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RESEARCH ARTICLE

RECONSTRUCTION AFTER TOTAL GASTRECTOMY: RATIONALE FOR HUNT LAWRENCE J POUCH RECONSTRUCTION

***[1]Shaukat Jeelani, [2]Umer Mushtaq, [2]Ishfaq Ahmad Gilkar, [2]Javid Ahmad Peerzada and [2]Varun Dogra**

[1]Professor and Head Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India
[2]Senior Resident, Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India

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ABSTRACT

Background: The main categories of reconstruction following total gastrectomy are restoration of intestinal continuity without preservation of the duodenal food passage (Roux-en-Y oesophagojujunostomy) and restoration of intestinal continuity with preservation of the duodenal passage. Operations in either category may be combined with the construction of an enteric pouch or gastric reservoir to simulate the reservoir function of the normal, intact stomach. Methodology: The study included 20 patients, who underwent total gastrectomy with Hunt-Lawrence J–pouch reconstruction. In each patient postprandial symptoms, food intake in single meal (intake capacity),body weight, serum nutritional parameters viz. Serum total protein, serum albumin, serum cholesterol were evaluated. The follow up period was for 6 months and the patients were interviewed, examined periodically viz after 1 week of discharge from hospital, at the end of 1 month and at the end of 6 months. Results: The mean age of patients included in our study was 63 years. Postoperative follow up presented an improving trend in the mean haemoglobin values, 9.93±0.633 g/dl, 10.655±0.75 g/dl, 10.63±0.91 g/dl at the end of first week, first month and 6 months respectively. Preoperative mean serum albumin was 2.96±0.415 g/dl and post-operative mean serum albumin values were 2.51±0.566 g/dl, 2.835±0.752 g/dl, 3.24±0.392 g/dl at the end of first week, first month and 6 months respectively. The mean body weight preoperatively was 62.4±9.213 kilograms and the mean body weight ratio calculated on the follow up was 93.37±0.0388 %, 95.80±0.0313%, 97.95±0.0487% respectively. Conclusion: The findings of this study show that Hunt Lawrence reconstruction offers cancer patients an acceptable reconstructional method after total gastrectomy. The advantages of the pouch reconstruction: diminishing of postoperative symptoms, improvement in eating capacity, decreased postoperative weight loss and better postoperative nutrition.

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INTRODUCTION

Globally, gastric cancer is the fourth most common cancer type and second leading cause of cancer death. In Asia and Europe gastric cancer remains the leading cause of cancer death. The estimated 5 year survival rate is 27% up from about 15 % in 1975. More than 90 per cent of gastric cancers have been reported to be adenocarcinomas (95%), the remainder being predominantly non Hodgkin´s lymphomas (4%) or leiomyosarcomas (1%) (Fuchs, 1995). The incidence of adenocarcinoma of the gastro-oesophageal junction and gastric cardia has increased at a rate exceeding that of any other cancer, including melanoma and cancer of the lung (Fuchs, 1995). The intestinal type of carcinoma has decreased compared with the diffuse type (Kampschöer, 1989 and Laurén, 1993).

***Corresponding author: Shaukat Jeelani,**
Professor and head Department of Surgery, Government Medical College Srinagar, Jammu and Kashmir, India.

These epidemiological changes, despite the overall decline in the incidence of the disease and the fact that an increasing proportion of early lesions are found, underline the increasing need for total gastrectomy compared with gastric resection. Descriptions of probable gastric carcinoma specimens date as far back as themillennium between 500 BC and 500 AD, but the story of gastric carcinomamay be said to start with Theodor Billroth´s first successful gastric resection forcarcinoma in 1881 (Billroth, 1881). This was inJanuary 1881, when he excised an obstructing carcinoma of the pylorus andperformed a gastroduodenostomy (Henley, 1953). This was the first Billroth Ioperation. The Billroth II operation i.e. gastric resection with gastrojejunostomywas introduced in 1883. The first total gastrectomy was probably that performed by Connerin Cincinnati, but the patient succumbed (Conner, 1887). Total gastrectomywas first successfully performed by Schlatter in Switzerland in 1897 (Schlatter, 1897). The operative mortality in total gastrectomy was very high until the 1940s, whenthe introduction of antibiotics, blood replacement,

and improved anaestheticand surgical techniques helped to reduce the immediate surgical death rate.During this period total gastrectomy was proposed as routine treatment for allresectable carcinomas of the stomach. The approach was subsequentlyabandoned, however, since improved survival rates could not be demonstratedand operative mortality and the incidence of adverse side effects continued tobe greater than after subtotal resection (ReMine, 1952). Untilthe 1980s, total gastrectomy was used infrequently and was performed only inhighly selected cases (Inberg, 1981). Intestinal reconstruction after total gastrectomy was for the mostpart initially performed by suturing the oesophagus to the duodenum or to theloop of jejunum. The inevitable problem of regurgitation was solved with theadoption of Roux-en-Y oesophagojejunostomy in 1909 (Ikard, 1989). After the first successful total gastrectomy in 1897 Schlatter reconstructed thealimentary tract continuity by an end-to-side oesophagojejunostomy (Schlatter, 1897). Many of the early pioneers of total gastrectomy employedoesophagoduodenostomy (Waugh, 1953), or performed a loopoesophagojejunostomy (Ikard, 1989). There are more than 50 described operations for intestinalreconstruction following total gastrectomy (Lykidakis, 1981 and Lawrence, 1996). The major concern after total gastrectomy relates to the integrity of theoesophageal anastomosis. The main categories of reconstruction following total gastrectomy arerestoration of intestinal continuity without preservation of the duodenal foodpassage (Roux-en-Y oesophagojujunostomy) and restoration of intestinalcontinuity with preservation of the duodenal passage (jejunal interposition). Operations in either category may be combined with the construction of anenteric pouch or gastric reservoir to simulate the reservoir function of the normal, intact stomach.

Consequences of total gastrectomy

Malnutrition, assessed in terms of weight loss, has been regarded as the most frequent complication after total gastrectomy (Adams, 1967). On one hand postgastrectomy postoperative symptoms like early satiety, dumping and anorexia may reduce amount of ingested food and cause malnutrition (Adams, 1967; Olbe, 1987; Sategna-Guidetti, 1989). On the other hand total gastrectomy causes many defects and disorders in digestive physiology. Digestion and absorption of nutrients is altered in many different mechanisms. Grinding of foodstuffs, and mixing with digestive enzymes is changed. Timing in secretion of bile and digestive enzymes is altered, gastric reservoir function is lost, hormonal and nervous regulation of the gastrointestinal canal is disturbed.

Post-gastrectomy syndromes; these include: jejunal distension, dumping syndrome, dysphagia, reflux, diarrhoea and anorexia. Hunt (1952) reported the results of his 7 patients with a food pouch made of a segment of jejunum (Hunt, 1952). He made a 15-cm-long pouch and the duodenal contents were diverted by an end-to-side Roux-en-Y technique. No leaks were seen at the site of anastomosis and he believed that the pouchprovided facilities for balanced diet, diverted the duodenal contents and lowered the incidence of reflux oesophagitis. In 1952 Longmire reported on his attempt in November 1944 to form a gastric reservoir by longitudinally splitting the complete antimesenteric wall of the jejunum loop (Longmire, 1993). Scott (1968) was among the first to report on metabolic and clinicalconsequences of pouch reconstruction after total gastrectomy (Scott, 1968). In a series of twenty-two patients, with 8 long-term survivors living from 3 to 5 years after the operation, most ate only three meals a day and normal quantities of food could be ingested by each. The weight gain was good except in one case, coefficients of fat absorption ranged from 78 to 98 per cent, serum carotene and cholesterol were within normal range. The rationale behind reconstruction after total gastrectomy is to prevent and minimise post gastrectomy disorders and more than 50 types of reconstruction procedures have been tried to minimise the symptoms.

Aims and Objectives

The study addressed the following issues:

- Mortality of the procedure.
- Postoperative course or morbidity.
- Does pouch reconstruction increase patients eating capacity?
- What is the effect of pouch reconstruction on postoperative weight and nutrition?
- What is the operative time?
- How long is the hospital stay?

Inclusion Criteria

- Early proximal gastric cancers (oesophago-gastric, cardiac, tumours of the body)
- Diffuse infiltrating cancers (linitis plastica)

Exclusion Criteria

- Advanced (stage IV disease)
- Absolute contraindication to anaesthesia.

MATERIALS AND METHODS

The study was conducted in Government Medical College, Srinagar, in the department of General Surgery. The study was prospective observational and included 20 patients, who underwent total gastectomy with Hunt-Lawrence J –pouch reconstruction between May 2014 to May 2016. All the patients with esophago-gastroduodenosopy and histology proven carcinomas involving proximal or whole of the stomach were included. All the patients were made to go through an extensive procedure of history taking, clinical examinations, baseline investigations. Metastasis was ruled out beforehand by clinical examination, chest radiographs, abdominal USG and CECT abdomen/pelvis, operative exploration of the abdomen. Each patient was evaluated and optimised for medical comorbidities preoperatively. In each patient postprandial symptoms, food intake in single meal (intake capacity),body weight, serum nutritional parameters viz. Serum total protein, serum albumin, serum cholesterol were evaluated. The patients were explained the procedure they were taken for. The follow up period was for 6 months and the patients were interviewed, examined periodically viz after 1 week of discharge from hospital, at the end of 1 month and at the end of 6 months. Postoperatively, post prandial symptoms were considered present when experienced atleast once in a month immediately preceeding the interview. The volume of the food intake in single meal (eating capacity) was expressed as a percent of normal pre-illness level and

classified into grades viz. <50%, 50% to 80% , >80%. Body weight change expressed in body weight ratio. Serum nutritional parameters included total protein, serum albumin, total cholesterol.

Operative Technique

The indication for total gastrectomy was 1) a proximal upper-third gastrictumour or 2) a distal gastric tumour when the carcinoma was of diffuse typeaccording to the classification of Lauren (Laurén 1965). In all patients thetumour was located in the cardia or fundus. Total gastrectomy together with modified D 2 lymphadenectomy was performed.After radical gastrectomy and D2 lymphadenectomy the patientswere considered for jejunal pouch reconstruction. In all patients the jejunum was divided 20 cm below theligament of Treitz. A 15-cm-long jejunal pouch was made from distal portion of the jejunum, brought up retrocolic and plicated to proximal efferent limb and held in place by traction sutures. At the mid portion of the plicated limbs a stab was made parallel in both limbs over antimesenteric borders in each limb and hand sewn anastomosis with absorbable suture (polygalactin) was created. Care was taken to leave a gap wide enough to admit index finger between the proximal end of the anastomosis in the folded or plicated loop to avoid any vascular supply of the jejunal wall at the site to be used to fashion esophago-J pouch anastomosis. After inspection for the hemostasis of the anastomotic lines for hemostasis hand sewn esophago-J pouch anastomosis was created. After this end to side esophago-jejunostomy the distal end of the loop was closed. Anastomotic integrity was checked by saline injection through a naso-oesophageal tube. The Roux-en-Y end-to side anastomosis was made 50 cm distally from the oesophagojejunalanastomosis. The duration of the operation and intraoperative blood loss wererecorded. Feeding via feeding jejunostomy was started on second post operative day. The anastomosis was checked on day 7 by a swallow of contrast medium and enteral feeding wasstarted unless leakage was observed. Leakage was considered clinicallysignificant when radiological leakage was accompanied by fever andleukocytosis. The postoperative complications and hospital stay were recorded.The study protocol was approved by the ethics committee of Government Medical College, Srinagar and informed consent was obtained from each patient.After discharge from hospital the patients were seen at the outpatient clinic commencing one week after the discharge from hospital, at one month interval and six-month interval until two years.

RESULTS

This study was conducted in the department of general surgery, S.M.H.S. hospital, as associated hospital of Govt. Medical College Srinagar and included 20 patients. The results obtained were subjected to statistical analysis and following observations were made. The mean age of patients included in our study was 63 years with a standard deviation of 7.3 and the minimum and maximum age of 53years and 77 years respectively.

Table 1. Distribution of patients as per age

Age(years)	No. Of patients	Percentage
50-59	6	30
60-69	9	45
70-79	5	25

The total number of male and female patients included in the study were 15(75%), 5(25%).

Table 2. Distribution of patients as per gender

Gender	Number of patients	Percentage
Male	15	75
Female	5	25

The study included various nutritional parameters to follow in the patients who underwent the Hunt-Lawrence J pouch reconstruction after total gastrectomy for gastric cancers viz Haemoglobin values, serum total protein , serum albumin , serum total cholesterol. The mean haemoglobin value in these patients was 8.65±1.3 g/dl preoperatively. Postoperative follow up presented an improving trend in the mean haemoglobin values, 9.93±0.633 g/dl, 10.655±0.75 g/dl, 10.63±0.91 g/dl at the end of first week, first month and 6 months respectively.

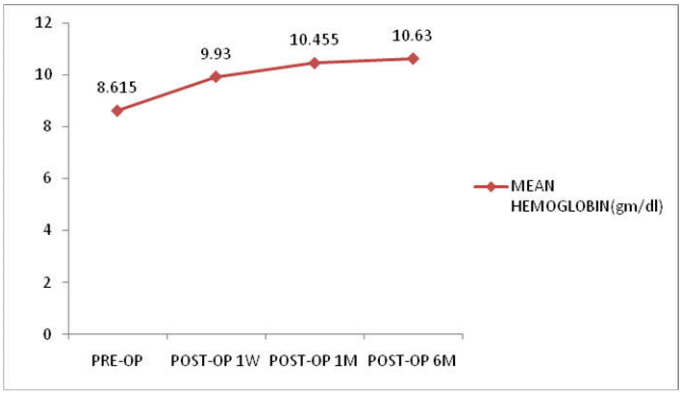

Fig. 1. Mean haemoglobin of the patients

The other serum nutritional parameters viz. serum total protein, serum total albumin and serum total gastrectomy were followed and the results showed an overall improvement in the levels with preoperative mean serum total protein 6.89±0.592 g/dl and post operative mean serum total protein at the end of first week, first month and 6 months being 6.44±0.561 g/dl, 6.725±0.526 g/dl, 7.35±0.487 g/dl respectively (Fig. 2). Preoperative mean serum albumin was 2.96±0.415 g/dl and post operative mean serum albumin values were 2.51±0.566 g/dl, 2.835±0.752 g/dl, 3.24±0.392 g/dl at the end of first week, first month and 6 months respectively (Fig.3). The preoperative mean serum total cholesterol value was 156.95±14.05 mg/dl, with post operative mean serum total cholesterol values equal to 150.05±14.33 mg/dl, 153±14.14 mg/dl , 161.65±15.12 mg/dl at the end of first week, 1 month and 6 months respectively (Fig. 4).

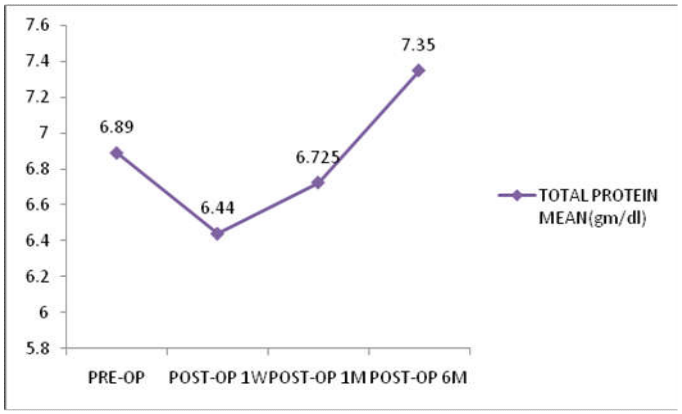

Fig. 2. Mean total protein of the patients

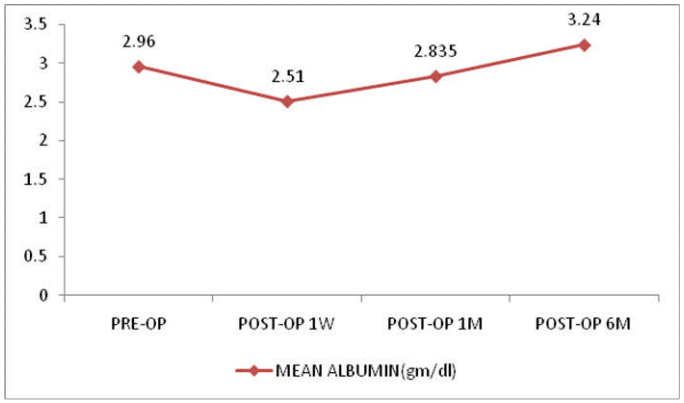

Fig. 3. Mean albumin of the patients pre and post-operatively

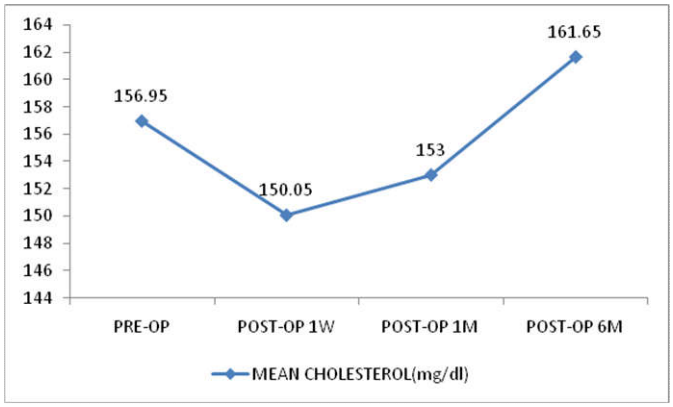

Fig. 4. Mean total cholesterol pre and post-operative

The weight of the patients was followed in these patients, with preoperative weight measured at the time of admission of these patients and post operative body weight ratio calculated on the follow up at the end of first week, first month and 6months. The mean body weight preoperatively was 62.4±9.213 kilograms and the mean body weight ratio calculated on the follow up was 93.37±0.0388 %, 95.80±0.0313%, 97.95±0.0487% respectively (Fig. 5).

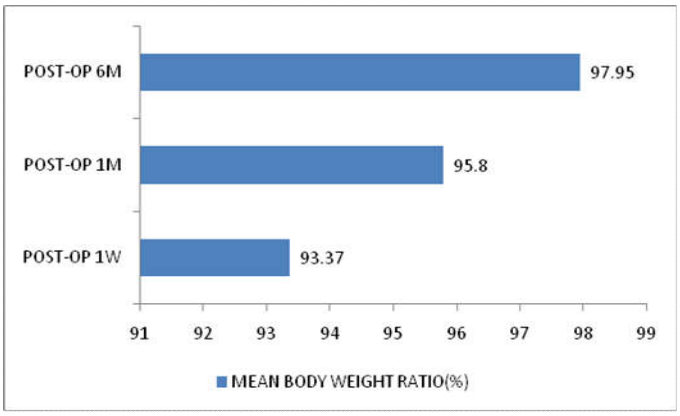

Fig. 5. Post-Operative Mean Body Weight ratio

The single meal intake capacity was enquired postoperatively at the end of first week, first month and 6 months. 10(50%) patients were able to take more than 80% of pre-illness single meal quantity, 9(45%) were able to take 50%-80% and 1(5%) patient was able to take less than 50% of the pre-illness single meal volume (Fig.6). The procedure related complications in these patients were divided into immediate and late. Immediate complications included anastomotic leak, wound infection, respiratory tract infection, intra-abdominal abscess, ileus, pulmonary thromboembolism (Fig 7). The late complications were regurgitation, dysphagia, early satiety, diarrhoea (Fig. 8).

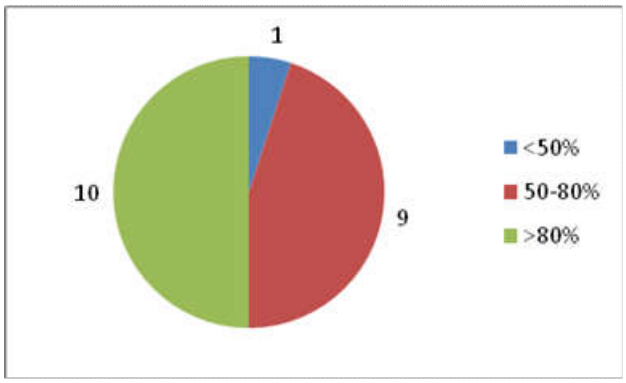

Fig. 6. Post operative single meal intake capacity in the patients

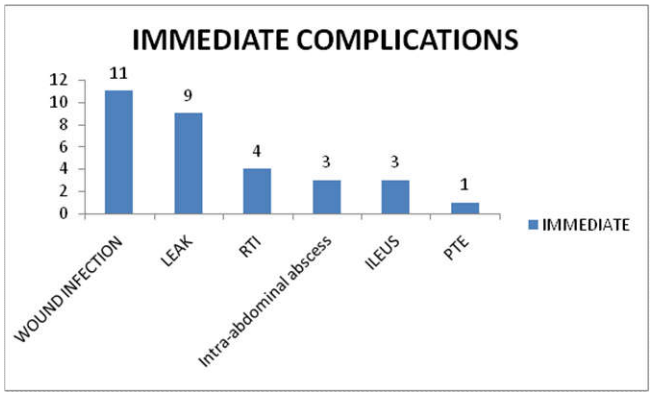

Fig. 7. Immediate complications in the patients with J-Pouch

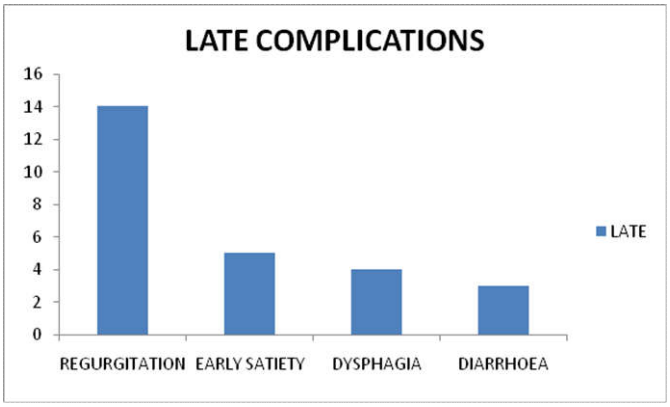

Fig. 8. Late complications in patients with J-Pouch

The study recorded no mortality in 2 years. The mean operative time recorded was 346.25±20.0575 minutes and the mean hospital stay was 22.1±4.376 days.

DISCUSSION

Since the first successful total gastrectomy in 1897, surgeons have sought thebest mode of reconstruction for the patient. Roux-en-Y oesophagojejunostomysolved the problem of alkaline reflux oesophagitis, which was an inevitable complication after loop oesophagojejunostomy. In the Roux-en-Y method theduodenum is bypassed, which may partly compromise digestion andabsorption, and some surgeons prefer interposition between the oesophagusand the duodenum instead of the Roux-en-Y method. Neither reconstructionoffers any

solution to the loss of the reservoir function of the resected stomach.Almost all gastrectomised patients suffer somewhat from fullness, upperabdominal pain and early satiety after meals. Furthermore, many suffer frommalnutrition, anaemia and bone-metabolic disturbances.The aims of the present study were to evaluate the operativemortality and morbidity associated with pouch reconstruction, to investigate thepossible advantages of the pouch reconstruction. The study was undertaken in the department of General Surgery , S.M.H.S. hospital , an associated hospital of Govt. Medical College, Srinagar. The study comprised of 20 patients with documented early proximal gastric cancers, who underwent surgical treatment in between may 2014 to may 2016. Out of these 20 patients 15(75%) were males and rest 5(25%) were females. These variables corresponded to those of YNakane *et al* (1995), Michielsen *et al* (1996), Chua L (1998), Fujiwara *et al* (2000). The mean age of patients included in our study was 63±7.3 years and the minimum and maximum age of 53years and 77 years respectively. The study included various nutritional parameters to follow in the patients who underwent the Hunt-Lawrence J pouch reconstruction after total gastrectomy for gastric cancers viz Haemoglobin values, serum total protein , serum albumin , serum total cholesterol. The mean haemoglobin value in these patients was 8.65±1.3 g/dl preoperatively. Postoperative follow up presented an improving trend in the mean haemoglobin values, 9.93±0.633 g/dl, 10.655±0.75 g/dl, 10.63±0.91 g/dl at the end of first week, first month and 6 months respectively. The other serum nutritional parameters viz. serum total protein, serum total albumin and serum total gastrectomy were followed and the results showed an overall improvement in the levels with preoperative mean serum total protein 6.89±0.592 g/dl and post operative mean serum total protein at the end of first week, first month and 6 months being 6.44±0.561 g/dl, 6.725±0.526 g/dl, 7.35±0.487 g/dl respectively.

Preoperative mean serum albumin was 2.96±0.415 g/dl and post operative mean serum albumin values were 2.51±0.566 g/dl, 2.835±0.752 g/dl, 3.24±0.392 g/dl at the end of first week, first month and 6 months respectively. The preoperative mean serum total cholesterol value was 156.95±14.05 mg/dl, with post operative mean serum total cholesterol values equal to 150.05±14.33 mg/dl, 153±14.14 mg/dl , 161.65±15.12 mg/dl at the end of first week, 1 month and 6 months respectively. The nutritional parameters followed in the study presented with improving trend in these patients with Hunt Lawrence J pouch gastric substitute. The improvements found were consistent with studies by Beese G*et al* (1994), Y Nakane *et al*(1995), Iivonen MK *et al.* (2000), Kono K*et al*(2003) ,ÖP. Horváth *et al.,* (2015), Kimiya Takeshita *et al* (2016). The findings were however contrary to findings of Zelnick R *et al* (1989) where in no nutritional benefit was seen in patients with pouch reconstruction. The weight of the patients was followed in these patients, with preoperative weight measured at the time of admission of these patients and post operative body weight ratio calculated on the follow up at the end of first week, first month and 6months. The mean body weight preoperatively was 62.4±9.213 kilograms and the mean body weight ratio calculated on the follow up was 93.37±0.0388 %, 95.80±0.0313%, 97.95±0.0487% respectively. The findings with respect to regaining pre-illness weight or post operative weight gain in studies by Beese G*et al* (1994),YNakane *et al* (1995), Karl-Hermann Fuchs *et al* (1995), Iivonen MK *et al*(2000),Kono K*et al*.(2003) Lehnert T, Buhl K. (2004) were consistent.The single meal intake capacity was enquired postoperatively at the end of first week, first month and 6 months. 10(50%) patients were able to take more than 80% of pre-illness single meal quantity, 9(45%) were able to take 50%-80% and 1(5%) patient was able to take less than 50% of the pre-illness single meal volume, findings comparable to those reported by YNakane *et al* (1995), Michielsen D*et al* (1996),Iivonen MK *et al* (2000), Lehnert T, Buhl K. (2004), Liedman B.(1999), Fujiwara Y *et al* (2000), Kono K *et al* (2003). The mean operative time recorded was 346.25±20.0575 minutes as opposed to mean operative time of 275 minutes for the procedure repoted by Karl-Hermann Fuchs *et al* (1995) less possibly due to use of anastomotic GI staplers, fact supported by Chua L (1998) where he in his comparative study of reconstructive procedures after total gastrectomy found that Hunt Lawrence J pouch reconstruction extends the operative time but less so with the use of GI staplers. The mean hospital stay was 22.1±4.376 days which was comparable to the results by Iivonen MK *et al.* (2000), 19 days. The procedure related complications in these patients were divided into immediate and late. Immediate complications included anastomotic leak 9(45%) and consequent wound infection 11(55%) as opposed to Iivonen MK *et al*(2000) where in the clinical leakage rate of 4% in the control group correspondswell with that in previous studies (Inberg *et al*. 1981, Ovaska *et al*. 1989), butthe clinical anastomotic leakage rate (19%) in the pouch group was higher. Two patients the pouch group had only radiological leakage in theoesophagojejunal anastomosis but no signs of infection, and they recovered asquickly as the patients without leakage. A possible explanation for theincreased leakage rate in the pouch group is that pouch reconstruction maycompromise the intestinal wall circulation, resulting in impaired healing of the anastomosis. A less likely explanation is increased luminal tension in the pouch, this should could well enough be decompressed by thenaso-pouch tube routinely inserted at operation, respiratory tract infection 4(20%),intra-abdominal abscess 3(15%), ileus 3(15%), pulmonary thromboembolism 1(5%). The late complications were regurgitation 14(70%), dysphagia 4(20%), early satiety 5(25%), diarrhoea 3(15%), the findings were consistent with the post operative morbidity profile submitted by Iivonen MK *et al*(2000), Michielsen D *et al* (1996) however contrary toYNakane *et al* (1995) where in no differences in the incidence of post operative complications were reported.

The study recorded no operative mortality, stats above par of Karl-Hermann Fuchs *et al* (1995), Michielsen D *et al* (1996), Schwarz A *et al* (1997) with a recorded operative mortality of 3.8%, 8.8%, 0.8% respectively in the procedure. In conclusion, the findings of this study show that Hunt Lawrence jejunal pouchreconstruction offers cancer patients an acceptable reconstructional methodafter total gastrectomy. The advantages of the pouch reconstruction: diminishing of postoperativesymptoms, improvement in eating capacity, decreased postoperative weight loss and better postoperativenutrition. Although the operative time and hospital stay is lengthened with increased post operative morbidity, the benefits of the reconstruction supersede. However, special attention shouldbe paid to the surgical technique in performing the pouch-oesophagealanastomosis.

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