Repair of uncomplicated umbilical hernia in cirrhotic patients: experience of an institute

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Objective
The objective of this study was to present experience of a single institute in the management of uncomplicated umbilical hernia (UH) in cirrhotic patients.
Patients and methods
The study included 232 patients with UH: 103 patients class A, 83 Child–Pugh class B, and 46 Child–Pugh class C. Ascites was mild in 46 patients, moderate in 80 patients, and severe in seven patients, whereas 99 patients had no ascites. All patients underwent classic repair with proline mesh insertion if required.
Results
A total of 71 patients had direct defect closure and 161 patients had mesh repair. Operative time was significantly longer in class C patients than other classes and in patients of class B than class A. Peritoneal drainage was required in 109 patients with significantly higher frequency in class C. ICU admission was required in 33 patients with significantly higher frequency and longer duration in patients of class C. Duration of subcutaneous wound drainage was significantly longer, frequency of patients who developed short-term postoperative complications was significantly higher and hospital length of stay was significantly longer for patients of class C. During the follow-up for 23.2±7.9 months, 23 patients developed recurrent UH with significantly higher frequency in class C than other classes. Recurrence rate was significantly lower with mesh repair than direct closure (6.8 vs. 16.9%). During follow-up, 14 (6%) patients died secondary to causes not related to surgery with significantly higher in class C.
Conclusion
Elective UH repair in cirrhotic patients is feasible and is associated with acceptable rate of postoperative complications and no surgery-related mortalities. Mesh repair significantly reduced the recurrence rate. The pronounced outcome of patients of class A points to the necessity of early repair of UH to get the benefit of hepatic reserve and minimal volume of ascetic fluid.

Keywords:
cirrhotic patients, mesh repair, morbidities, mortalities, recurrence, uncomplicated umbilical hernia

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Introduction

The underlying etiologies for umbilical hernia (UH) development in cirrhotic patients include weakness of muscles of the anterior abdominal wall secondary to poor nutrition [1] and recanalized umbilical vein induces restoration of supraumbilical fascial defect [2]. In such patients' population, UH was exaggerated when longstanding ascites is present leading to increased intra-abdominal pressure. The high intra-abdominal pressures when applied to areas of parietal weakness causes hernia formation and/or enlargement [3].

Surgical repair of UH in ascetic patients is a challenge [4] with high anesthetic and surgical risk [5]. However, permanent mesh can be used in hernias in cirrhotic patients with minimal wound-related morbidity and a significantly lower recurrence rate (RR) [6,7]. Thus, the current study aimed to present the experience of a single institute in the management of uncomplicated UH in cirrhotic patients.

Patients and methods

The current prospective comparative study was conducted at the General Surgery Department, National Hepatology and Tropical Medicine Research Institute, Cairo, Egypt, since June 2012 till June 2016. The study protocol was approved by the Local Ethical Committee. Inclusion criteria included patients with varying degrees of liver dysfunction and presented with uncomplicated UH. Patients with complicated UH, compromised respiratory functions,

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or hernia at other abdominal wall orifices were excluded from the study. Patients fulfilling inclusion criteria or their near relatives signed fully informed written consent for study participation and undergoing the assigned surgical procedure.

All patients underwent clinical examination to assure diagnosis and inclusion criteria. Ascites was graded according to definitions of the International Ascites Club [8] as three grades (grades 1–3) according to the extent of ascites and the method for detection using ultrasound or clinical examination (Table 1).

Patients underwent preoperative estimation of serum albumin and total bilirubin levels and international normalized ratio, and then they were classified according to the Child–Turcotte–Pugh scoring system [9] into three classes: class A: 5–6 points, class B: 7–9 points, and class C: 10–15 points. The risk for developing 3-month mortality was calculated using the model for end-stage liver disease (MELD) score which is based on the etiology of cirrhosis and laboratory variables [10].

No special preoperative preparation was needed for class A cases. For patients of classes B and C, hepatic function support, control of ascites, and reduction of portal vein pressure reduction so as to allow class C patients to near class B level for safer elective surgery; on the other side, associated comorbidities were also controlled.

General anesthesia using sevoflurane was applied if general condition and results of liver function tests permit; otherwise, local infiltration anesthesia in conjunction with intravenous anesthetic infusion was used. All patients received prophylactic broad-spectrum antibiotic prior to skin incision. All patients were assigned for classic repair with proline mesh insertion according to requirement with wound drainage. Peritoneal drainage was provided if indicated to relieve abdominal pressure to allow wound healing.

Immediate postoperative (PO) care was conducted at postanesthetic care unit unless there is an indication for admission to ICU as delayed recovery, development of respiratory embarrassment, or if patient was preoperatively at risk of cardiac or cerebrovascular accident.

Collected operative data included operative time, amount of operative bleeding, the frequency of patients had mesh insertion, and if it was onlay or sublay, the frequency of peritoneal drainage. Immediate PO data included the frequency of ICU admission and length of stay (LOS). Short-term PO data included duration of wound drainage, frequency of patients developed wound infection, seroma and duration of peritoneal drainage. During follow-up for at least 6 months, the frequency of patients developed recurrence or other surgery-related morbidities and/or mortality were recorded.

Statistical analysis

The obtained data were presented as mean±SD, ranges, numbers, and ratios. Results were analyzed by one-way analysis of variance and χ^2-test using the SPSS (version 15, 2006; SPSS Inc., Chicago, Illinois, USA) for Windows statistical package. P value less than 0.05 was considered statistically significant.

Results

The study included 232 cirrhotic patients with UH; 103 (44.4%) patients were Child–Pugh (CP) class A, 83 (35.8%) patients were CP class B, and 46 (19.8%) patients were of CP class C. There was nonsignificant ($P>0.05$) difference between the studied patients as regards age, sex, and frequency of additional morbidities. Patients of class C had a significantly higher BMI compared with patients of class A ($P_1=0.001$) and class B ($P_2=0.004$) with significantly ($P_1=0.027$) higher BMI of patients of class B than class A. Patients of class A had a significantly ($P_1=0.001$) lower MELD score than patients of other classes with significantly ($P_2=0.001$) lower score of patients of class B than class C. A total of 91 (42.7%) patients had no ascites and all were of Child class A; 46 (19.8%) patients had mild ascites; 80 (34.5%) patients had moderate ascites; and only seven (3%) patients had

Table 1 Criteria and score points for calculation of Child–Pugh score [9]

Criteria	Scores (points)		
	1	2	3
Serum total bilirubin	<2 mg/dl	2–3 mg/dl	>3 mg/dl
Serum albumin	>3.5 g/dl	2.8–3.5 g/dl	<2.8 g/dl
International normalized ratio	<1.7	1.71–2.20	>2.2
Ascites	No	Controlled	Poorly controlled
Encephalopathy	No	Controlled	Poorly controlled

severe ascites. The frequency of patients had ascites grade 3 among patients of class C which was significantly (P_1 and P_2<0.001) higher compared with patients of class A (P_1<0.001) and class B (P_2<0.001) with significantly (P_1<0.001) higher frequency among patients of class B than class A. Details of enrollment data of studied patients are shown in Table 2.

A total of 118 (50.9%) patients received local anesthesia; 72 patients of class B and 46 patients of class C, whereas the other 114 (49.1%) patients received general anesthesia. Mean diameter of the umbilical defect, in its greatest dimension, was 3.5&#x00B1 range: 1–6 cm with significantly wider defect in patients of class C than patients of class A (P_1=0.002) and class B (P_2=0.047) and nonsignificantly (P>0.05) wider defect in patients of class B than patients of class A. Totally, 71 (30.6%) patients had anterior abdominal wall muscles of appropriate strength and small umbilical defects that allowed direct defect closure without the need for mesh application. The frequency of patients who required mesh repair was significantly higher among patients of class C compared with patients of classes A (P_1<0.001) and B (P_2<0.001) with significantly (P_1<0.001) higher frequency among patients of class B compared with class A. A total of 14 patients, nine of class B and five of class C, received sublay mesh insertion followed by muscle approximation, so as to minimize ascetic fluid loss; the frequency of patients required sublay mesh was significantly higher in patients of classes B and C than those of class A. A total of 147 patients received onlay mesh with a significantly higher frequency among patients of classes B and C compared with patients of class A (Fig. 1).

No patient of class A required peritoneal drainage, whereas 109 patients, 63 (75.9%) patients of class B and 46 (100%) patients of class C, required peritoneal drainage to lessen the intra-abdominal pressure so as to allow wound healing with significantly higher

Table 2 Patients' enrollment data

Data	CP classes			
	Class A (*n*=103)	Class B (*n*=83)	Class C (*n*=46)	Total (*n*=232)
Age (years)	46.5±10.9	50±11.5	46.8±11.3	48±11.3
Sex [*n* (%)]				
Males	68 (66)	56 (67.5)	31 (67.4)	155 (66.8)
Females	35 (34)	27 (32.5)	15 (32.6)	77 (33.2)
BMI data				
Weight (kg)	87±8.6	91.6±16.4	98.6±7.2	90.9±12.5
P value		P_1=0.027	P_1=0.001	
			P_2=0.004	
Height (cm)	169.7±3.5	170.2±3.3	169.9±3.1	169.9±3.3
BMI (kg/m^2)	30.2±2.6	31.7±5.9	34.2±2.4	31.5±4.2
P value		P_1=0.037	P_1=0.001	
			P_2=0.002	
MELD score				
Mean score	15.2±1.1	22.1±1.3	28.3±1.6	21.9±6.4
P value		P_1=0.001	P_1=0.001	
			P_2=0.001	
Ascites grade [*n* (%)]				
No	99 (96.2)	0	0	99 (42.7)
Mild (grade 1)	4 (3.8)	20 (24.1)	22 (47.8)	46 (19.8)
Moderate (grade 2)	0	63 (75.9)	17 (37)	80 (34.5)
Severe (grade 3)	0	0	7 (15.2)	7 (3)
P value		P_1<0.001	P_1<0.001	
			P_2<0.001	
Additional morbidity [*n* (%)]				
No morbidities	41 (39.8)	22 (26.6)	5 (10.9)	68 (29.3)
Diabetes mellitus	29 (28.2)	29 (34.9)	16 (34.8)	74 (31.9)
HR dysfunction	12 (11.7)	13 (15.7)	11 (23.9)	36 (15.5)
Cardiac disease	13 (12.6)	10 (12)	8 (17.4)	31 (13.4)
Malignancy	0	1 (1.2)	1 (13)	23 (2.2)

Data are presented as mean±SD; CP class, Child–Pugh class; HR dysfunction, hepatorenal dysfunction; MELD, model for end-stage liver disease; P_1, significant difference between patients of class A; P_2, significant difference between patients of class B; P>0.05, nonsignificant difference; P<0.05, significant difference.

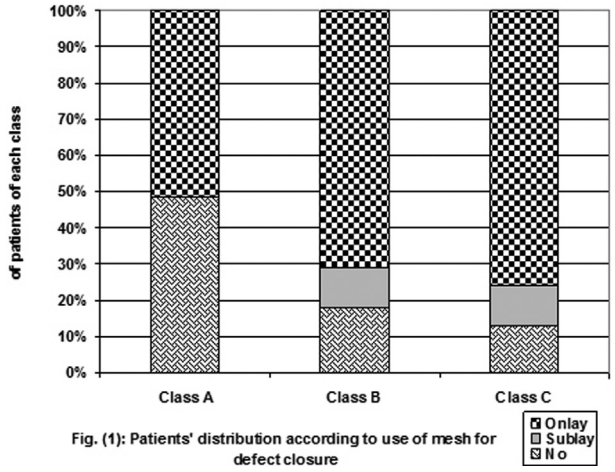
frequency of peritoneal drainage among patients of class C than patients of class B (P_2=0.0003).

The mean amount of operative blood loss was 177±42; range: 105–350 ml with nonsignificantly (P>0.05) higher amounts of blood loss in patients of class C than patients of the other classes. Mean operative time was 65.7±10; range: 45–90 min operative time was significantly (P_1 and P_2=0.001) longer for patients of class C compared with patients of the other classes and significantly (P_1=0.001) longer operative time in patients of class B than class A (Table 3 and Fig. 2).

Thirty-three (14.2%) patients required ICU admission for a mean duration of 2.3±0.7; range: 1–4 days. The frequency of ICU admission among patients of class C was significantly (P_2=0.0005) higher than patients of class B with nonsignificantly (P>0.05) longer duration of ICU stay (Table 4).

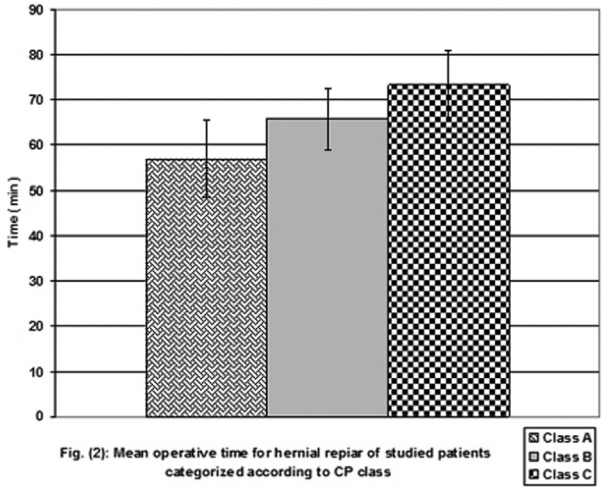
Mean duration of subcutaneous wound drainage was significantly longer in patients of class C compared with that of patients of class A, whereas in patients of class B, duration of wound drainage showed a

Figure 1



Patients' distribution according to the use of mesh for defect closure.

Figure 2



Mean operative time for hernial repair of studied patients categorized according to Child–Pugh class.

Table 3 Operative data of studied patients categorized according to Child–Pugh class

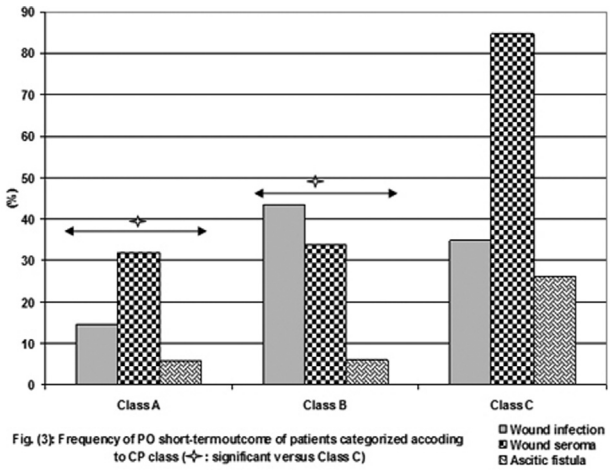
Data	Classes			
	Class A (n=103)	Class B (n=83)	Class C (n=46)	Total (n=232)
Mode of anesthesia				
General	103 (100)	11 (13.3)	0	114 (49.1)
Local	0	72 (86.7)	46 (100)	118 (50.9)
Diameter of umbilical defect (cm)	3.4±1.02	3.5±0.87	4±0.92	3.5±1
		P_1>0.05	P_1=0.002	
			P_2=0.047	
Mesh insertion				
No	50 (48.5)	15 (18.1)	6 (13)	71 (30.6)
Sublay	0	9 (10.8)	5 (10.9)	14 (6)
Onlay	53 (41.5)	59 (71.1)	35 (76.1)	147 (63.4)
			P_1=0.011	P_1=0.001
				P_2=0.003
Peritoneal drainage				
No	103 (100)	20 (24.1)	0	123 (53)
Yes	0	63 (75.9)	46 (100)	109 (47)
				P_2=0.0003
Amount of operative blood loss (ml)	170±39	184±47	192±43	177±42
Operative time (min)	57±8.7	65.9±6.8	73.2±7.8	65.7±10
		P_1=0.001	P_1=0.001	
			P_2=0.001	

Data are presented as mean±SD or n (%); P>0.05, nonsignificant difference; P<0.05, significant difference.

nonsignificant ($P>0.05$) difference compared with patients of other classes. A total of 129 (55.6%) patients developed short-term PO complications for a frequency of 1.4 complications per affected patient. The frequency of PO complications was significantly higher in patients of class C compared with patients of classes A ($P_1=0.001$) and B ($P_2=0.013$). Moreover, the frequency of PO complications was significantly ($P_1=0.001$) higher among patients of class C (1.46/patient) than patients of other classes (0.5/patient in class A and 0.68/patient in class B). On the contrary, the frequency of PO complications was nonsignificantly ($P>0.05$) higher among patients of class B than class A (Fig. 3). Mean hospital LOS was significantly longer for patients of class C compared with those of classes A and B (P_1 and $P_2=0.001$) with significantly longer duration for patients of class B ($P_1=0.001$) than patients of class A (Table 5).

Mean duration of follow-up was 23.2±7.9; range: 6–42 months with nonsignificant ($P>0.05$) difference between patients of the three classes. A total of 23 patients developed recurrent UH throughout follow-up period for a total RR of 9.9%. However, the frequency of recurrence was nonsignificantly higher

Figure 3



Frequency of postoperative short-term outcome of patients categorized according to Child–Pugh class (☆: significant vs. class C).

Table 4 ICU data of studied patients categorized according to Child–Pugh class

Data	CP classes			
	Class A (n=103)	Class B (n=83)	Class C (n=46)	Total (n=232)
Frequency of admission	0	13 (15.7)	20 (43.5)	33 (14.2)
P value			$P_2=0.0005$	
Duration of stay (days)	0	2.3±1	2.8±0.9	2.3±0.7
P value			$P_2>0.05$	

Data are presented as mean±SD or *n* (%); CP class, Child–Pugh class; P_1, significant difference between patients of classes A and B; P_2, significant difference between patients of classes A and C; P_3, significant difference between patients of classes B and C; $P>0.05$, nonsignificant difference; $P<0.05$, significant difference.

Table 5 Short-term postoperative data of studied patients categorized according to Child–Pugh class

Data	CP classes			
	Class A (n=103)	Class B (n=83)	Class C (n=46)	Total (n=232)
Frequency of peritoneal drainage	0	63 (55.6)	46 (100)	109 (47)
			$P_2=0.0003$	
Duration of wound drainage (days)	1.6±0.8	1.8±0.9	2.2±0.7	1.7±0.8
		$P_1>0.05$	$P_1=0.001$	
			$P_2>0.05$	
Wound infection	15 (14.6)	25 (43.4)	16 (34.8)	56 (24.1)
Wound seroma	33 (32)	28 (33.7)	29 (84.8)	100 (43.1)
Ascitic fistula	6 (5.8)	5 (6)	9 (26.1)	23 (9.9)
P value		$P_1>0.05$	$P_1=0.001$	
			$P_2=0.013$	
Frequency (complication/patient)	0.5	0.68	1.46	1.4
		$P_1>0.05$	$P_1=0.001$	
			$P_2=0.001$	
Total length of hospital stay (days)	2.4±0.6	2.9±0.7	6.2±0.8	3.3±1.6
		$P_1=0.001$	$P_1=0.001$	
			$P_2=0.001$	

Data are presented as mean±SD or *n* (%); CP class, Child–Pugh class; P_1, significant difference between patients of classes A and B; P_2, significant difference between patients of classes A and C; P_3, significant difference between patients of classes B and C; $P>0.05$, nonsignificant difference; $P<0.05$, significant difference.

among patients of class C compared with patients of classes A and B (P_1 and P_2 >0.05), with nonsignificantly (P_1>0.05) higher frequency of recurrence among patients of class B than patients of class A. Moreover, the RR was significantly (P=0.006) lower among patients who had mesh repair (6.8%) than those who had direct closure (16.9%) as shown in Fig. 4. Unfortunately, 14 patients died throughout the follow-up period for a frequency of 6%; but no patient died secondary to surgical complication. Mortality rate was significantly higher among patients of class C compared with patients of class A (P_1=0.002), but was nonsignificantly (P_2>0.05) higher compared with class B and nonsignificantly (P_1>0.05) higher mortality rate among patients of class B than class A (Table 6).

Discussion

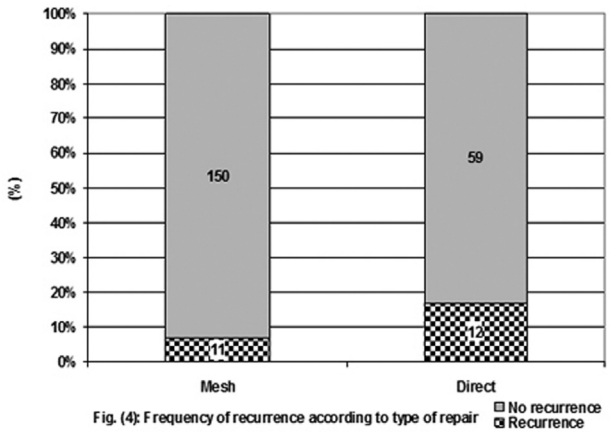
The current study included 232 cirrhotic patients presented with uncomplicated UH; to illustrate the outcome of surgical repair, patients were categorized according to Child–Turcotte–Pugh grading and the outcome for each class was illustrated and compared. In line with this, de Goede *et al*. [11] and Kotb *et al*. [12] documented that preoperative MELD and CP scores appeared to be predictive of PO risks in patients with liver cirrhosis who undergo nonhepatic surgery.

The frequency of patients had ascites grade 3 was significantly higher among patients of class C than patients of other classes and this was reflected clinically as significantly higher BMI and wider umbilical defect and could define a relation between ascetic fluid volume and severity of heniation; similarly Wang *et al*. [13] reported that the volume of ascites and CP scores had positive correlations with UH.

A total of 23 (9.9%) patients developed recurrent UH with significantly higher RR among class C patients than patients of other classes and among patients who had direct closure (16.9%) versus patients who had mesh repair (6.8%). In support of these data, Youssef and El Ghannam [14] reported an RR of 10% with mesh repair and 35% with direct repair of UH in ascetic patients. Besides, Eker *et al.* [15] reported an RR of 7% after UH repair. Recently, Winsnes *et al.* [16] reported cumulative RR of 8.4% and Coelho *et al.* [17] found hernia repair with mesh is associated with lower RR than direct repair of UH in a cirrhotic patient.

The mean operative time (65.7±10 min) was significantly longer for patients of class C compared with patients of the other classes with significantly longer operative time in patients of class B than class A. In line with this finding, Hassan *et al.* [18] studied 70 cirrhotic patients who underwent elective sublay UH mesh repair and reported a mean operative time of 67.45 min. Besides, Kotb *et al*. [12] reported significant difference in operative time among patients of the three CP classes and was longest in group C when compared with the other two groups.

Figure 4



Frequency of recurrence according to the type of repair.

Table 6 Follow-up postoperative data of studied patients categorized according to Child–Pugh class

Data	CP class			
	Class A (n=103)	Class B (n=83)	Class C (n=46)	Total (n=232)
Duration (months)	23.8±8.1	22.4±7.2	22±8	23.2±7.9
Recurrence				
Frequency	8 (7.8)	7 (8.4)	8 (17.4)	23 (9.9)
P value		P_1>0.05	P_1>0.05 P_2>0.05	
Mortality				
Frequency	2 (1.9)	5 (6)	7 (15.2)	14 (6)
P value		P_1>0.05	P_1=0.002 P_2>0.05	

Data are presented as mean±SD or n (%); CP class, Child–Pugh class; P_1, significant difference between patients of classes A and B; P_2, significant difference between patients of classes A and C; P_3, significant difference between patients of classes B and C; P>0.05, nonsignificant difference; P<0.05, significant difference.

Short-term PO complications were reported in 129 patients for a frequency of 1.4/patient with significantly higher frequency of PO complications and significantly higher frequency per patient in class C than in classes A and B. Similarly, Youssef and El Ghannam [14] reported early PO ascitic fluid leakage in 15%, and mild superficial wound infection in 25% of patients had mesh repair, whereas in patients who had direct repair ascitic leakage occurred in 30% and wound infection in 15%. Besides, Choi *et al*. [19] and Lasheen *et al*. [20] reported an overall complication rate of 42 and 30%, respectively, after elective repair of UH in ascetic patients.

On contrary to these results, Hassan *et al*. [18] reported wound infection in 2.8%, seroma in 4.2%, ascitic fistula in 1.4%, and recurrence in 1.4% of patients and Kotb *et al*. [12] reported no recurrence, no morbidities after a 6-month follow-up; however, such discrepancy could be attributed to their small sample size (n=70 and 40 patients, respectively) and short duration of follow-up (6 months).

The mean hospital LOS was significantly longer for patients of class C compared with those of classes A and B with significantly longer duration for patients of class B than class A. Similarly, Kotb *et al*. [12] reported significant difference in hospital stay among patients categorized according to CP classes.

During follow-up, 14 (6%) patients died secondary to causes unrelated to surgery with significantly higher mortalities among patients of class C. In line with the reported figure, Eker *et al*. [15] and Choi *et al*. [19] reported a mortality rate of 7 and 6.2%, respectively, after elective UH repair in patients with liver cirrhosis. Similar to the obtained results, Kotb *et al*. [12] and Eker *et al*. [15] reported no surgery-related mortality in their series of ascetic patients underwent UH repair.

One point of discrepancy in the literature is to operate or not on UH in cirrhotic patients especially if ascetic; the current study illustrates the beneficial outcome of hernial repair of uncomplicated UH, irrespective of the severity of hepatic derangement as judged by preoperative investigations and clinical evaluation and expressed as CP class and allow rejecting the traditional concepts regarding operative decision in cirrhotic patients especially if ascetic. In support of such opinion, multiples previous studies [18,19,21–24] have documented that early repair of UH in cirrhotic patients is safer than it was in the past and can be considered for selected patients to safeguard against the increased morbidity and mortality associated with urgent repair later on.

Conclusion

The obtained results and review of literature allowed to conclude that elective UH repair in cirrhotic patients is feasible and is associated with acceptable rate of PO complications and no surgery-related mortalities. Mesh repair improves outcome as significant reduction of RR. The pronounced outcome of patients of class A points to the necessity of early repair of UH to get the benefit of hepatic reserve and minimal volume of ascetic fluid. However, there was no definite contraindication for repair of UH in patients of classes B and C and PO peritoneal drainage helps healing of the repair site.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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