# A new modified technique in complicated umbilical hernia repair in patients with decompensated cirrhosis: a single center Experience

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**Background**
Patients with decompensated cirrhosis have a high incidence of abdominal wall hernias with a poor outcome after surgical management.
**Aim**
The aim was to evaluate the outcome of a new technique in the repair of complicated umbilical hernias in patients with decompensated cirrhosis.
**Patients and methods**
In all, 30 consecutive patients with decompensated cirrhosis underwent herniorrhaphy for complicated hernia and were randomized into two groups: group I ($n$=15) received the new technique: three-transverse-layer technique with regular paracentesis, first, 5–7 interrupted sutures without tie; second, continuous suture starting 3 cm lateral to the angles, third, tie the previous interrupted suture over the continuous tied suture, fourth, the third layer continuous suture to invaginate the previous sutures (using Proline 1/0 at all), fifth, regular paracentesis. Group II ($n$=15) received two continuous transverse-layer repair, first, suture started 1 cm lateral to the angle and then completed in a continuous manner till 1 cm after the second angle and tied; second, this was then followed by the second layer continuous suture to invaginate the previous sutures.
**Results**
Postoperatively, there were complications in 14 (46.67%) patients in the form of wound infection in three (20%) patients in group I and seven (46.67%) patients in group II with no statistical significance between both groups. Wound dehiscence occurred in five (33.33%) patients in group II only with statistical significance between both groups ($P<0.05$). Wound leakage also occurred in eight (53.33%) patients of group II with statistical significance between both groups ($P<0.05$). During the follow-up after 6 months and 1 year, the overall recurrence showed statistical significance regarding the new modified technique.
**Conclusion**
The new technique of hernia repair in patients with decompensated liver cirrhosis was associated with a significant reduction in wound ascitic leak, wound dehiscence, hospital stay, morbidity, and recurrence.

**Keywords:**
ascities, liver cirrhosis, recurrence, umbilical hernia

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## Introduction

In cirrhotic patients with ascites 20% has a high incidence of hernia existence which has a tendency to enlarge quickly [1]. In cirrhotic patients, the etiology of the hernia is complex including increased intra-abdominal pressure secondary to ascites that initiate protrusion of abdominal content through a potential defect mainly at the umbilicus [2]. Ascites is probably the major risk factor for developing occurrence in cirrhotic patients especially when associated with persistent ascites [3]. The other influential factor in hernia formation is hypoalbuminemia causing weakness of the abdominal muscle; in addition, the portal hypertension causes recanalization, dilatation, and formation of varices the umbilical veins in the umbilicus leading to weakness [4].

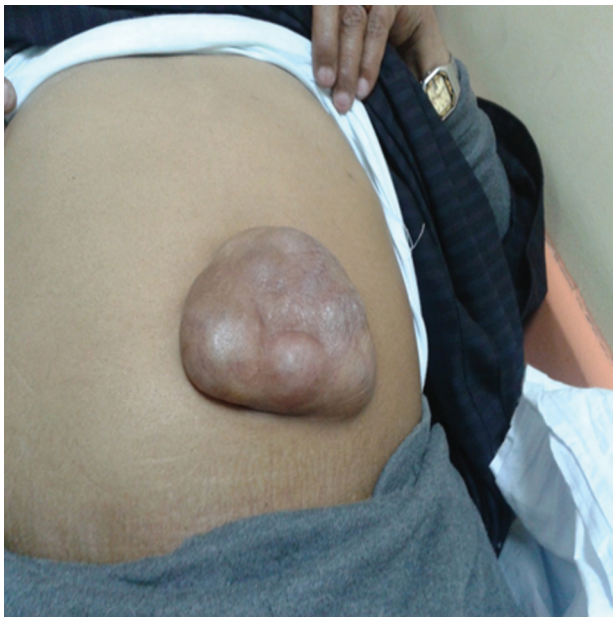
Herniorrhaphy in the past had a high rate of morbidity and mortality which correlated with the severity of liver dysfunction in cirrhotic patients [5], making the surgeons avoid to perform elective umbilical herniorrhaphy despite the operational simplicity [6].

The treatment of umbilical hernia in cirrhotic patients is controversial in the absence of prospective clinical trials and large comparative studies which has caused considerable debate in the existing literature regarding the management options [1]. In cirrhotic patients, hernia repair was performed only in patients with complicated hernias. The first step was conservative management, but this line of management is associated with elevated rate of complications, such as hernia incarceration, evisceration, ascitic leak, and peritonitis. It is clear that the early umbilical hernia repair in patients with decompensated liver is safer and can be considered for selected patients. This may avoid increased complication and death related to urgent hernial repair later on [7]. The aim of our study was to evaluate the outcomes following a new technique in the repair of complicated umbilical hernias in patients with decompensated liver diseases.

## Patients and methods

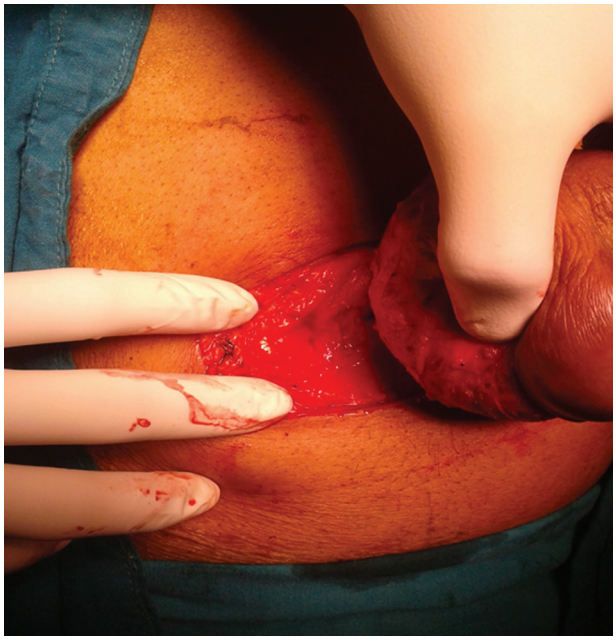
This prospective study was conducted in the Hepatopancreaticobiliary Surgery and Liver Transplantation Department, National Liver Institute, Menoufia University from January 2014 to January 2016. The research was conducted ethically in accordance with the http://www.wma.net/en/30publications/10policies/b3/index.html World Medical Association Declaration of Helsinki. The patients have given their written informed consent on admission and pre-operative to use their prospective data base and files for research work. The study protocol was approved by the National Liver Institute committee and review board (NLI: 23745). Consent: the work has been approved by the National Liver Institute ethical committees, in

**Figure 1**



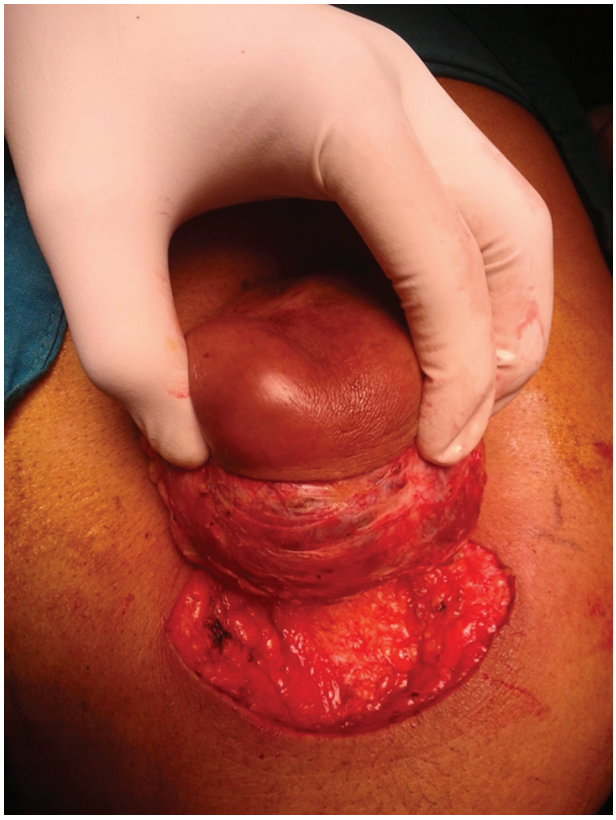
Multiloculated umbilical hernia.

**Figure 2**



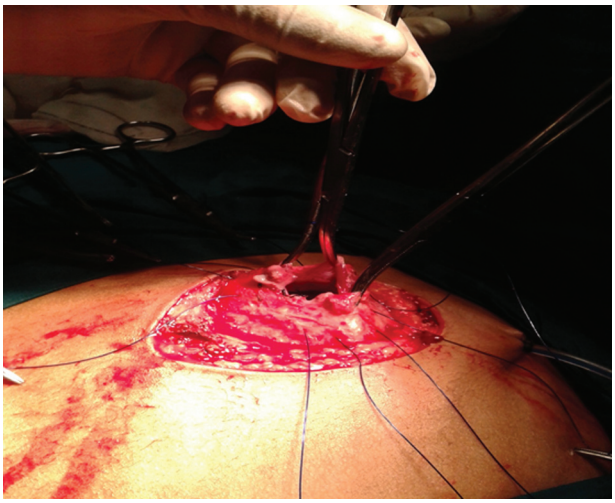
Elliptical (transverse) incision around the hernia.

**Figure 3**



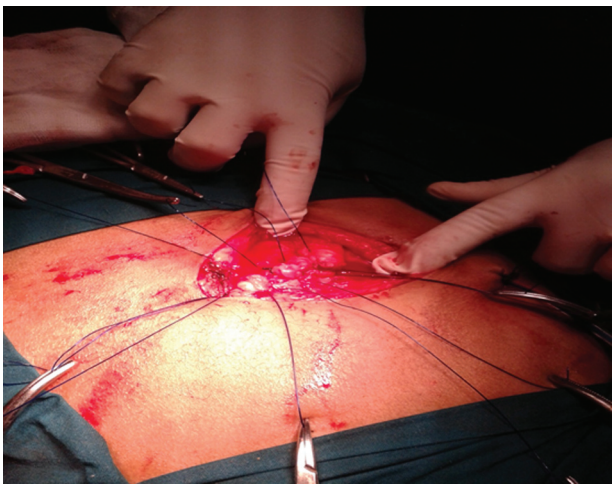
Dissection till the neck of the hernia.

**Figure 4**



Interrupted suture taken under vision with insertion of the peritoneal drain.

**Figure 5**



Continuous suture, 3 cm lateral to angles was done and will tie the previous interrupted suture over continuous tied suture.

which the study was performed and the patients gave informed consent to use their retrospectively collected data from files for study and research work. The editor in chief can access the consent any time when needed. The study included 30 consecutive patients with decompensated cirrhosis who underwent herniorrhaphy for emergency complicated umbilical hernia after anesthesia and sterilization (Figs. 1–5). Elliptical (transverse) incision will be done around the hernia and dissection continues until the neck and then the sac is cut open. Remove 3–4 l of ascitic fluid from the abdomen and then add 1 l warmish saline (temperature of saline is 18–20°) into the abdomen. The patients were randomized into two groups: group I underwent the new technique: three-transverse-layer technique with regular paracentesis through insertion

**Table 1 Demographic data**

| Items | Groups [*n* (%)] | | |
|---|---|---|---|
| | Group I | Group II | Total |
| Sex | | | |
| Female | 3 (20.00) | 3 (20.00) | 6 (20.00) |
| Male | 12 (80.00) | 12 (80.00) | 24 (80.00) |
| DM | | | |
| Negative | 12 (80.00) | 11 (73.33) | 23 (76.67) |
| Positive | 3 (20.00) | 4 (26.67) | 7 (23.33) |
| Smoking | | | |
| Nonsmoker | 13 (86.67) | 14 (93.33) | 27 (90.00) |
| Smoker | 2 (13.33) | 1 (6.67) | 3 (10.00) |
| Chest infection | | | |
| Negative | 14 (93.33) | 11 (73.33) | 25 (83.33) |
| Positive | 1 (6.67) | 4 (26.67) | 5 (16.67) |
| HCV | | | |
| Negative | 2 (13.33) | 2 (13.33) | 4 (13.33) |
| Positive | 13 (86.67) | 13 (86.67) | 26 (86.67) |
| HBV | | | |
| Negative | 12 (80.00) | 14 (93.33) | 26 (86.67) |
| Positive | 3 (20.00) | 1 (6.67) | 4 (13.33) |

DM, diabetes mellitus; HBV, hepatitis B virus; HCV, hepatitis C virus.

of a 16 F drain inside the abdomen ($n$=15): first, 5–7 interrupted sutures without tie, second, continuous suture starting 3 cm lateral to the angles, third, tie the previous interrupted sutures over the continuous tied suture, fourth, the third layer continuous suture to invaginate the previous sutures (using proline 1/0), fifth, during regular paracentesis 2–4 l daily (2 l/12 h) through peritoneal drains for at least 5 days with replacement by human albumin (20%, 50 ml) and fresh frozen plasma (1–2 U) to relive tension on the suture during the first week and convert the tense ascites into mild or moderate ascites. Group II: two continuous transverse layer repair ($n$=15): first, suture started 1 cm lateral to the angle, then completed in a continuous manner till 1 cm after the second angle and tied, second, the second layer continuous suture is to invaginate the previous one). Then two to three interrupted vicryle 2/0 subcutaneous stitches are given to cover the repair, and the skin sutured by transverse matters using Proline2/0. Postoperatively, the patients were followed for: first, early complications such as wound dehiscence and wound leak, grade of ascites, postoperative hematemesis, and hospital stay and second, late complications: recurrence after 6 and 12 months.

Statistical analysis was done by SPSS Statistical Software Package version 21 (SPSS Inc., Chicago, Illinois, USA). Tests such as $\chi^2$, Fischer's exact, and Monte Carlo exact tests were used. Values were considered statistically significant when the $P$ value was less than 0.05.

**Table 2 Preoperative laboratory data of patients in both groups**

| Items | Groups | | | |
|---|---|---|---|---|
| | Group I | | Group II | |
| | Range | Mean±SD | Range | Mean±SD |
| Age | 35–67 | 48.27±9.51 | 27–60 | 44.33±9.98 |
| Splenomegally | 15–20 | 17.27±1.44 | 13–19 | 15.53±1.73 |
| Bilirubin T | 0.9–4.3 | 2.28±1.11 | 0.9–3.2 | 1.99±0.75 |
| Bilirubin D | 0.3–3 | 1.17±0.98 | 0.3–2.1 | 1.13±0.59 |
| Serum albumin | 2.4–3.5 | 2.89±0.35 | 2.3–3.1 | 2.80±0.23 |
| PT | 45–80 | 57.53±7.79 | 46–70 | 58.40±7.20 |
| INR | 1.3–1.9 | 1.66±0.12 | 1.5–1.9 | 1.67±0.11 |
| HB | 7.7–12 | 10.42±1.13 | 9–11 | 9.97±0.53 |
| Platelet | 49–100 | 74.13±14.24 | 67–110 | 85.87±12.24 |
| TLC | 3–5 | 3.76±0.50 | 3–9 | 4.86±1.68 |
| Na | 125–132 | 128.80±2.34 | 123–132 | 128.20±2.54 |
| K | 3.2–4.3 | 3.99±0.31 | 3.9–5 | 4.34±0.46 |
| Urea | 18–55 | 33.67±9.61 | 22–65 | 38.13±13.22 |
| Creatinine | 0.9–2 | 1.35±0.32 | 0.9–2 | 1.47±0.38 |

HB, hemoglobin; INR, international normalized ratio; PT, prothrombin time; TLC, total leukocytic count.

**Table 3 Presentation of the hernia**

| Items | Groups [*n* (%)] | | | $\chi^2$ | *P* value |
|---|---|---|---|---|---|
| | Group I | Group II | Total | | |
| Presentation | | | | | |
| Irreducible | 5 (33.33) | 3 (20.00) | 8 (26.67) | | |
| Obstructed | 3 (20.00) | 2 (13.33) | 5 (16.67) | | |
| Rupture | 3 (20.00) | 6 (40.00) | 9 (30.00) | 2.267 | 0.687 |
| Huge multiloculated | 3 (20.00) | 2 (13.33) | 5 (16.67) | | |
| Leaking ascites | 1 (6.67) | 2 (13.33) | 3 (10.00) | | |

**Table 4 Liver decompensation**

| Items | Groups [*n* (%)] | | | $\chi^2$ | *P* value |
|---|---|---|---|---|---|
| | Group I | Group II | Total | | |
| Ascites | | | | | |
| Moderate | 3 (20.00) | 11 (73.33) | 14 (46.67 | 8.571 | 0.003 |
| Marked (tense) | 12 (80.00) | 4 (26.67) | 16 (53.33) | | |
| History of encephalopathy | | | | | |
| Negative | 12 (80.00) | 10 (66.67) | 22 (73.33) | 0.687 | 0.407 |
| Positive | 3 (20.00) | 5 (33.33) | 8 (26.67 | | |
| History of hematesis | | | | | |
| Negative | 12 (80.00) | 11 (73.33) | 23 (76.67) | 0.187 | 0.666 |
| Positive | 3 (20.00) | 4 (26.67) | 7 (23.33) | | |
| Upper endscopy (esophageal varices) | | | | | |
| Negative | 11 (73.33) | 12 (80.00) | 23 (76.67) | 0.187 | 0.666 |
| Positive | 4 (26.67) | 3 (20.00) | 7 (23.33) | | |

## Results

There were 30 patients included in this study who were divided in two groups 80% (24 patients) were men and 20% were women (six patients), with the overall mean age of the patients being 47 years, ranging from 27 to 67 years. Hepatitis C virus was shown to represent the most common cause of cirrhosis in both groups. Patients who had comorbidities for both groups are shown in Table 1. Table 2 showed the preoperative laboratory data.

Rupture umbilical hernia was the most common presentation in nine (30%) patients followed by irreducibility in eight (26.67%) with no statistical significance between the two groups (Table 3).

**Table 5 Postoperative wound complications**

| Postoperative wound complications | Groups [*n* (%)] | | | $\chi^2$ | *P* value |
|---|---|---|---|---|---|
| | Group I | Group II | Total | | |
| Wound infection | | | | | |
| Negative | 12 (80.00) | 8 (53.33) | 20 (66.67) | 2.400 | 0.121 |
| Positive | 3 (20.00) | 7 (46.67) | 10 (33.33) | | |
| Wound dehesinse | | | | | |
| Negative | 15 (100.00) | 10 (66.67) | 25 (83.33) | 7.938 | 0.005 |
| Positive | 0 (0.00 | 5 (33.33) | 5 (16.67) | | |
| Wound leakage | | | | | |
| Negative | 15 (100.00) | 7 (46.67) | 22 (73.33) | 14.067 | 0.000 |
| Positive | 0 (0.00) | 8 (53.33) | 8 (26.67) | | |

**Table 6 Hospital stay and outcomes**

| Items | Groups [*n* (%)] | | | *t* test | *P* value |
|---|---|---|---|---|---|
| | Group I | Group II | Total | | |
| Hospital stay | | | | | |
| Range | 3–19 | 9–18 | | | |
| Mean±SD | 6.53±3.96 | 12.80±3.00 | | –4.881 | 0.000 |
| Hospital morbidity | | | | | |
| Negative | 11 (73.33) | 5 (33.33) | 16 (53.33) | 4.821 | 0.028 |
| Positive | 4 (26.67) | 10 (66.67) | 14 (46.67) | | |
| Hospital mortality | | | | | |
| Negative | 15 (100) | 14 (93.3) | 29 (96.7) | 0.309 | |
| Positive | 0 (00 | 1 (6.67) | 1 (3.30) | | |
| Hematmesis postoperative | | | | | |
| Negative | 15 (100.00) | 12 (80.02) | 27 (89.98) | 11.157 | 0.001 |
| Positive | 0 | 3 (19.98) | 3 (10.03) | | |
| Amount of ascites | | | | | |
| No | 0 | 1 (6.67) | 1 (3.33) | | |
| Mild | 6 (40.00) | 0 (0.00) | 6 (20.00) | | |
| Moderate | 9 (60.00) | 7 (46.67) | 16 (53.33) | 19.659 | 0.000 |
| Marked | 0 | 7 (46.67) | 7 (23.33) | | |

All patients presented with liver decompensation in the form of ascites and the tense ascites was significant in group I vs group II ($P<0.05$), but there were no significant differences between both groups regarding the history of encephalopathy, history of hematemesis, or esophageal varices (Table 4).

Postoperatively, there were complications in 14 (46.67%) patients (more than one complications present in one patient) in the form of wound infection in three (20%) patients in group I and seven (46.67%) patients in group II with no statistical difference between both groups Wound dehiscence occurred in five (33.33%) patients in group II only with statistical difference between both groups ($P<0.05$). Wound leakage occurred in eight (53.33%) patients of group II with statistical difference between both groups ($P<0.05$) For the five patients with wound dehiscence in GII, three cases had pigtail insertion with conservative wound management and two cases needed reoperation for wound suture and insertion of intra-abdominal drain. Patients ($n=3$) (five patients had both wound dehiscence and leakage of ascites) with ascitic leakage in group II were treated by pigtail insertion with plasma (1 U), albumin (20%, 50 ml) infusion, and diuretics to control ascites. Postoperative hematemesis occurred in three (20%) patients of group II with statistical difference between both groups ($P<0.05$). So, hospital morbidity was statistically different between both groups ($P<0.05$). Also, there was a significant deference between both groups regarding the amount of ascites ($P<0.05$) due to regular paracentesis in group I. There was one hospital mortality in group II due to hepatic failure and severe sepsis with no statistical significance between both groups (Tables 5 and 6).

The mean hospital stay in group I was 6.53±3.96 (range: 3–19 days) while for group II it was 12.8±3 (range: 9–18 days) with statistical significance

**Table 7 Postdischarge recurrence and mortality**

| | Group I | Group II | *P* value |
|---|---|---|---|
| After 6 months | | | |
| Recurrence | | | |
| Yes | 0 | 3 (21.4) | 0.058 |
| No | 15 (100) | 11 (78.6) | |
| Mortality | | | |
| Yes | 0 | 1 (7.1) | 0.292 |
| No | 15 (100) | 13 (92.9) | |
| After 12 months | | | |
| Recurrence | | | |
| Yes | 1 (6.7) | 6 (42.9) | 0.023 |
| No | 14 (93.3) | 8 (57.1) | |
| Mortality | | | |
| Yes | 1 (6.7) | 2 (14.3) | 0.501 |
| No | 14 (93.3) | 12 (85.7) | |

($P<0.05$) between both groups due to increased morbidity in group II (Table 6).

During the follow-up after 6 months, there was no recurrence or mortality in group I but there were three recurrences and one mortality in group II with statistical significance ($P>0.05$). After the 1year follow-up, there was one recurrence and one mortality in group I and there were three recurrences and one mortality in group II with statistical significance ($P>0.05$). The overall recurrence showed statistical significance regarding the new modified technique (one patient,6.7%) in group I and six patients (42.9%) in group II with a *P* value of 0.023 (Table 7).

## Discussion

Umbilical hernia in cirrhotic patients with ascites has a propensity to enlarge quickly and become symptomatic [8]. The way of management of cirrhotic patients with umbilical hernia is debatable [9–12]. In the past, these patients were usually managed expectantly due to the elevated rate of complication and hernia recurrence [9,10]. In our study, there were 24 (80%) men and six (20%) women. Unlike the overall population, in which female gender and obesity are risk factors for umbilical hernia, umbilical hernias are more likely to occur in men with cirrhosis and ascites [1,8,13].

In this study, ruptured umbilical hernia was the most common presentation in nine (30%) patients followed by irreducibility eight (26.67%). De Goede and Belghiti and colleagues showed in their studies that individuals with elevated intra-abdominal pressure, such as in decompensated liver cirrhosis, umbilical hernia increases in size rapidly. Furthermore, ascites is also important in the development of complications in these patients [4,10]. Ascites may trigger hernia incarceration of the intestine or the omentum into a dense fibrous ring at the neck of the hernia [14–17]. Yu *et al.* [7] and Krawczyk *et al.* [16] showed in their studies that enormous increase of intra-abdominal pressure secondary to tense ascites may also cause pressure necrosis and perforation of the overlying skin followed by evisceration, leakage of ascitic fluid, and peritonitis. Acute umbilical hernia rupture in cirrhotic patients is uncommon, yet a potentially life-threatening complication [1].

In this study, postoperatively there were complications in 14 (46.67%) patients. Many published reports on patients with hepatic cirrhosis and ascites presenting with complicated umbilical hernias (including incarceration, strangulation, and rupture) evaluated postoperative morbidity to be as high as 71%, whereas the mortality rate varies from 60 to 80% after best supportive care and 6–20% after urgent surgical repair [15,18,19]. Cirrhotic patients who were operated for umbilical herniorrhaphy had elevated morbidity and mortality rates associated with severe liver dysfunction [3–5]. The potential complications include decompensation of liver disease, hepatic encephalopathy, hemorrhage, infection, hepatorenal syndrome, hepatopulmonary syndrome, and high hernia recurrence rate [11,12].

Our new technique has shown statistical difference regarding wound dehiscence and ascitic leak and postoperative hematemesis as our new technique in the closure of umbilical defect, besides lowering the intra-abdominal pressure by slowly advancing regular paracentesis through the insertion of a 16 F drain inside the abdomen for at least 5 days with replacement by human albumin and fresh frozen plasma every time when indicated. This is to relive the tension on the suture and allow wound healing during the first week and convert the tense ascites into mild or moderate ascites. Marsman *et al.* [11] stated that the effective treatment of ascites is the cornerstone for umbilical herniorrhaphy in cirrhotic patients have been demonstrated in the most studies. The effective control of ascites reduces complications, such as wound infection, evisceration, leakage of ascitic fluid from the wound, and peritonitis. Sodium restriction, diuretics, and paracentesis should be the first step in the medical management of ascites [10]. In patients with good control of ascites after medical treatment with no significant comorbidities, umbilical hernia repair is indicated; on the other hand, ascites drainage or shunting is indicated either before or at hernia repair

if there is uncontrolled ascites on medical treatment [5]. Presently, Slakey *et al.* [20] have suggested that intermittent paracentesis, temporary peritoneal dialysis catheter, or transjugular intrahepatic portosystemic shunt may be used. These procedures significantly reduce the incidence of hernia recurrence and wound dehiscence. The use of temporary peritoneal dialysis catheter at the end of umbilical herniorrhaphy has some advantages, such as effective ascitic control, reducing the complication rates of outpatient care during the postoperative period, and easy removal of the catheter. This agreed with the current modified technique as insertion of intraperitoneal drain making the control of ascites was effective.In the current study, the overall recurrence showed statistical significance regarding the new modified technique [one patient (6.7%) in group I and six patients (42.9%) in group II with a *P* value of 0.023]. The recurrence rate of umbilical hernia in cirrhotic patients with ascites ranges from 0 to 40% [8]. In the literature review, McKay *et al.* [6] identified only three retrospective studies comparing hernia recurrence in cirrhotic patients with and without control of ascites. The recurrence rate was 45% (22 of 49 patients) in the ascites uncontrolled group and 4% (six of 47 patients) in the controlled group. The authors concluded that uncontrolled ascites strongly correlates with umbilical hernia recurrence in cirrhotic patients. This agreed with our study as there is a statistically significant difference between group I and II regarding hernia recurrence with the new technique and controlled ascites after 6 months and 1 year with the *P* value being less than 0.05.

## Conclusion

The use of the new technique of hernia repair with regular paracentesis through peritoneal drains for at least 5 days was associated with a significant reduction in wound ascitic leakage, wound dehiscence, hospital stay, morbidity, and recurrence in patients with decompensated cirrhosis presenting with complicated abdominal hernias. A large prospective randomized study is needed to verify these initial results.

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**Conflicts of interest**

There are no conflicts of interest.

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