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ELECTIVE MESH CONE AND COVER (C&C) REPAIR OF UMBILICAL HERNIA IN PATIENTS WITH CIRRHOTIC LIVER AND ASCITES.

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Background: ***The policy of elective repair of umbilical hernia in cirrhotic ascitic patients has long been a subject of debate. Also, little is known about the mesh repair of umbilical hernia in those patients. The aim of this work was to evaluate the applicability and the outcome of elective mesh cone and cover repair besides, the perioperative management of ascitis.***

Patients and Methods: ***This non-randomized prospective controlled study included 65 cases of umbilical hernia with a small defect in ascitic patients due to liver cirrhosis, divided into 2 main groups (GI,n=30 & GII,n=35). Patients in both 2 main groups were divided into 3 subgroups. In the first subgroups (GIa,n=5 & GIIa,n=6), patients had mild ascites. Those with moderate and tense ascites were included in the second and third subgroups (GIb,n=18 & GIIb,n=20) & (GIc,n=7 & GIIc,n=9) respectively. After proper control of ascites in both groups, patients in GI were subjected to elective umbilical hernia mesh repair using cone and cover (C&C) technique. In GII, hernias were managed conservatively and operations were only done on an emergency base using conventional repair. Patients were followed up for 2 years.***

Results: ***In GI, no operative mortality was recorded. Transient early postoperative ascitic fluid leakage occurred in 3 (10%) cases, and mild superficial wound infection in 3 (10%) more cases. There was only one case of hernia recurrence in GIc. In GII, unrepaired umbilical hernia showed incarceration in 5(17.24%) cases with 60% operative mortality, rupture in 5(17.24%) cases with 80% operative mortality, and skin pigmentation and ulceration in 14(48.28%) cases. The overall major umbilical complications in GII was 34.38%, significantly higher than in GI (3.7%) with p=0.003. The avoidance of the hernia complications related deaths in GI affected its 2 year survival (62.96%) which was considerably higher than in GII (41.38%) with p=0.1.***

Conclusion and Recommendations: ***Elective mesh cone and cover (C&C) technique with proper management of ascites could be proposed as a safe and effective procedure in repair of umbilical hernia with small defect in cirrhotic ascitic patients.***

Key words: umbilical, hernia, cirrhosis, ascites, mesh, repair, cone, cover.

INTRODUCTION

Umbilical hernias are known to occur more frequently among patients with hepatic cirrhosis and ascites[1]. These hernias are liable to complications in the form of incarceration [2,3], ascitic fluid leakage and rupture with or without evisceration[4] which need an emergency operation with a high recurrence rate[6] and significant risk of morbidity and even mortality [1,4,5].

The policy of elective repair of the uncomplicated umbilical hernia in cirrhotic patients with ascites to obviate the risky emergency operation has long been a subject of debate [5,6,7]. Some authors recommended conservative treatment for uncomplicated umbilical hernia in those patients including local support and protection of skin, reserving emergency surgical repair for complicated hernia[8]. This concept reflects the disappointing results of a high incidence of operative mortalities [2,3], postoperative

leakage; poor wound healing and hernia recurrence[6]. Other investigators stated that elective umbilical hernias repair may be indicated to prevent their complications and to obviate the risky emergency operation [5,9,10].

In addition, little is known about the use of mesh in repair of umbilical hernia in patients with hepatic cirrhosis and ascites as a trial to decrease its recurrence.

The aim of this study was to evaluate the role of elective repair of umbilical hernia in cirrhotic ascitic patients to avoid the risky emergency operation. Also, to assess the applicability and the outcome of mesh cone and cover repair of umbilical hernia with small defect, besides the perioperative management of ascites in those patients.

PATIENTS AND METHODS

This non-randomized prospective controlled study included 65 cases of umbilical hernia in patients with hepatic cirrhosis and ascites. Hernias in this study were non-complicated with small defects of about one inch in diameter or less. All patients were under variable doses of diuretic therapy. Patients who accepted to undergo elective hernia repair using the technique of this study were included in the first group (GI,n=30) after giving an informed consent. The remaining patients were included in the second group (GII,n=35). According to the degree of ascites that determined using both clinical and ultrasonographic examination, patients in the 2 main groups were divided into 3 subgroups. In the first subgroups (GIa,n=5&GIIa,n=6), patients had minimal to mild ascites. Those with moderate and tense ascites were included in the second and third subgroups (GIb,n=18&GIIb,n=20)& (GIc,n=7&GIIc,n=9) respectively.

All patients in this study were subjected to history taking, general and local examinations and conventional biochemical laboratory investigations. Electrocardiogram (ECG), abdominal ultrasonography, and upper GIT endoscopy were also done (Table 1).

In patients with history suggestive of spontaneous bacterial peritonitis (SBP) or by exa,mination suspected to have it, ascitic fluid samples were taken for detection of polymorphonuclear leukocyte (PMN) count, aerobic and anaerobic cultures and estimation of ascitic fluid protein concentration. Ascitic fluid was inoculated into blood culture bottles at the bedside[11,12].

Exclusion criteria included patients with abdominal malignancy, spontaneous bacterial peritonitis (SBP), history of hepatic coma and recent history of bleeding esophageal or gastric varices.

• THE FIRST GROUP (GI,n=30):

Patients in this group were subjected to elective mesh cone and cover repair after proper preoperative preparations.

Preoperative Preparations

The management of ascites started with salt restriction (88 mmol/day = 2,000 mg/day) and oral diuretics {100-400 mg spironalactone (Aldactone A, Kahira/Searle) and 40-160 mg frusemide (Lasix, Hoechst)} were given as single morning doses. Follow up of the treatment was done by daily body weight, abdominal girth, 24 hours urinary output, serum sodium (Na^+)& potassium (K^+) and 24 hours urinary Na^+ excecretion. Paracentesis was used only in diuretic resistant cases (refractory ascites) as needed every 2 weeks[13]. Post-paracentesis albumin infusion was only adopted for paracentesis of >5L as 10g/liter of fluid removed[13]. In this study, patients would be legible for operation when the ascites was minimal and the serum albumin more than 2.5 g/dl. All patients received intravenous (IV) 2 gm cefotaxime (Claforan, Hoeckest) antibiotic just before induction of anaesthesia to be continued for 5 days postoperatively.

**** Anaesthesia:-***

All surgeries were arranged to be carried out under local anaesthesia using lidocaim hydrochlorid (Xylocaine, Astra, Sweden) with a maximum dose as 5 mg/kg. If the cardiovascular condition did not preclude its use, the addition of 1:200,000 epinephrine (Epinephrine, Misr, ARE) serve to intensify and prolong the action of local anaesthetic with increasing its maximum dose to be 7 mg/kg[14]. Patients sedation may be needed in addition to local anaesthesia for some anxious cases. General anaesthesia was only needed if the patients could not withstand operation under local anaesthesia and sedation, or if the dose of local anaesthesia was expected to exceed the safe therapeutic value, as in the presence of associated epigastric hernia.

**** Operative Technique (Figs.:1-6):-***

A small subumbilical curved incision (about 4 cm in length) was done. Meticulous dissection of the hernial sac until its neck proper was clearly identified. The aponeurotic fascia was cleared about 2 cm around the hernial defect. The fundus of the sac was meticulously dissected off the skin. Usually the sac was adherent to the skin and its dissection resulted in a tear which needed closure with 2/0 polyglactic acid (Vicryl, Eticon LTD) stitch. In all cases, ascitic fluid samples were taken for PMN count and culture.

A cone was fashioned of polypropylene (Prolene, Eticon Inc) mesh, so as its base circumference was a little bit

larger than that of the defect. The shape of the cone was maintained using a 2/0 polypropylene (Prolene, Eticon LTD) stitch midway between its tip and base. A second stitch was taken near the cone tip after its invagination for 3-4 mm to make it more blunt. The handle of the non-toothed forceps was introduced into the cone which was applied to invaginate the sac so that the margin of the cone base was opposite the edge of the hernial defect. The margin of the cone was stitched to the edge of the hernial defect using interrupted 2/0 Prolene . A square mesh patch was tailored to cover the cone and 1-2 cm area of the aponeurotic fascia surrounding the hernial defect. The patch was secured to the fascia using 2/0 Prolene stitches.Haemostasis was revised again and the center of the deep surface of umbilical skin was stitched to the fascia and its mesh cover to get the umbilicus inverted. No drain was used in this procedure. Skin closure was done using interrupted mattress 2/0 Prolene stitches and a tight compressing dressing was applied.

Postoperative Follow Up:-

Parentral IV cefotaxime (Claforan, Hoeckest) antibiotics was continued for 5 days postoperatively at a dose of 2 gm/8 hours. In cases with positive intraoperative ascitic fluid culture, antibiotics was continued for 10 days postoperatively followed by long term oral ciprofloxacin ` 750 mg/week as a prophylaxis[15]. Prophylactic oral antibiotics was also prescribed if the ascitic fluid protein concentration was<1 gm%[16]. At any time after operation, prophylactic intravenous antibiotics was given at a dose of 2 gm/8 hours for 5 days if varicial bleeding occurred in all cases[17]. Ascites was observed regarding its control and early detection and management of bacterial peritonitis. The hernial repair was followed up to detect any complication as leakage, infection or recurrence. Clinical examination and investigations were carried out regularly to follow up the patient general condition particularly those related to liver and kidney insults.

- ***The Second Group (GII,n=35):***

In this group (GII), the ascites control and the antibiotics regimen were the same as in GI. The patients were followed up at regular intervals with special attention to diagnose and manage the hepatorenal insults and bleeding esophageal varices. Conservative management of the uncomplicated umbilical hernia including local support and protection of skin[8]. Conventional surgical repair was only done for complicated hernia with incarceration or rupture.

Statistical Analysis

Statistical analysis was performed by the unpaired "student's" t test, and $x^{(2)}$ test. P value < 0.05 was considered significant.

RESULTS

The initial demographic and preoperative data were found to be almost equally distributed among patients in the 2 main groups and their subgroups of this study (Table 1).

It was observed that the majority (73.2%) of cases of umbilical hernia in ascitic patients admitted to the medical department in Theodor Bilharz Research Institute had a small defect. The small size defect was more found in mild and moderate ascites than in tense ascites. In patients excluded preoperatively from the study due to SBP, the ascitic fluid sample revealed that the PMN count was ≥250 cells /mm^3, and its fluid culture was positive.

- ***The results in the first group (GI,n=30):***

In this group, 26 out of the 30 patients (86.7%) responded well to salt restriction and diuretic therapy preoperatively. In the the remaining 4 resistant cases (13.3%), the 24 hours urinary sodium excretion was less than 78 mmol and therapeutic paracentesis was resorted to on a regular base every 2 weeks. Postoperatively, all patients who attended the 2 years follow up were regular in their ascites treatment except one case in GIc who lost several settings of pracentesis. It was obviously noticed that the dose of diuretics was needed to be increased and the paracentesis required to be more frequent in refractory cases during the first 4 weeks postoperatively. Intraoperative ascitic fluid sample revealed PMN count less than 250 cell/mm^3 and negative culture in all cases included in this group. The ascitic fluid protein concentration in only 2 (6.67%) cases were less than 1 g%. The later 2 cases were in GIc and they received postoperative prophylactic oral ciprofloxacin at a dose of 750 mg/week for life.

Local infiltration anaesthesia alone was efficient in 18 (60%) cases in this study. In 9 (30%) more cases, sedation was needed in addition to local anaesthesia due to their irritability. The remaining 3 (10%) cases underwent the operation under general anaesthesia due to associated epigastric hernia in 2 cases and severe patient irritability in the third case.

The operating time ranged from 45 to 65 minutes with a mean of 54.83±8.5 minutes in cases with single umbilical defect. In the 2 cases with double hernias, the operating times were 110 and 125 minutes.

No operative mortality was reported in this group. There were early minor postoperative complications in the form of negligible transient ascitic leak in 3 (10%) cases and mild superficial wound infection in 3(10%) more cases. It was found that these minor complications occurred mainly in GIc. Ascitic fluid leak occurred during the first 3 days

postoperatively which responded well to compressing dressing and IV antibiotics. Wound infections were found one week after operation which was managed by repeated dressing and IV antibiotics.

Postoperative follow up in this group (GI) ranged from 4 month to 2 years. Only 3 (10%) patients (1 in GIa& 2 in GIb) were lost follow up. Of the remaining 27 (90%) patients, 17 (62.96%) survived to the end of the follow up. The survival rates were greatly variable among patients in the 3 subgroups included in GI. They were 100% (4 out of 4) in group Ia and 81.25%(13 out of 16 cases) in group Ib, while non (0%) of the 7 patient in group Ic were alive at 2 years (Table, 3). Non of the deaths reported in GI could be attributed to the hernial repair.

In this group (GI), the overall recurrence of umbilical hernia occurred in only one (3.7%) case out of 27 cases attended the 2 years follow up. This case was found in GIc after 6 months and supposed to be attributed to improper postoperative control of ascites and/or poor healing power (Table, 3). In this case the mesh was removed and a conventional repair was carried out. This patient died 4 months later due to hepatorenal failure.

Bleeding esophageal varices occurred in 9 out of the 27 cases (33.33%) who attended the 2 years follow up in this group, of them 3 (33.33%) died due to failure to control bleeding (Table, 3).

•The results in the second group (GII,n=35):

In the second group, 30 out of 35 patients (85.7%) responded to salt restriction and diuretic therapy during the first 5 months follow up. The remaining 5(14.29%) cases needed paracentesis at an intervals ranged between 2 and 4 weeks. Two cases of them had an ascitic fluid protein concentration less than 1g% and received prophylactic oral ciprofloxacin at a dose of 750 mg/week for life. There was no statistical significant difference in number of patients responded to diuretic therapy in both groups in this study (p=0.8)

The follow up duration in this group ranged from 5 months to 2 years. Six out of the 35 patients (17.14%) were lost follow up (2 in GIIa and 4 in GIIb), (Tables,2&3). The percentage of the remaining patients, 82.86% (29), who attended the follow up were less than that in GI, although the difference was statistically non significant (p=0.64) but the patients in GII were not as quite regular as those in GII in the term of their hospital visits.

Incarceration and rupture, the major local umbilical hernia complications in GII, occurred in 10 out of 29 (34.48%) compared with single case (3.7%) of umbilical hernia recurrence in GI (Tables,2&3). The difference was statistically significant with P=0.003. In GII, incarceration which required emergency operation occurred in 5 (17.24%) cases, of them 3 (60%) died during the first postoperative week. Five patients (17.24%) had ruptured hernia, to whom emergency surgery was done with 4(80%) cases operative mortality owing to severe peritonitis and septicemia. There was no hernia recurrence in the remaining 3 survived cases. In this group, skin changes occurred in 14(48.28%) cases in the form of discoloration and ulceration. Ulceration of umbilical skin preceded all cases of rupture while skin discoloration followed all cases of incarceration. Umbilical hernia skin pigmentation occurred in the remaining 4 cases without rupture or incarceration (Table 2).

In this group, bleeding esophageal varices occurred in 9 (31.03%) cases, of them 5 (55.6%) died of uncontrolled bleeding (Table 3). The higher incidence of bleeding esophageal varices in GI than in GII in this study was statistically non significant (p=0.85). In the meantime, the lower incidence of bleeding control in GII was non significant compared with GI (p=0.64).

At the end of the 2 years follow up, 12 out of the 29 patients (41.38%) in this group were alive. They were 2 out of 4 in GIIa, 10 out of 16 in GIIb, while non of the 9 patients in GIIc were alive at the end of follow up (Table 3). The rate of survival in this group was much lower than that in the first group (62.96%) although the difference was statistically non-significant (p=0.1). The higher mortality rate in GII might be due to the more major complications of the unrepaired umbilical hernias. The relatively longer life expectancy in GI seemed to increase the incidence of deaths of hepatic coma in this group (p=0.64), (Table 3).

Table (1): ***The initial demographic and preoperative data of the patients included in the study.***

	Groups					
	Group I (GI,n=30)			*Group II (GII,n=35)*		
	Mild ascites (GIa,n=5)	*Moderate ascites (GIb,n=18)*	*Tense ascites (GIc,n=7)*	*Mild ascites (GIIa,n=6)*	*Moderate ascites (GIIb,n=20)*	*Tense ascites (GIIc,n=9)*
-number of cases.	5	18	7	6	20	9
-Sex (*male : female*)	3:2	12:6	5:2	4:2	13:7	6:3
-Age (*mean ±SD*)	38.9±10.2	40.3±11.1	48.3±10.8	39.3±12.1	41.3±10.2	44.1±12.3
-C.B.C :						
Hgb (gm/dl)	11.9±2.1	10.1±2.4	8.4±2.1	11.7±2.3	10.6±2.6	9.1±2.4
RBC (x 10^6)	4.5±0.8	4.1±0.7	3.8±0.6	4.3±0.9	4.2±0.8	3.7±0.5
W.BC (x 10^3)	7.8±1.6	8.3±1.8	5.4±1.7	7.2±1.8	8.1±2.4	5.8±2.1
Platelets x 10^3	200±60	152±50	100±40	210±70	149±52	104±42
- Proth . conc %	60.2±10.1	52.8±8.2	52.6±9.1	62.8±11.2	54.4±7.2	51.4±8.4
-S. albumim *(g/dl)*	3.8±0.8	2.6±0.6	2.1±0.3	3.6±0.9	2.5±0.5	2.3±0.4
-S. creatinine*(mg/dl)*	1.3±0.2	1.5±0.2	1.7±0.3	1.2±0.3	1.6±0.3	1.8±0.5
-S. bilrubin *(mg/dl)*	1.5±0.4	2.6±1.6	5.8±2.2	1.4±0.3	2.5±1.4	5.1±2.5
-ALT *(units/L), n=0-45*	48±15.5	98±13.2	122±14.3	42±14.2	96±16.4	112±16.2
-AST *(units/L), n=10-40*	46±13.5	82±12.6	102±13.1	43±12.4	84±14.2	107±14.6
-S. sodium *(mmol/L)*	134.5±2.5	132.2±2.2	130±2.4	135.1±2.6	133.4±2.4	129±2.2
-S. potassium*(mmol/L)*	4.5±1.5	4.6±1.2	4.6±1.4	4.4±1.6	4.5±1.4	4.7±1.8
-Ultrasonography :						
Ascites	Mild	Moderate	Tense	Mild	Moderate	Tense
Cirrhosis	2	7	2	2	8	3
Mixed	3	11	5	4	12	6
-Esoph. Varices	2	12	5	2	13	7
-Child class (A:B:C)	4:1:0	2:15:1	0:0:7	5:1:0	2:17:1	0:0:9

- *Age=mean(in years) ± standard deviation (SD)*
- *Numbers indicated for laboratory estimation are mean values ± SD*

Table(2): ***Local complications of umbilical hernia in the second group (GII).***

	Mild ascites (GIIa,n=6)	*Moderate ascites (GIIb,n=20)*	*Tense ascites (GIIc,n=9)*	*Total*
- Follow up	4	16	9	29(82.86%)*
- Incarceration	1[1]^d	2[1]^d	2[1]^d	5(17.24%)**
- Rupture	Nil	3[2]^d	2[2]^d	5(17.24%)**
- Skin	2	8	4	14(48.28%)**

( ) * = percentage of the total number of this group (35 patients).

( )** = percentage of the patients survived in this group (29 patients).

[ ]^d = number of deaths

Table(3) ***:The outcome during the 2 years follow up in the study .***

	Groups							
	Group1 (GI,n=30)				*GroupII (GII,n=35)*			
	GIa	GIb	GIc	Total	GIIa	GIIb	GIIc	Total
Follow up	4	16	7	27(90%)*	4	16	9	29(82.86%)*
Recurrence of hernia	Nil	Nil	1	1(3.7%)**	Nil	Nil	Nil	Nil
Bleeding varices	1	4[1]^{d}	4[2]^{d}	9(33.33%)**	Nil	4[2]^{d}	5[3]^{d}	9(31.03%)**
Survivors (2 years)	4	13	Nil	17(62.96%)**	2	10	Nil	12(41.38%)**
Mortalities (2 years)	Nil	3	7	10(37.04%)**	2	6	9	17(58.62%)**
Cause of death:								
Incarceration	*Nil*	*Nil*	*Nil*	*Nil*	*1*	*1*	*1*	*3=(17.65%)****
Rupture	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*2*	*2*	*4=(23.53%)****
Bleeding	*Nil*	*1*	*2*	*3=(30%)****	*Nil*	*2*	*3*	*5=(29.41%)****
Hepatic coma	*Nil*	*1*	*5*	*6=(60%)****	*Nil*	*1*	*3*	*4=(23.53%)****
Cardiac	*Nil*	*1*	*Nil*	*1=(10%)****	*1*	*Nil*	*Nil*	*1=(5.88%)*****

( )*percentage of the all patients included in GI(n=30)&GII(n=35)

( )** percentage of the patients attended the 2 years follow up GI(n=27)&GII(n=29)

( ) percentage of the patients died during the 2 years follow up GI(n=10)&GII(n=17)***

[ ]^{d} number of deaths due to uncontrolled bleeding varices

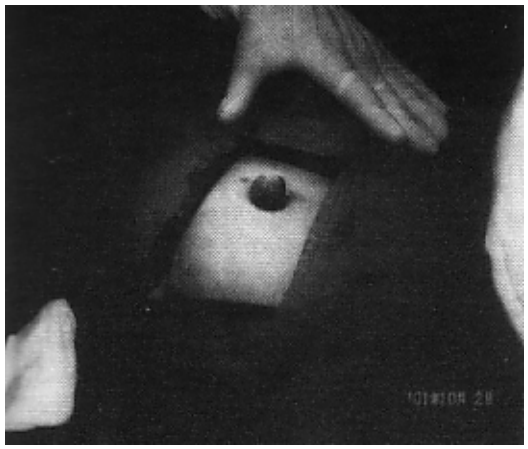

Fig (1): Umbilical hernia in patient with mild ascitis.

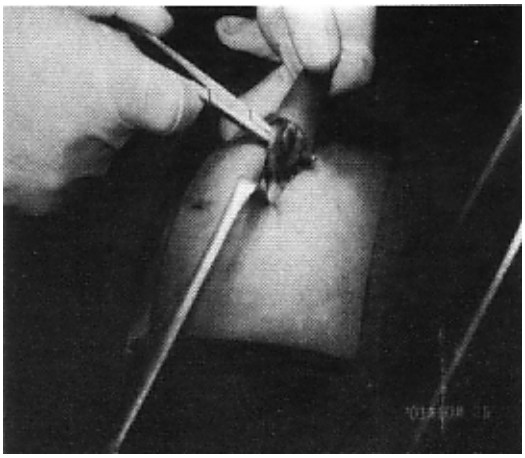

Fig (2): Dissection of the hernial sac.

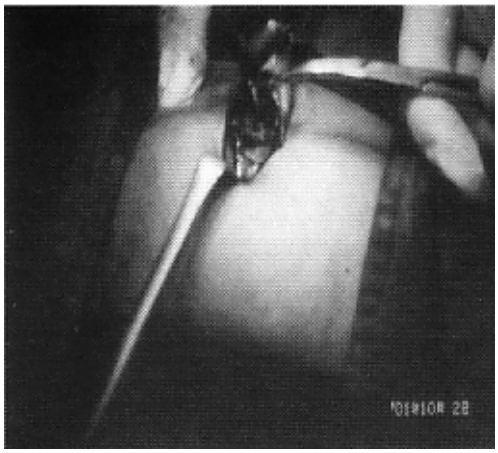

Fig (3): The umbilical hernial sac after dissection from the skin.

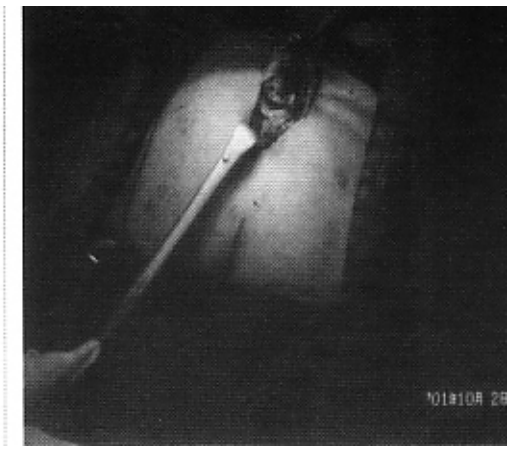

Fig (4): The mesh cone (after ivaginating the hernial sac) sutured to the hernial defect.

Fig. (5): Skin ready for closure.

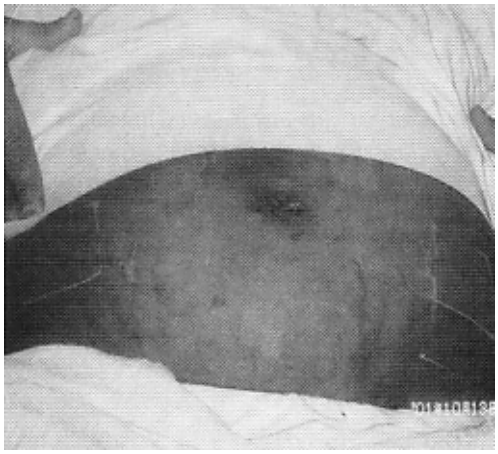

Fig. (6): The repaired umbilical hernia on removing the stitches.

DISCUSSION

Mesh repair of venteral hernia in noncirrhotic patients with no ascites markedly decreases its recurrence[18]. Unfortunately, very little is known about the fate of mesh repair of umbilical hernia in cirrhotic patients with ascites. To our knowledge, no studies were found dealing with the use of mesh repair in such patients, apart from a single case of inguinal hernia repair included in a study carried out by Hurst et al[19] in 1992 and a case report of mesh plug repair for a small incisional hernia by Hachisuka[20] in 1997.

In this study we have used the principle of mesh plug repair which was introduced by Rutkow and Robbins in 1989 for repair of inguinal and femoral hernias in non ascitic patients[21]. Also, we have considered the several subsequent studies that evaluated the use of mesh plug for the internal ring and large patch to cover the posterior wall of the inguinal canal in non ascitic patients with a favorable outcome [22,23,24,25].

The current study might be the first, as far as we know, to apply the principle of mesh plug in elective repair of umbilical hernia in ascitic patients due to liver cirrhosis. The mesh plug was fashioned in the form of a cone, and a small patch was used only to cover the cone and give it a support against dislodgement due to increased intra-abdominal pressure of ascites during the early postoperative period. The patch used in this technique was small enough to cover only the cone and a small area of fascia (about 1-2 cm)

surrounding the hernial defect. So, we used the term cover rather than patch which conventionally used for the onlay repair of ventral hernia in non-ascitic patients. In the conventional technique, the patch usually large enough to reinforce the abdominal wall for several cm away from the line of repair[21]. We have suggested the abbreviation of C&C for the cone and cover procedure .

The patch was arranged to be small to avoid over dissection in this type of patient with bleeding tendency. The limited dissection minimizes the dead space and the expected postoperative seroma formation particularly in undrained wound. Also, the skin of cirrhotic patient is usually thin enough to be jeopardized and may slough in case of excessive dissection. Furthermore, the limited dissection needs a lesser volume of local anaesthia, and saves the patient the risk of general anaesthia. Besides, it shortens the operating time in these frail patients who hardly afford prolonged operations. Lastly, the use of small mesh does not interfere with the abdominal distension by ascites which may be restricted if a large patch is used and lead to respiratory embarrassment or mesh displacement.

In the first group (GI), there was no single case of operative mortality related to the technique used in this study compared to 3.7%[6], 16%[7] and 38%[26] mortality rates reported in previous studies after the conventional repair of umbilical hernia in ascitic patients with liver cirrhosis.

The incidence of the early postoperative wound infection and ascitic fluid leakage in GI seemed to be almost similar to that reported by other investigators[6]. They reported incidence of 9% infection and 9% ascitic fluid leakage. But actually, in our study, the wound infection was very mild and superficial and the leakage was very minimal (ooze) and trivial, while in the previous study these 2 complications were more demanding.

There was only a single case (3.7%) of recurrence 6 months after elective mesh C&C repair in this study compared to higher rates reported in previous studies. Runyon et al., reported recurrence rates of 47% in cirrhotic patients and 73% in patients with liver cirrhosis and ascites[6]. It is worthy to emphasize that the single case of recurrence in our study occurred in GIc of tense ascites. Moreover, this patient had refractory ascites and had not undergone paracentesis for 4 months before the recurrence occurred. This case might document the value of postoperative control of ascites after hernioplasty.

In the second group of this study (GII), it was noticed that the natural complications and their emergency operative mortalities were more than that recorded in previous studies. They reported 14% incarceration with 14% mortalities, 35% skin discoloration&ulceration, and 7% rupture with 45% mortalities during the follow up of 4 years[1]. Other study reported that rupture of an umbilical hernia has a mortality rate of 11% to 43%, often owing to bacterial peritonitis[4]. The higher complication rates of unrepaired umbilical hernia in our study might owing to the narrow hernial defect which seemed to be more prone to these complications. Also, decompression of the abdomen by diuretics or paracentesis may increase the incidence of umbilical hernia incarceration as reported in previous studies[2,3,5]. The higher emergency operative mortalities might be due to the delayed patient presentation to the hospital and undergoing the emergency operations untimely and in a worse condition.

There was no significant increase in number of cases of bleeding esophageal varices in GI compared to GII. The higher success rates of sclerotherapy in group I (GI) might be because of the more patient awareness and regular follow up. But, still this difference in bleeding control was nonsignificant. However, The overall incidence of bleeding in groups of patients included in this study was more favorable than that occurred during the natural course of this type of patients whom underwent no operation. Some authors reported that 35% of cirrhotic patients will bleed within 2 years of diagnosis and 50% will die of the first hemorrhage[27].

The overall survival in GI was 62.96%, considerably higher than those in conservative GII with 41.38% survival ($p=0.1$). The more mortalities recorded in GII were mainly attributed to the local complications of unrepaired umbilical hernia and the high mortality rates in their emergency repair. These hernia complications related deaths were eliminated in GI 2 year follow up which might explain the higher death rate due to hepatic coma in GII (Table 3). However, other literatures reported 50% survival rate in ascitic patients due to liver cirrhosis with or without hernia[28,29.]

Also, in GI of this study, the overall morbidity and postoperative mortality were more acceptable compared to those reported in previous studies [6,7]. In the meantime, both morbidities and mortalities occurred mainly in group Ic of tense ascites. So, it could be hypothesized that the outcome of this study would be exceptionally favourable if the patients in group Ic were excluded.

The favorable outcome reported in GI of this study might be attributed to doing the operation on an elective base in well prepared patients and the proper perioperative management ascites.

In this study, the effectiveness rate of medical management of ascites was efficient to control ascites in 86.7% and 85.7% of cases in GI and GII respectively. This was almost near to that reported by Stanlley et al., who found a success rate of 90%[30].

In this work, the ascitic fluid culture was positive only in samples with PMN count more than 250 cells/mm^3. This finding might document the reliability of ascitic fluid PMN count in diagnosis of SBP without waiting for culture which might delay the start of treatment. This results agreed with what previously reported by other investigators[31].

According to the results of the present study it could be also suggested that the technique of mesh C&C repair in those patients might carry the following practical and theoretical advantages:-

(1)-It could be done under local infiltration anaesthia in most cases.

(2)-The majority of cases of umbilical hernia in ascitic patients have a small defect that makes them candidate for this technique.

(3)-It needs minimal dissection that save the operating time, utilizes small piece of mesh, and decrease postoperative seroma particularly in undrained wound.

(4)-The cone shaped mesh plug theoretically divert the pressure force of ascitic fluid away from the repaired defect.

(5)-The presence of ascites might help to decrease the chance of contact of bowel with the mesh cone. This hypothesis might suggest this procedure to be more indicated in ascitic patients than in non ascitic ones.

(6)-The repair is tension free as the defect is actually plugged without approximation of its edges.

(7)-The small cover may add a more support to the repair, prevent early dislodgment of the cone, and in the meantime does not restrict the dispensability of the anterior abdominal wall in response to accumulation of ascitic fluid.

(8)-No need for subcutaneous drain of the wound which simplifies the surgical postoperative follow up and avoid its potential risk of infection.

(9)- No need for dissection in case of intraperitoneal adhesions which may carry the risk of bowel injury.

(10)-Preservation of the normally inverted umbilicus may have a positive psychological impact in some patients.

CONCLUSION

- Despite the relatively small numbers of patients included in this study, ***elective*** repair of uncomplicated umbilical hernias in cirrhotic patients with ascites might obviate the risky emergency operations for their complications.

- Elective ***mesh cone and cover*** (C&C) repair of umbilical hernia in those patients could be claimed to be a simple, rapid, safe and effective procedure without operative mortality and with acceptable recurrence rate.

- This type of repair is suggested to be suitable in cases of umbilical hernia with a ***small defect*** who fortunately represent the majority in patients with liver cirrhosis and ascites. Moreover, hernias with a small defect might carry a higher risk of complications than those with a wide defect.

- This procedure could be performed under local infiltration anaesthesia in most cases, besides general ***anaesthesia*** proved to be safe if rarely needed in this study.

- ***Control of ascites*** is essential before the operation and during the whole postoperative patient life. Actually, it should be considered as a step of the operation if a favorable results are aimed to be achieved.

- Avoidance of ***bacterial peritonitis*** is mandatory in this technique as the mesh may increase the risk of infection particularly in those immune compromised hepatic patients.

- The best results in this study were revealed in cases with early ascites than those with tense ascites .

RECOMMENDATIONS

Elective mesh cone and cover (C&C) repair could be proposed as a safe and effective procedure in repair of umbilical hernia with small defect in cirrhotic ascitic patients. This procedure is suggested to be more suitable in patients with early ascites who may have a relatively longer life expectancy during which natural complications of unrepaired umbilical hernia are worthy to be prevented.

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