

Laparoscopic fundoplication for gastro-esophageal reflux disease and hiatus hernia: A short term outcome of first 8 cases.

## Abstract

### Background

Acute gastro-esophageal reflux disease is a common ailment in kashmiri population. Most of these patients are managed by gastroenterologist, physicians and surgeons in daily outpatient basis. Majority of them settle by medical management with the help of proton pump inhibitors, prokinetics and antacids. , laparoscopic Nissen's fundoplication (LNF) is currently the procedure of choice for the surgical management of GERD.

### Aims and objectives

The aim of this study was to know the feasibility of laparoscopic fundoplication for hiatus hernia and acute gastro-esophageal disease in terms operative time, post operative pain, length of hospital stay, conversion rate and recurrence of symptoms.

### Material and methods

The present prospective observational study was conducted in the Post-Graduate Department of General Surgery and minimal access surgery Government Medical College Srinagar from June 2013 to June 2017. The patients that were included in the study had symptomatic gastro-esophageal reflux (documented by endoscopy) with either persistent symptoms despite adequate and prolonged medical treatment, CT documented hiatus hernia and patients, who wanted to avoid long-term medical treatment. The duration of reflux symptoms ranged from 9 months to 30 years (median 6 years). Patients who were excluded from the study were those unfit for anesthesia. Informed consent was taken before surgery in the language, the patients understood.

### Results

This study includes 8 patients, with median age of 40 years (range 20-70 years). In the study group, 5 were males and 3 were females. The mean operative time was 90 minutes (range 60 to 120 minutes). There were no major intra operative and post operative complications. The post operative pain was minimal as compared to open surgery. The median hospital stay was 3.5 days (range 3 -6 days). Two patients developed symptoms of bloating, early satiety, nausea and diarrhea. However these symptoms improved within weeks with a good response to appropriate medication. The median time until normal physical activity resumed was 2 weeks (range 3 days to 4 weeks). Median follow-up was 6 months (range 1-12 months).The overall short-term results in appropriately selected patients were excellent. The recurrence of symptoms was not observed in any patient within follow up of 6 months.

## 39 Conclusion

40 We conclude from our early series of 8 cases, that patients having long standing GERD not  
41 responding to medical management who are at a threat to develop barrettes esophagus should be  
42 given the benefit of laparoscopic fundoplication. However proper evaluation, patient's selection  
43 is mandatory. The choice of fundoplication should be dictated by the surgeon's preference and  
44 experience. Currently, the main indication for laparoscopic fundoplication is represented by PPI-  
45 refractory GERD, provided that objective evidence of reflux as the cause of ongoing symptoms  
46 has been obtained by impedance-pH monitoring.

47 **Keywords;** laparoscopy, hiatus hernia, reflux, fundoplication

48

## 49 Introduction

50 Gastroesophageal reflux disease (GERD) is currently defined as a condition that develops when  
51 the reflux of gastric contents into the esophagus leads to troublesome symptoms and/or  
52 complications [1,4]. The management of GERD is multi-disciplinary, often involving general  
53 practitioners, gastroenterologists, surgeons and specialist nurses, all of whom should have an  
54 awareness of the pros and cons of each management option. Barrett's esophagus is a condition in  
55 which the stratified squamous esophageal epithelium is replaced by endoscopically detectable  
56 columnar metaplasia [5,6]. It occurs in 2% of the general adult population and represents the  
57 most dreaded complication of GERD because it predisposes to esophageal adenocarcinoma, the  
58 fastest growing cause of cancer mortality. There is still debate about the working definition of  
59 Barrett's esophagus [5,6]. According to the American Gastroenterological Association, Barrett's  
60 esophagus is a change in the distal esophageal epithelium of any length that can be recognized as  
61 columnar type mucosa at endoscopy and is confirmed to have intestinal metaplasia by biopsy of  
62 the tubular esophagus [5]. According to the British Society of Gastroenterology, only 1 cm or  
63 more of endoscopically visible columnar epithelium above the gastro-esophageal junction  
64 dictates biopsy sampling, whereas the detection of intestinal metaplasia is not a prerequisite for  
65 the definition of Barrett's esophagus but only for the necessity of endoscopic surveillance [6].  
66 Although multiple variants of anti-reflux operations are described, laparoscopic Nissen's  
67 fundoplication (LNF) is currently the procedure of choice for the surgical management of GERD  
68 This is reiterated in the **RCSE** (Royal college of surgeons) guidance, which recommends  
69 fundoplication for the surgical management of GERD. Since fundoplication was reported by  
70 Nissen in 1956 [7,8], it has become the most common surgical procedure for gastro-esophageal  
71 reflux disease, achieving long-term relief of reflux symptoms in 90% of patients [9-11], with low  
72 morbidity rates (12-13%) and negligible mortality [12], to reduce the incidence of post-  
73 fundoplication sequelae. The fundoplication offers the potential of reduced postoperative pain  
74 and hence a shorter stay in hospital and reduced convalescent times compared with the open  
75 approach.

76

## 77 Aims and objectives

78 The aim of this study was to know the feasibility of laparoscopic fundoplication for hiatus hernia  
79 and acute gastroesophageal disease in terms of operative time, post operative pain, length of  
80 hospital stay, conversion rate and recurrence of symptoms.

81

## 82 Material and methods

83 The present prospective observational study was conducted in the Post-Graduate Department of  
84 General Surgery and minimal access surgery, Government Medical College Srinagar from June  
85 2013 to June 2017. A total of 8 patients were included in the study. [These are results, move to  
86 results portion] The approval from the ethics committee and a signed informed consent were  
87 obtained from the patients. The median age was 40 years (20-70), 5 were male, and the median  
88 weight of the adult patients was 70 kg (60-105). [ These are results too] The patients that were  
89 included in the study were symptomatic gastro-esophageal reflux (documented by endoscopy)  
90 with either persistent symptoms despite adequate and prolonged medical treatment, CT  
91 documented and patients, who wanted to avoid long-term medical treatment. The duration of  
92 reflux symptoms ranged from 9 months to 30 years (median 6 years). [Results again, should be  
93 under results section] Patients who were excluded from the study were those unfit for anesthesia.  
94 The following data was collected prospectively: age, sex, operative time, intra-operative and post  
95 operative complications, postoperative pain, hospital stay, conversion to open and recurrence of  
96 symptoms. All the patients enrolled for the study were evaluated by detailed history, thorough  
97 general physical examination, and focused systemic examination. Informed consent was taken  
98 before surgery in the language, the patients understood. The patient was kept fasting overnight.  
99 All patients received a prophylactic dose of injection ceftriaxone 1 g one hour before surgery.

## 100 Operative procedure

### 101 Position of patient

102 After induction of general anesthesia and introduction of a bladder catheter, the patient was  
103 placed in lithotomy, position, the table tilted 30° head up, and the surgeon standing between the  
104 patient's legs with the first assistant to the patient's left and the second assistant to the patient's  
105 right. We preferred camera man to stand on the left side of surgeon. We use only one monitor on  
106 the side of the right shoulder of the patient. All procedures were completed by using 30 degree  
107 telescope

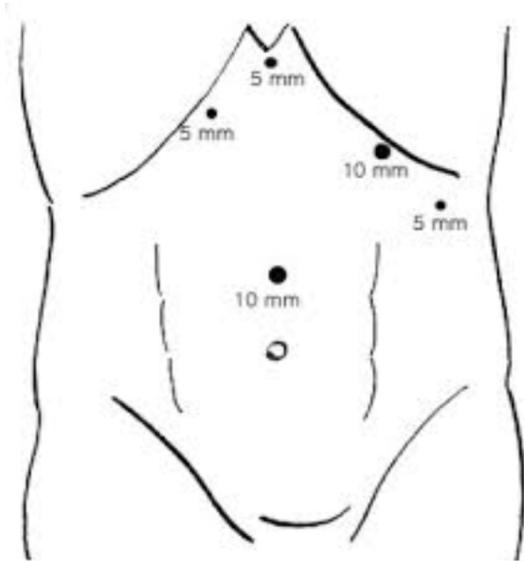
### 108 Port position

109 After placing an orogastric tube to deflate the stomach, Pneumo-peritoneum up to 15 mmHg was  
110 achieved by a direct trocar technique. Five ports were used (Fig. 1). A 10 mm optical port for  
111 the laparoscope was introduced just to the left of the midline, midway from the xiphisternum to  
112 the umbilicus. Additional ports were placed under vision; 5 mm ports was placed in the mid-  
113 clavicular line just below the right costal margin for a fan shaped retractor used for liver  
114 retraction, two working ports were made on either side of the optical port, 10 mm working port  
115 in the mid-clavicular line 5 cm away from the optical port on the left side of the abdomen, while  
116 as 5 mm working port was placed on the right side of abdomen, 5 cm away from the optical port  
117 in the mid-clavicular line and additional 5mm port was made in the anterior axillary line for  
118 retraction of the stomach by the left assistant

### 119 Surgical procedure

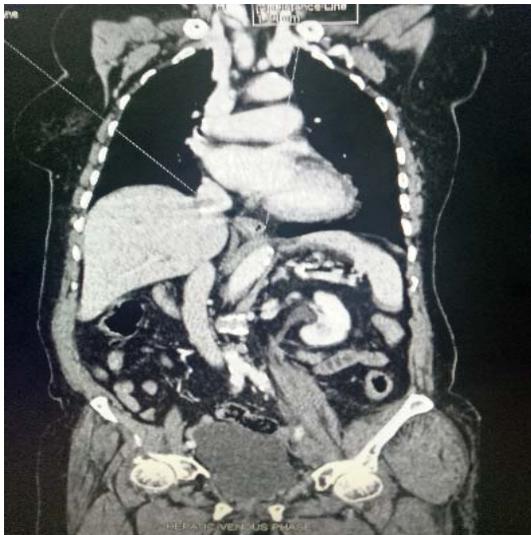
120 Two of the assistants stand on the patient's right side; The camera man and the assistant who  
121 retracts the liver. The assistant on the right side of the surgeon pulls the stomach down to expose  
122 the gastro-esophageal junction. The first step is to incise the lesser omentum and pars flaccida  
123 and proceed up towards the right side of gastro-esophageal junction. The phreno-esophageal  
124 membrane is incised and the dissection is carried across the esophagus. The lesser omentum is  
125 incised to expose the right crus of diaphragm. A plane is created between the right crus and  
126 Para-esophageal tissue and deepened. The Para-esophageal fat is dissected from the esophagus  
127 taking care not to damage the hepatic branches of vagus nerve, next to that dissection of  
128 esophagus hiatus is done. The dissection of the hiatus is done to mobilize the lower esophagus  
129 and making it free from all the structures. The dissection is also carried to the left of the  
130 esophagus anteriorly till the left crus is reached. A cleavage is developed between the esophageal  
131 Wall and the left crus. Again the left Para-esophageal fat is dissected off the esophagus to expose  
132 the whole of left crus. Next step is to complete the dissection of esophagus within the the  
133 esophageal hiatus and to further extend the peri-esophageal dissection in the mediastinum in  
134 order to mobilise enough length of it, thereby avoiding the upward retraction of gastro-  
135 esophageal junction and fundoplication. At least 3- 4 cm tension free abdominal esophagus must  
136 be present within the abdomen at the end of dissection. During the upper dissection of the  
137 hiatus, a great care is taken not to damage the anterior vagus nerve. The mobilization of upper  
138 part of the fundus of the stomach is the next step; this is achieved by dividing the gastro  
139 esophageal adhesions and short gastric vessels until the upper part of fundus is liberated. The  
140 dissection and division of these vessels is greatly facilitated by using harmonic scalpel. After the  
141 dissection is completed, the reconstruction beginning by approximately the two pillars in order to  
142 narrow the esophageal hiatus. The narrowing of the esophageal hiatus should be calibrated to a  
143 size that allows the supple passage of a 10 mm scope along side of esophagus. The fundus is  
144 passed behind the esophagus to initiate the fundoplication. The fundoplication is performed by  
145 stitching the both sides of gastric fundus together in front of esophagus. To assess the tightness  
146 of gastric wrap, a 5 mm grasper forcep is passed between fundal gastric wrap along side of  
147 gastro-esophagus. Anchoring the fundoplication to the esophagus using an additional suture  
148 completes the procedure. We also fixed the wrap with the right crus of diaphragm to avoid the  
149 prolapse of fundal wrap. The drain was placed and secured in all cases. The ports were closed  
150 and dressing applied. (Figure 1-14).

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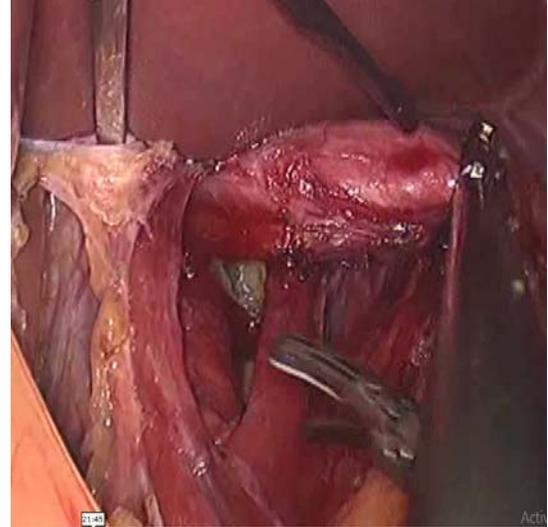


152  
153 Figure 1 Port position in Laparoscopic  
154 Fundoplication  
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Figure 2 Post operative picture



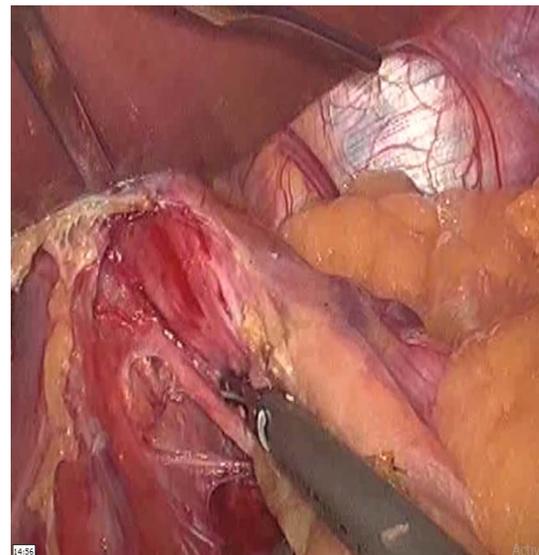
156  
157 Fig. 3 Longitudinal section of CECT abdomen showing hiatus hernia  
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159  
160 Fig 4 Release of gastro hepatic ligament by  
161 Harmonic.This exposes the lesser sac distally  
162 and proximally from the hepatic branches of  
163 the vagal nerves which are left intact  
164 .

Fig. 5 the right crus is incised and the dissection  
is extended anteriorly, posteriorly on to the  
V- shaped commissure of the right crus. The  
mediastinum is opened widely which helps in  
localizing the left pillar and esophagus

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178 Fig 6 A ribbon gauze is passed in the window  
179 behind the esophagus and placed around the  
180 abdominal part of esophagus. This maneuver  
181 allows the traction onto the esophagus and  
182 gastroesophageal junction which helps in  
183 opening dissection planes.

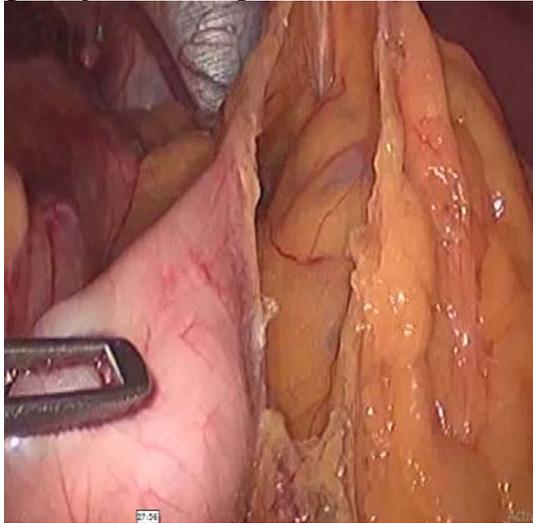
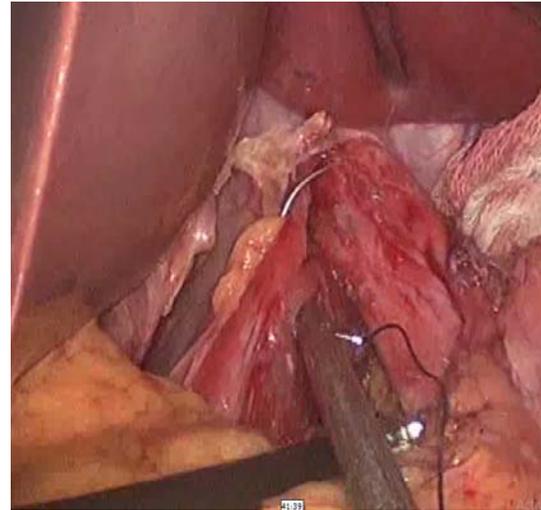
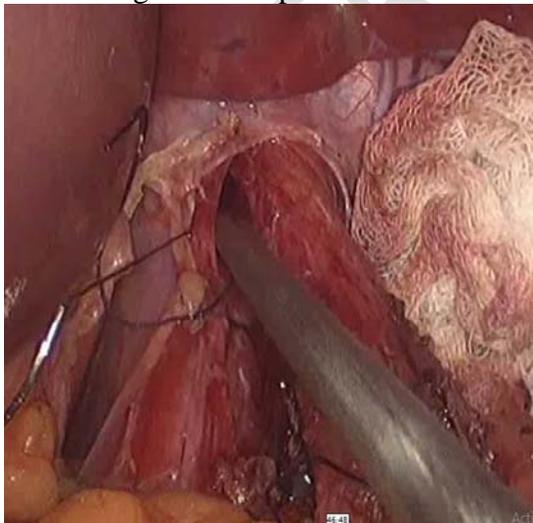


Fig 7 Vagus nerve on the posterior aspect  
of esophagus Continuously keeping in mind  
the presence of both vagus nerves limits the  
possibility of harming them



184 Fig 8 The greater omentum is dissected from  
185 the stomach along the greater curvature. The  
186 short gastric vessels are divided individually  
187 using the harmonic scalpel. It is important to  
188 mobilize the fundus completely away from  
189 the diaphragm i.e until reaching the base of  
190 the pillar posteriorly to avoid undue torsion on  
191 the gastro-esophageal junction when  
192 constructing the fundoplication.  
193

Fig 9 The pillars are approximated from the  
right of the esophagus with interrupted  
nonabsorbable sutures. In order to narrow the  
opening of esophageal hiatus.



194 Fig 10 Narrowing of esophageal hiatus is access  
195 -ed by passing grasper forcep alongside of  
196 esophagus.  
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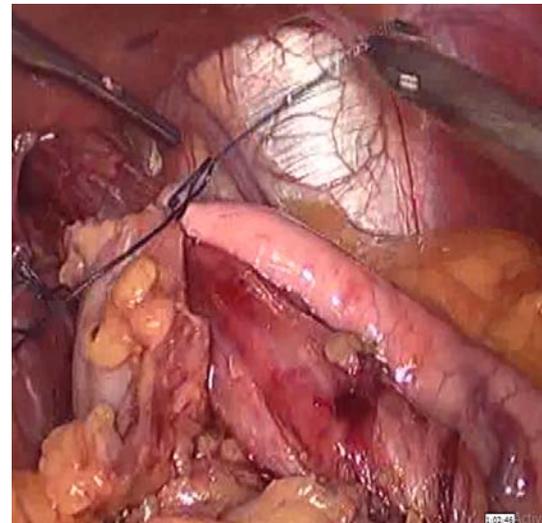
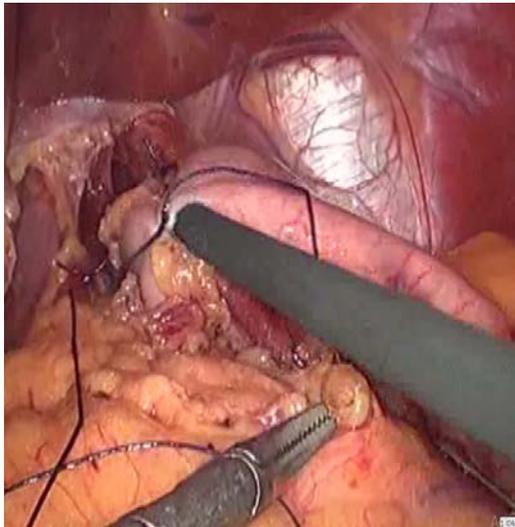


Fig 11 The fundoplication is performed by  
stitching both sides of gastric fundus together  
infront of esophagus



199  
200 Fig 12 To access the tightness of gastric wrap  
201 Grasper forcep is passed between fundal  
202 gastric wrap and esophagus  
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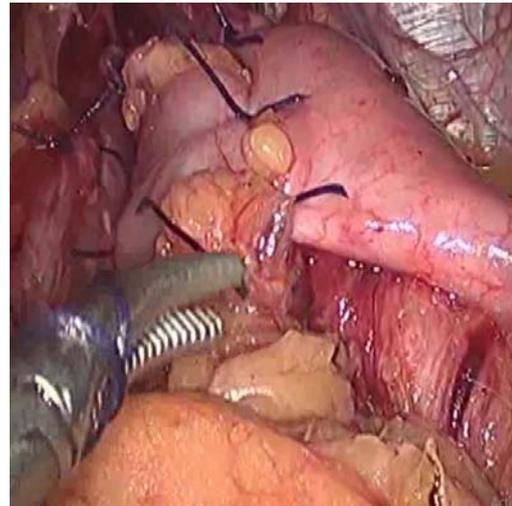
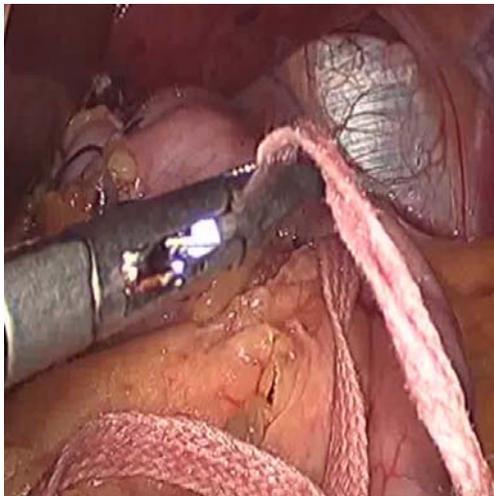


Fig 13 complete fundoplication



204  
205 Fig 14 Removing the ribbon gauze. The  
206 Floppy aspect of the fundoplication is again  
207 Checked by passing grasper alongside of  
208 esophagus  
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Fig 15 Drain placed and secured

210 **Postoperative care**

211 To avoid forceful vomiting the first hours postoperatively as this may cause early disruption of  
212 the sutures and intra-thoracic migration of the fundoplication an anti-emetics was administered.  
213 A naso-gastric tube was routinely kept in place for 24 h after the surgery. Oral fluid intake was  
214 started on the 1st postoperative day and soft solids on the 2nd day. Patients left hospital as soon  
215 as they are well enough, continuing with a soft diet for the next 4 weeks. All patients were again  
216 seen at the outpatient clinic at 1 week, 6 weeks and 6 month after the procedure. Further follow-  
217 up was arranged on individual basis.

## 218 Results

219 This study includes 8 patients, with median age of 40 years (range 20-70 years). In the study  
220 group 5 were males and 3 were females. The mean operative time was 90 minutes (range 60 to  
221 120 minutes). There was no major intra operative and post operative complications (such as  
222 bleeding, perforation of esophagus, injury to diaphragm, phrenic nerves and conversion to  
223 open). The post operative pain was minimal as compared to open surgery. The median hospital  
224 stay was 3.5 days (range 3 -6 days). Two patients developed symptoms of bloating, early satiety,  
225 nausea and diarrhea. However these symptoms improved within weeks with a good response to  
226 appropriate medication. The median time until normal physical activity was resumed was 2  
227 weeks (range 3 days to 4 weeks). Median follow-up was 6 months (range 1-12 months). All  
228 patients were currently free of reflux symptoms. Postoperative gastroscopy was performed in all  
229 patients, revealing a satisfactory fundoplication on direct inspection and the absence of  
230 oesophagitis in all patients. The overall short-term results in appropriately selected patients were  
231 excellent. The recurrence of symptoms was not observed in any patient within follow up of 6  
232 months.

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237 Table 1 shows variables and there results.

Variable	Results
Age (years)	40 (20-70)
Sex	Male=5, Female=3
Median weight(kgs)	70 (60-105 )
Mean Operative time(minutes)	90 (60-120)
Post operative pain	Minimal
Intra and postoperative complication	
Bleeding	0
Esophageal perforation	0
Diaphragmatic injury	0
Vagal nerve injury	0
Conversion to open	0
Post operative fever	1
Port site infection	1
Mean hospital stay (Days)	3.5( 3-6)
Recurrence of symptoms	0
Mean Follow up	6 (1-12 months)

238

## 239 Discussion

240 Acute gastro-esophageal reflux disease is a common ailment in kashmiri population. Most of  
241 these patients are managed by gastroenterologist, physicians and surgeons in daily outpatient  
242 basis. Majority of them settle by medical management with the help of proton pump inhibitors,  
243 prokinetics and antacids [1,2,3]. There is an association of gall stones with esophageal reflux  
244 disease and duodenum diverticulum (saint's triad). Gastro-esophageal reflux disease and gall

245 stone presentation share the common clinical scenario of symptoms. It is difficult to differentiate  
246 the one entity from the other clinically. Unfortunately, there are only few places in our state,  
247 where these patients would be evaluated in the true scientific spirit and helped on scientific  
248 logical ground. Under this perspective most of these patients stay on a continued medical  
249 management of PPIs even though they could be helped by surgical management called Nissen's  
250 fundoplication. To detect acute gastro-esophageal disease, we need impedance PH monitoring,  
251 esophageal manometry and establish imaging diagnosis of hiatus hernia, we require endoscopy  
252 and CECT scan. The patients that were sent to us were highly suspicious of having acute gastro-  
253 esophageal disease on clinical scoring systems and having a resistance to treatment by PPIs for  
254 duration of more than two years. The patients having acute gastro-esophageal disease were with  
255 the persistent symptoms of retrosternal burning pain, regurgitation of gastric aspirate, hoarseness  
256 of voice and irritative cough [13, 14]. The patients with hiatus hernia were Nissen's  
257 fundoplication were performed were diagnosed on clinical, radiological (barium meal study),  
258 Endoscopy and CECT scan. Stein and De-Meester [15] have stated that the established principles  
259 of anti-reflux surgery should not be jettisoned in order to perform a procedure laparoscopically.  
260 They state that the 'construction of a loose 360° fundoplication' should be the goal. Dallemagne  
261 et al [16] demonstrated the feasibility of this in their initial series of 12 patients. Geagea [17] and  
262 Falk et al [18] all reported good initial results in preliminary series of 10 and 16 patients,  
263 respectively. Five patients of our study group presented with a documented hiatus hernia on  
264 endoscopy and CT scan. Four of them had sliding hiatus hernia and one had Para-esophageal  
265 type. However the rest three patients were taken for surgery for acute gastro-esophageal disease  
266 on their clinical presentation only, due to paucity of esophageal manometry and PH monitoring.  
267 We could not document their reflux before taking them for surgery. Nevertheless, after a  
268 threadbare discussion with the treating gastroenterologist, a unanimous consensus was generated  
269 that Nissen's fundoplication will help these patients. It is agreed that the two entities may coexist  
270 together, however it is also known that they are not related to each other. A small hiatus hernia  
271 may have severe symptoms of gastro-esophageal disease and converse is also true. All these  
272 patients were counselled in the preoperative setting about the nature of surgery, advantages,  
273 disadvantages approach of surgery, conversion possibility and long term outcome. The risk of  
274 barrettes esophagus in three of our patients who were resistant to medical management was  
275 explained to them. A formal consent was obtained from the patients.

276 In our study, median age was 40 years (range 20-70years) and there are 5 male patients and 3  
277 female patients and median weight was 70 kg (range 60-105 kg). There was a noticeable lack of  
278 data on the demographic group in the study conducted previously. Mean operative time was 90  
279 minutes (range 70-120), the operating time decreased with experience. The operating time was  
280 comparable to the study conducted by David I Watson, with mean Operative time of 81 minutes  
281 (range 45-154) minutes. Two patients developed symptoms of bloating, early satiety, nausea and  
282 diarrhea. These symptoms improved within weeks and responded to appropriate medication.

283 The mean hospital stay was 3.5 days ( range 3-6 days) and mean follow was 6 months (range  
284 1month-1 year) this was comparable to study conducted by David I Watson with mean hospital  
285 stay of 3 days (rang 3 -8 days) and follow up 5 months rang (1 month 1 year).

286 In our study the results demonstrated excellent symptomatic out come with shorter operative  
287 time , hospital stay, early discharge and early return to normal physical activity and also cost  
288 effective, as well as beneficial to patients by reducing the morbidity of surgery [19], with no  
289 reduction in efficacy. One of our patients in this series developed postoperative fever which  
290 responded to usual analgesics prescribed. One more patient developed port site infection which  
291 settled within first 10 days of surgery performed. We didn't have any conversions to open  
292 technique and we followed them for around 1 year.

## 293 Conclusion

294 We conclude from our early series of 8 cases, that patients having long standing GERD not  
295 responding to medical management who are at a threat to develop barrettes esophagus should be  
296 given the benefit of laparoscopic fundoplication. Patients having CT documented hiatus hernia  
297 are also indications for laparoscopic fundoplication. Laparoscopy gives them all the benefits of  
298 minimal access surgical procedure and avoids a big laparotomy on them. However proper  
299 evaluation, patient's selection is mandatory. The choice of fundoplication should be dictated by  
300 the surgeon's preference and experience. Currently, the main indication for laparoscopic  
301 fundoplication is represented by PPI-refractory GERD, provided that objective evidence of  
302 reflux as the cause of ongoing symptoms has been obtained by impedance-pH monitoring.

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