GI mucosa continues to be permeable in spite of the nutritional status improving. As opposed to the prevalent notion, early enteral feeding is both well tolerated and decreases the rate of post-intervention complications significantly. It minimises the risk of undernutrition and can nullify the hypermetabolic response seen after surgery. Hence, the consensus now is that in malnourished patients in the surgical wards, enteral feeding is ideal if they have a functioning GI tract.

### Shortening the Convalescent Period

The shorter the recovery period of the patient in the hospital, the better it is. This was definitely the case in this study were Length of Stay (LOS) in the hospital<sup>6,7</sup> was comparatively less among the test group. Moreover, the days to return to normal diet was also less among the test groups. These patients also had a greater weight gain and lesser post-interventional fatigue when compared with the control group. All this equates into a shorter convalescent period and a healthier patient on the day of discharge.

### Cost Effectiveness and Cost Benefit

Since parenteral feeds were not included in the study, the actual cost effectiveness could not be compared. Nevertheless, the average cost of the enteral feeds per day was around 65 rupees. This is in stark contrast to parenteral formulas, which cost around 2000 rupees per feed.

When the decreased length of stay, shorter convalescent period and the lesser post-interventional fatigue were taken into account, early enteral feeding has a definite cost benefit.<sup>8</sup>

### CONCLUSION

Early enteral feeding was beneficial, associated with fewer complications and was cost effective in this study.

Nutrition is now regarded as a medical intervention and this was aptly personified by Thomas Edison - the doctor of the future will no longer treat the human frame with drugs, but rather will cure and prevent disease with nutrition. If the gut works, use it. This is the theory behind early enteral feeding.

### Future Recommendations

Certain core investigations that would throw a better light on the effect of early enteral feeding could not be done because of their non-availability. For instance, serum pre-albumin is a better indicator for acute changes in the nutritional status of the surgical patients. Similarly, serum transferrin is quite useful in assessing the patients. Twenty-four hour nitrogen balance can be calculated only if urine urea nitrogen concentration can be measured.

Formula feeds are nearly non-existent in our hospital. Only blended modular diets were used in these studies, which were made from easily available food materials. The formal introduction of commercially available formula feeds into our hospital system could help us better control the nutritional requirements of the patient.  
Food for thought- Feed the food early.

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