

## Comparative Study between Traditional Method of Application of Lumbo–Peritoneal Shunt and Laparoscopic Assisted Method in Patients with Idiopathic Intracranial Hypertension

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### Abstract

The annual incidence of IIH is 1 to 2 per 100,000 population. There is a higher incidence in obese women between the ages of 15 and 44 years (4 to 21 per 100,000). The aim of the present study was to compare our results in placement of the abdominal tube of lumbo-peritoneal shunt using traditional method and laparoscopic assisted method in patient with idiopathic intracranial hypertension after failure of conservative treatment and repeated lumbar punctures. This study includes 20 patients operated with mini laparotomy for insertion of abdominal end of the shunt method and 20 patients operated with laparoscopic assisted method prospectively and retrospectively for treatment of idiopathic intracranial hypertension after failure of conservative treatment and repeated lumbar punctures. Full assessment of the patients pre and post-operative obtained using plain X-rays ,CTScans ,MRI ,Visual Fields & Fundus Examinations. Rate of Satisfaction was higher in Laparoscopic group than open group but with no statistically significant . The mean Post-operative stay was significantly lower in Laparoscopic group than open group as The mean Time of surgery in Laparoscopic group was  $1.35 \pm 0.47$  day and was  $3.35 \pm 1.52$  day in open group ( $p < .00001$ ). Also rate of Complications was significantly lower in Laparoscopic group than open group . There was a statistically significant difference between both groups according to Need for repeated surgeries . laparoscopic placement of lumbarperitoneal shunts is a safe and efficacious procedure in avoiding need for repeated surgeries ,intraoperative blood loss and hospital stay .It lowers the rate of postoperative complications and the time of surgery. It many advantages over the traditional minilaparotomy approach.

### 1.Introduction

Idiopathic intracranial hypertension (IIH) is a disorder characterized by increased intracranial pressure without radiological or laboratory evidence of intracranial pathology. This condition typically affects obese women. The incidence of IIH is increasing with the rising prevalence of obesity. The annual incidence of IIH is 1 to 2 per 100,000 population. There is a higher incidence in obese women between the ages of 15 and 44 years (4 to 21 per 100,000). Persistent headache is the most common symptom. Visual impairment is a serious complication that may not be recognized by the patients.( 1)

Lumbo-peritoneal shunts are widely used for the treatment of patients diagnosed with IIH . catheter migration out of the abdominal cavity is more commonly observed in morbidly obese patients. In addition, larger and deeper incisions are required for the placement of a distal catheter into the abdominal cavity by laparotomy in such patients. Complications including wound healing problems, abdominal pain, and increased risk of an incisional hernia are also observed(2)

Laparoscopy-assisted LP shunt placement offers many advantages over classic way of application of VP or LP shunts. It avoids open wounds on anterior abdominal wall, enables proper positioning of the distal tip away from the omentum, provides an opportunity for diagnostic laparoscopy and possible adhesiolysis in patients with multiple

abdominal surgeries prior to the placement of the new shunt.If revision become necessary, the distal tip of the shunt can easily be retrieved laparoscopically, eliminating the need for an open procedure. The procedure can be done in less than 30 minutes by any practicing laparoscopist.( 3)

There are advantages and disadvantages in considering laparoscopic-assisted surgery. If it is possible to place the peritoneal catheter directly from the subcutaneous tissue into the peritoneal cavity without an overlying incision, this should eliminate the occasional complication of withdrawal of the catheter from the peritoneum into the subcutaneous pocket , inadvertent placement of the catheter in the preperitoneal fat space should likewise be eliminated. laparoscopic visualization and the ability of lysis of adhesions is advantageous for distal shunt revision. laparoscopy carries its own risks, however low in incidence. Laparoscopic-assisted shunt placement should be strongly considered in appropriate cases. ( 1)

Several studies have shown that using laparoscopy in distal shunt procedures enables placement of the abdominal end of the shunt under vision and in a distended peritoneum unlike the traditional method and lowering the risk of immediate injury to abdominal viscera and lowering the incidence of preperitoneal placement of the distal shunt end. The authors suggested that the main reason for this is visual control of the catheter position and its function

when assisted by laparoscopy and recommend its use in very obese patients or in those who had previously undergone abdominal surgery. (1, 4)

The aim of the present study was to compare our results in placement of the abdominal tube of lumbo-peritoneal shunt using traditional method and laparoscopic assisted method in patient with idiopathic intracranial hypertension after failure of conservative treatment and repeated lumbar punctures.

## 2. Patient and method

This study includes 20 patients operated with mini laparotomy for insertion of abdominal end of the shunt method and 20 patients operated with laparoscopic assisted method prospectively and retrospectively for treatment of idiopathic intracranial hypertension after failure of conservative treatment and repeated lumbar punctures. This study was conducted in our department of neurosurgery at Benha university hospital.

Full assessment of the patients pre and post-operative obtained using plain X-rays ,CTScans ,MRI, Visual Fields & Fundus Examinations

The cases were randomly chosen without privilege to sex , or weight, but all share the fact that they suffer from Headaches,visual field defects & papilledema that has been proven to be attributed to Idiopathic Intracranial Hypertension after failure of medical treatment.

Data will collected from the patients regarding age, weight ,abdomen circumference, previous abdominal operations, hospital stay, patient satisfaction, occurrence of complications ,time of surgery, blood loss during surgery, need for repeated surgeries.

## 3. Results

The mean age of open group was 32.15 ± 10.18 years and was 36.55 ± 7.60 years in Laparoscopic group. The mean weigh of open group was 90.75 ± 12.68 kg and was 95.25 ± 11.73 kg in Laparoscopic group. The mean Abdominal circumference of open group was 121.2 ± 21.01 cm and was 122.35 ± 19.34 cm in Laparoscopic group. The rate of Previous abdominal surgery was higher in Laparoscopic group than open group.

According to Preoperative papilledema, half of patient in the present study in both groups advanced Grade III papilledema before surgery and about the other half advanced Grade IV papilledema before surgery and only 3 patient had optic atrophy

According to operative data in both groups. The mean Time of surgery was significantly lower in Laparoscopic group than

open group as The mean Time of surgery in Laparoscopic group was 1.33 ± 0.52 hour and was 2.58 ± 0.63 hour in open group (p < .00001). Blood loss during surgery was significantly lower in Laparoscopic group than open group (p = 0.004)

According to post-operative data in both groups. The mean Post operative stay was significantly lower in Laparoscopic group than open group as The mean hospital stay in Laparoscopic group was 1.35 ± 0.47 day and was 3.35 ± 1.52 day in open group (p < .00001). Also rate of Complications was significantly lower in Laparoscopic group than open group (p = 0.009). Complications in both groups were slippage of the peritoneal end which was the most common specially in the open group, which was found in 9 cases of the open group, and required abdominal revision for these cases . CSF cyst formation in the abdomen due to either malpositioning of the peritoneal of the catheter , which required repetition of the surgery to revise the abdominal end and removal of the CSF cyst from the abdomen ,this happened in 2 cases of the open group .Shunt was found cutted in the back which required removal of the old system and insertion of a new one , this was found in one case of each group .Malpositioning of the peritoneal end which required repeated revisions in 4 cases of the open group. Slippage of the lumbar end in the back which required one time revision in one case of the laparoscopic group. Persistent papilledema , non functioning system and abdominal distention were found in one case of laparoscopic group , which required replacement of the shunt with a new one .

Rate of Satisfaction was higher in Laparoscopic group than open group but with no statistically significant (p = 0.301). Patient satisfaction was evaluated at each surgery in both groups .Rated as non satisfied ,poorly satisfied , satisfied and very satisfied .

According to Need for repeated surgeries, 8 patient in open group needed redo for once and 3 patients needed repeated surgeries for two times and one patient for 3 times due to persistence of the symptoms and finally operated with VP shunt using navigation. While in Laparoscopic group, Rate of repeated surgeries was lower, 2 patient needed redo for once , one of them the shunt was found cutted in the back . The other case , the lumbar end slipped from the back. One patient needed repeated surgeries for two times as the patient showed persistent papilledema ,non functioning shunt and abdominal distention . There was a statistically significant difference

between both groups according to Need for repeated surgeries (p = 0.031)

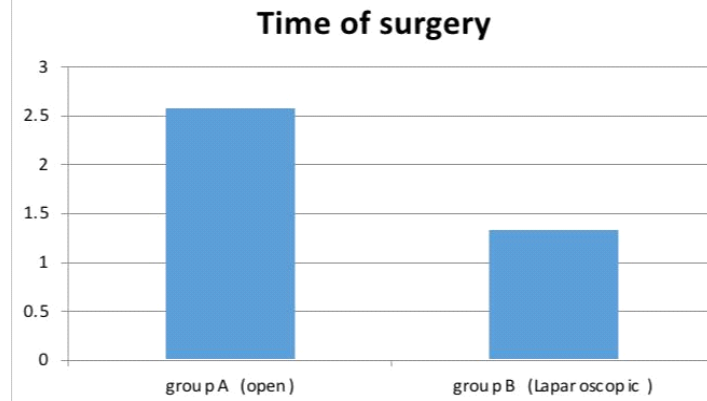


Fig (1).Time of surgery in both groups

Table (1). Post-operative data in both groups

post-operative data	open group	Laparoscopic group	t	p
<b>Post operative stay</b>	3.35 ± 1.52	1.35 ± 0.47	5.35	< .00001
<b>Complications</b>			15.24	0.009
Slippage of peritoneal end	9	0		
CSF cyst formation	2	0		
Shunt was found cutted in the back	1	1		
Malpositioning of peritoneal end	4	0		
Persistent papilledema and abdominal distension	0	1		
Slippage of lumbar catheter from the back	0	1		
<b>Satisfaction</b>			3.64	0.301
Not satisfied	3	1		
Poorly satisfied	4	2		
Satisfied	9	8		
Very satisfied	4	9		

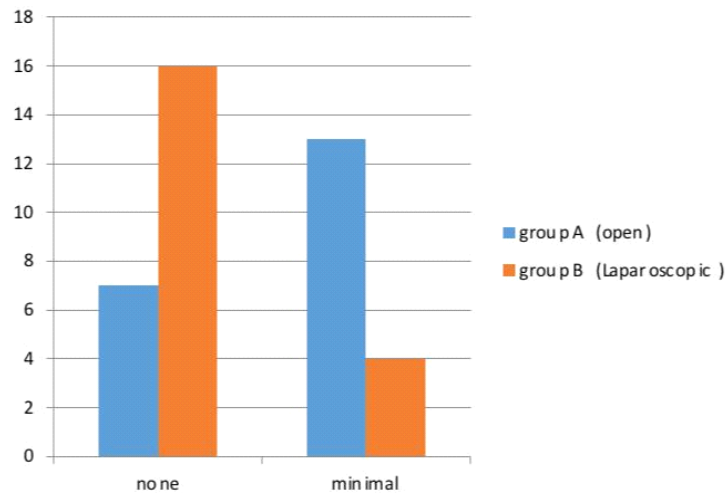


Fig (2). Intraoperative blood loss in both groups

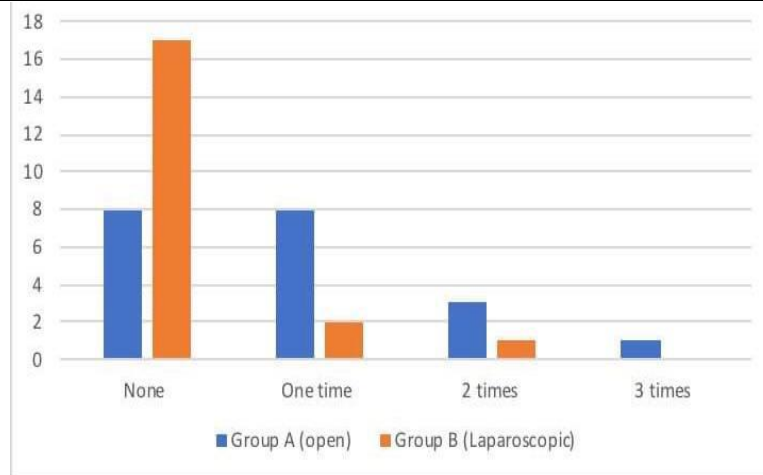


Fig (3). Need for repeated surgeries in both groups.

### 3. Discussion

Lumbarperitoneal shunts were first introduced in the 1950s. These initial shunts were associated with spinal arachnoiditis and scoliosis thought to be due to the polyethylene material used in the manufacture of the shunts. The incidence of arachnoiditis and scoliosis was drastically reduced with the introduction of silastic catheters in 1975. Despite this improvement, lumbarperitoneal shunts have significant complications. Orthostatic hypotension can cause disabling headaches particularly when valveless shunts are used. The shunts may also migrate out of the abdomen or spine. In addition the shunt may become infected and/or obstructed, particularly at the peritoneal end. (5)

Several groups have previously reported the use of laparoscopy for peritoneal catheter insertion beginning in 1983. Causha et al described their technique of laparoscopic shunt insertion using a single viewing port and a 10F introducer, although an additional port was required in some cases. Both ventriculoperitoneal and lumbarperitoneal shunts were inserted laparoscopically. This group also did not find previous abdominal surgery to be a contraindication to conventional laparoscopy. (6)

Some controversy exists with regard to the upper limit of CSF pressure with a belief that body weight influences cerebrospinal fluid pressure levels. There is, however, no convincing evidence for this belief. (7)

Patients with IIH are invariably obese, often morbidly so. Obesity is a risk factor for the development of an incisional hernia. Even though smaller “mini laparotomy” incisions are used for the traditional insertion of lumbarperitoneal shunts this may not necessarily reduce the incidence of incisional hernias.

The aim of the present study was to compare our results in placement of the abdominal tube of lumbo-peritoneal shunt using traditional method and laparoscopic assisted method in patient with idiopathic intracranial hypertension after failure of conservative treatment and repeated lumbar punctures.

Our results shows that the mean age of open group was  $32.15 \pm 10.18$  years and was  $36.55 \pm 7.60$  years in Laparoscopic group. The mean weigh of open group was  $90.75 \pm 12.68$  kg and was  $95.25 \pm 11.73$  kg in Laparoscopic group. The mean Abdominal circumference of open group was  $121.2 \pm 21.01$  cm and was  $122.35 \pm 19.34$  cm in Laparoscopic group.

In Raysi et al., (8) study as the average age was 62.6 years (range 24–85). In Roth et al., (9) study, average age was 60 years (range, 19-88). The average body mass index in many studies exceeds  $40 \text{ kg/m}^2$  (10,5)

According to Preoperative papilledema in the present study, half of patient in the present study in both groups advanced Grade III papilledema before surgery and about the other half advanced Grade IV papilledema before surgery and only 3 patient had optic atrophy

Severe visual impairment may be a serious and permanent complication of IIH, IIH produces significant visual impairment in approximately 25% of patients. The risk of visual loss in the pediatric IIH population is similar to that of adults. Visual deterioration in IIH patients is usually gradual, but in cases of fulminant papilledema, blindness may appear rather quickly(11).

Restoration of visual acuity and resolution of papilledema constitute the primary goals of management in IIH and the benchmark of relative success of a treatment technique (12).

Papilledema usually resolves after a few weeks or months, but many patients are left

with some residual disc elevation, especially nasally. (12).

According to operative data in the present study in both groups. The mean Time of surgery was significantly lower in Laparoscopic group than open group as The mean Time of surgery in Laparoscopic group was  $1.33 \pm 0.52$  hour and was  $2.58 \pm 0.63$  hour in open group ( $p < .00001$ ). Blood loss during surgery was significantly lower in Laparoscopic group than open group ( $p = 0.004$ )

In **Raysi et al., (8)** study, The total surgical time was less than 30 min with proximal (catheter placement and tunneling of the shunt down to the abdomen) and distal procedures (trocars insertion, abdominal inspection, distal catheter insertion, control of shunt function, and closure of abdominal incisions) performed simultaneously. In the laparotomic group, the total surgical time ranged from 45 to 80 min instead. The difference between the two groups was statistically significant ( $p < 0.05$ ).

**Himal (13)** reported that laparoscopic procedures have many advantages including the avoidance of large open wounds or incisions (thereby decreasing blood loss, pain, and discomfort); shorter operative times; decreased risk of incisional hernia; ease of surgical technique; and particularly in shunt surgeries, direct visualization of CSF flow out of the distal catheter into the abdominal cavity.

According to post-operative data in both groups in the present study. The mean Post-operative stay was significantly lower in Laparoscopic group than open group as The mean Hospital Stay in Laparoscopic group was  $1.35 \pm 0.47$  day and was  $3.35 \pm 1.52$  day in open group ( $p < .00001$ ). Also rate of Complications was significantly lower in Laparoscopic group than open group ( $p = 0.009$ ). Rate of Satisfaction was higher in Laparoscopic group than open group but with no statistically significant ( $p = 0.301$ )

According to **Hammers et al., (14)**. Advantages of laparoscopic procedures include decreased post-operative pain and narcotic requirements, shorter hospital stay, and lower morbidity from wound infection or incisional hernia. The risk of a malpositioned catheter in the preperitoneal fat pad is eliminated as the intraperitoneal contents are clearly identified.

According to Need for repeated surgeries in the present study, 8 patient in open group needed redo for once and 3 patients needed repeated surgeries for two times and one patient for 3 times. While in Laparoscopic group, Rate of repeated surgeries was lower, 2 patient needed redo for once and one patient

needed repeated surgeries for two times . There was a statistically significant difference between both groups according to Need for repeated surgeries ( $p = 0.031$ )

**Turner et al. (15)** reported on 111 patients who underwent laparoscopic insertion of the peritoneal catheter of an LP shunt over an approximately two-year period. The average follow-up period was 21.7 months. Average hospital stay was 1-2 day.

In our study we reported on 20 patients who underwent laparoscopic surgery of LP shunt over approximately two-year period. The average follow up period was 21.7 months .and average hospital stay was  $1.35 \pm 0.47$  day .

Lumbar shunts have been traditionally inserted into the peritoneum via a lateral minilaparotomy incision. We believe that inserting the peritoneal end of the catheter laparoscopically can decrease some of the complications associated with lumbarperitoneal shunting. The peritoneal end of the shunt can be placed under vision in an area free of adhesions or fat, theoretically reducing the incidence of early distal shunt obstruction.

The laparoscopic placement of lumbarperitoneal shunts is a safe and efficacious procedure with many advantages. The laparoscopic placement procedure should be particularly considered in obese and morbidly obese patients with IIIH. It shortens the length of the passer causing less damage on the skin and subcutaneous tissue and decreases the effort exerted by the neurosurgeon. Introduction of the laparoscope in LP shunts helps the patients to avoid repetition of surgery as the laparoscopist directs the catheter to the precise location away from any adhesions or in abdominal fat .It avoids slippage of peritoneal end as the surgeon puts it under visualization, unlike surgeons who put it blindly in the open method .It increases the patient satisfaction about the very small incisions which are cosmetically better than the incisions in open surgeries, which have higher risk of incisional hernia .It increases the surgeon's confidence about operating in patients with previous abdominal surgeries.

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