A new approach to umbilical hernia repair: the circular suture technique for defects less than 2 cm

Ann Ital Chir, 2017 88, 5: 449-453
pii: S0003469X17027312
free reading: www.annitalchir.com

İhsan Yıldız, Yavuz Savaş Koca

Süleyman Demirel University, Medical School Department of General Surgery, Isparta, Turkey

A new approach to umbilical hernia repair: the circular suture technique for defects less than 2 cm

BACKGROUND: *Umbilical hernia, unlike other abdominal wall hernias, occurs when the umbilical ring opens and expands. Its' symptoms and complications show similarities with other hernias. Although there are various repair techniques, there is not a standard technique yet. This paper investigated the outcomes of double layer circular suture technique as a new approach in the repair of umbilical hernia.*
MATERIAL AND METHOD: *A total number of 282 patients comprised of 102 males and 180 females with an age range of 18-89 whose umbilical hernias were repaired between 2002 and 2013, retrospectively studied in two groups group 1 (circular suture technique) and group 2 (open primary suture). The subjects were investigated with regards to age, sex, body mass index (BMI), accompanying disease, anesthesia method, surgical complications, hospital stay, total costs, mortality and recurrence.*
RESULTS: *The study participants were 282 patients with an age average of 49, 09 ± 16, 62 including 182 patients in group 1 (male/female ratio 76/106) and 100 patients in group 2 (26/74). There was a significant difference between the groups in terms of time and recurrence. During the follow-up period, 9 patients in group 1 (4.94%) and 16 patients in group 2 (16%) had a recurrence. This result was statistically significant (p=0.014)*
CONCLUSION: *We believe that the double layer circular suture technique is practical, inexpensive and effective in the repair of umbilical hernia defects, which are smaller than 2 cm diameter.*

Key words: Hernia, Repair, Umbilical hernia

Introduction

Umbilical hernia, unlike other abdominal wall hernias, occurs when the umbilicus circle previously closed with fibrosis opens and expands [1]. This might be by birth as well as often developing at later ages in cases where the intraabdominal pressure is increased, and in diabetes and connective tissue diseases where tissue quality deteriorates, and in obese people, and in women with multiple pregnancies, and in lung diseases accompanied by coughing and in patients with ascites [1]. Its incidence in society is 50%, and 1% of them are diagnosed and 11% are cured. Its symptoms and complications show similarities with other hernias [1]

Although there are various repair techniques in its treatment, there is not a standard technique yet. The available repair techniques are practiced as open repair technique and laparoscopic repair technique. In the open technique, the defect is repaired by means of primary

Pervenuto in Redazione Aprile 2017. Accettato per la pubblicazione Giugno 2017
Correspondence to: Ihsan Yıldız, Suleyman Demirel University School of Medicine Department of General Surgery 32260 Isparta, Turkey (e-mail: drihsanyildiz@gmail.com)

tissue repair and synthetic mesh, while laparoscopic repair uses synthetic mesh [2]. All techniques practiced have their advantages and disadvantages, and while the recurrence was previously somewhere around 20%, it is now 1.5-14% [1]. The defects smaller than 2 cm are usually repaired by primary sutures, while those larger than 2 cm are repaired by means of synthetic mesh [2-8].
This study investigated the outcomes of circular suture technique in umbilical hernias smaller than 2 cm in two groups, being first implemented by us and not found as a result of the literature review.

Material and Method

This paper retrospectively studied a total number of 324 patients whose umbilical hernias were repaired in Gazipasa and Gölhisar Public Hospitals between 2002 and 2013. The patients were investigated with regards to age, sex, body mass index (BMI) rates, accompanying disease (chronic obstructive lung disease, coronary heart disease, chronic renal failure, pregnancy and ascites) anesthesia method (general and local), previous laparotomy and recurring umbilical hernia. Postoperative surgical complications (incision infection, hematoma, seroma, incision dehiscence, intestinal complications, obstruction, and perforation), hospital stay, total costs, mortality, and recurrence were studied.
Forty-two of these patients with hernia defect larger than 2 cm and with BMI over 30 and chronic obstructive lung disease and recurring umbilical hernia were excluded. The remaining 282 patients, comprised of 102 males and 180 females with an age range of 18-89, were studied in two groups. The study was conducted as repair of the group implemented circular suture technique (group 1) and standard open primary suture (group 2). The patients were followed up by telephoning and inviting them in the 1st, 5th and 11th years *postoperatively, and superficial ultrasound was utilized along with the physical examination.*

Statistical Analysis

The statistical analyses were performed using SPSS (Statistical Package for the Social Sciences Ver. 21.0, SPSS Inc, Chicago, Illinois, USA) software. Descriptive statistics are reported as the mean ± standard deviation for age, BMI, the diameter of the defect and follow-up time. For categorical data (gender, delivery history, recurrence, hospital stay status, complication, and cost comparison) descriptive variables are reported as the percentage. Kaplan-Meier analysis and the log-rank test were applied for recurrences analysis in years between two treatment groups. In all statistical tests conducted as part of the study, the P value was taken as 0.05 and $p<0.05$ was considered statistically significant.

Operation Technique

Local (lidocaine) or general anesthesia were given depending on the compliance of the patients and the preference of the surgeon. The infra-umbilical space was incised as upward half-moon (smile incision) incision and the layers were passed and hernia sac was dissected and reduced into abdomen. Afterward, the intact fascia was

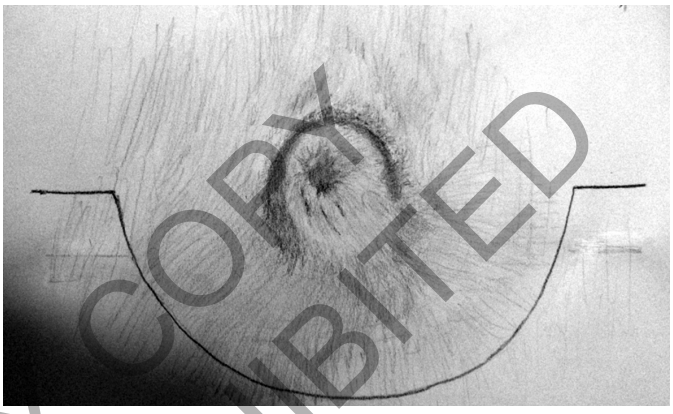


Fig. 1: Umbilical hernia is shown

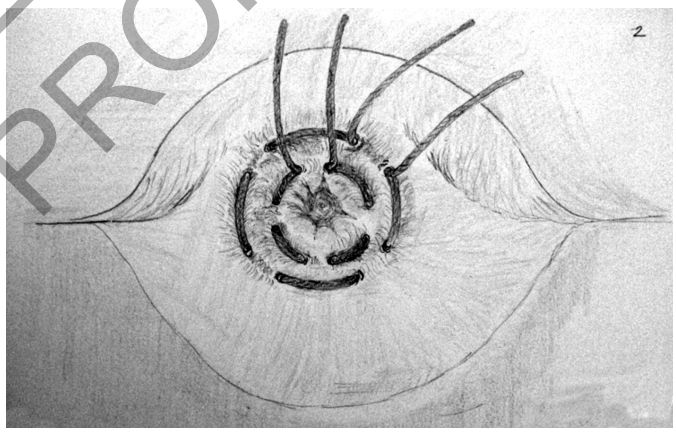


Fig. 2: Circular sutures before knotting

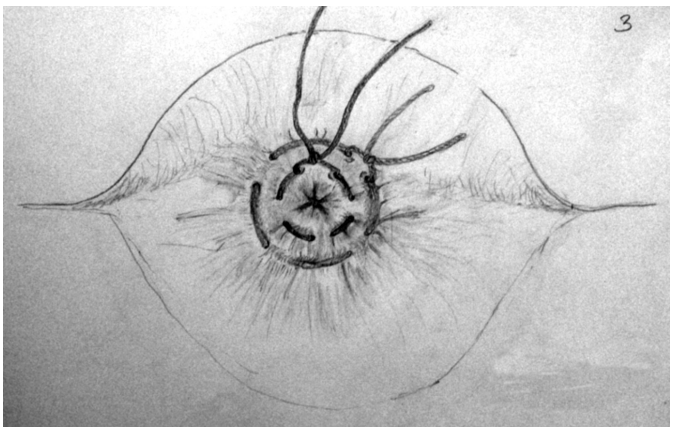


Fig. 3: Circular sutures after knotting

dissected up to 2 cm of the hernia defect borders. The inner surfaces of the umbilical circle were dissected and the tissues attached to fascia were excised. An all-round circular suture as complete fold fully closing the defect and fascia with nonabsorbent 1/0 or 2/0 polypropylene was placed close to the defective circle completely and to create full thickness, passing 0,5 cm away to the umbilical circle. Moreover, another full-thickness supporting suture passing 1,5 cm away to the defect and not as tight as the first one was put and bound (Figs. 1-3).
After control of bleeding, a hemovac drain was placed depending on the width of the dissection, and the operation was ended by creating the umbilicus and a pressured dressing in the shape of umbilicus was implemented. The patients in group 1 were implemented the same operation technique (circular suture). In the control group, the standard repair with interrupted 2/0 polypropylene suture technique was implemented.

Findings

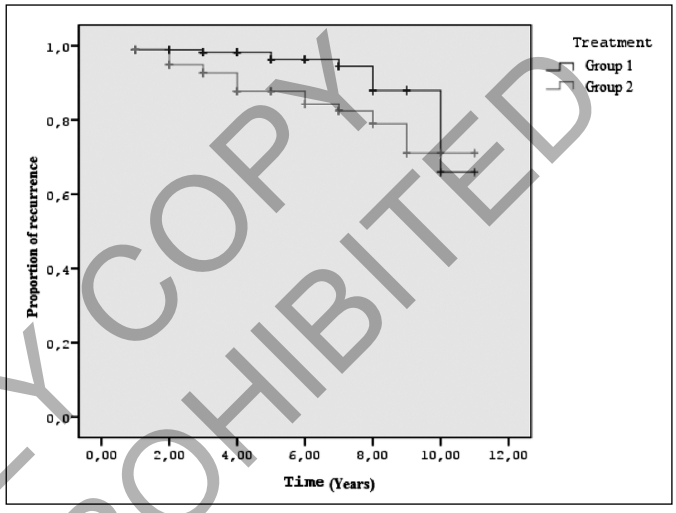
The study participants were 282 patients with an age average of 49.09 ± 16.62 including 182 patients in group 1 (male/female ratio 76/106 (71,69%)) and 100 patients in group 2 (26/74 (35.13%)).
In group 1, the age average was 50.75 ± 16.71 and average umbilical hernia defect diameter was 1.5 + 0.47 cm. In group 2, the age average was 46.07 ± 16.09 and average umbilical hernia defect diameter was 1.59 + 0.33 cm. The body mass index (BMI) in group 1 was 27,01 ± 2.69 kg/m^2, whereas it was 27.46 (±2,37) in group 2. Average follow-up period was 5.15 + 2.45 years (4.89 ± 2.42 years in group 1, and 5.55 ± 2.51 years in group 2) in total, and it was minimum 1 year and maximum 11 years (Table I).
While the rate of postoperative surgical complications was 3.84% in group 1, it was 6% in group 2. The cost less than 100 $ in group 1 was 60,43%, whereas it was 39% in group 2. Hospital stay rate was 26.37% in group 1, while it was 38% in group 2. Rate of having given birth after surgery of females were 25,5 % in group 1, and 40% in group 2 (Table II).
There was a significant difference between the groups in terms of recurrence. During the follow-up period, 9 patients in group 1 (4.94%) and 16 patients in group 2 (16%) had a recurrence. This result was statistically significant (p=0.014) (Graph 1).
Out of the total number of 25 patients with recurrence, 6 had BMI rate of 25 and lower than 25, while 19 had BMI above 25. In group 1, BMI rate in 3 patients with recurrence was 25 and lower, while 6 patients had BMI above 25, and this result was statistically significant (P<0.05). Moreover, there was no recurrence in the defects less than 1 cm during follow-up. There was a total of 25 recurrences in groups 1 and 2, with 3 recurrences in hernia defects ranging between 1 and 1.5 cm and 22 recurrences in hernia defects ranging between 1 and 5-2 cm.
Eighteen and 7 out of those with recurrence in total were females and males, respectively. The male-female ratio in group 1 was 3/6, and it was 4/12 in group 2. All of the females with recurrence had at least one giving birth. Twenty-three of the patients had (12 in group 1 and 11 in group 2) umbilical hernia history inborn. None of the patients had a hematoma, surgical site infec-

TABLE I - *Clinical characteristics and follow up of the patients*

	Group 1	Group 2
Age (Mean±SD) (Total 49.09±16.62)	50.75±16.71	46.07 ±16.09
Gender (Male/Famele)	76/106 (71.69%)	26/74 (35.13%)
Diameter of defect cm (Mean±SD)	1.5±0.47	1.59±0.33
BMI kg/m^2(Mean±SD)	27.01±2.69	27.46±2.37
Follow-up period (year) (Mean±SD)	4.89±2.42	5.55±2.51

Table II - *Results of the groups (%)*

	Group 1	Group 2
Number of recurrence	(9) % 4.94	(16) % 16
Cost (≤100 $)	60.4≤100$	39≤100$
Rates of surgical complication	% 3.84	% 6
Hospitalization % (Yes)	% 26.37	% 38
Pregnancy in woman (After surgery)	% 25.5	% 40



Graph1. Recurrence time in Group 1 and Group 2 (Kaplan-Meier)

tion, intestinal complication (intestinal adhesion and obstruction) and necrosis of the skin.
Hemovac drain was placed subcutaneously in 17 cases in total. There was minimal seroma in 13 patients in total in whom no drain was placed (6 in group 1 and 7 in group 2), and the seroma was resorbed without any intervention.
Two hundred twenty-three and 59 of the surgeries were performed under local anesthesia (lidocaine) and general anesthesia, respectively. 1 patient with ascites associated with cirrhosis was lost in the 7th month due to liver failure. However, there was no mortality due to operation in any case.

Discussion

Although several techniques were defined for repair of umbilical hernia with the widespread incidence in population, no established a standard used technique is available yet. These techniques are classified as those using or not using synthetic mesh, and open and laparoscopic, but the preference of the patients plays a role in the selection of the repair technique besides the preference of the surgeon [6-8].
The anterior rectus sheath is sutured horizontally by being folded on each other in the open technique without mesh, usually known as Mayo repair. A recurrence of 2.7 to 14% takes place in the repair with vertical or horizontal open primary suture, and it fails to be a fully permanent treatment option [2,3]. In this present technique, we did not deem it necessary to dissect the fascia excessively considering that the feeding of the fascia might be disturbed due to surgical trauma occurring in excessive dissection practiced in Mayo repair.
Synthetic meshes are widely used in open repair in order to avoid recurrence but average recurrence of 8 % cannot be prevented regardless. Similarly, the presence of infection restricts the use of mesh and requires alternative techniques [2]. Furthermore, we believe that increased mesh costs cannot be underestimated.
Recently, laparoscopic umbilical hernia repair has largely emerged as an alternative to open repair. Yet, this repair has not fully become a standard technique due to practical challenges and expenses such as the cost, surgical experience, general anesthesia requirement and synthetic mesh requirement [4,5].
Laparoscopic methods are particularly recommended for defects with a diameter larger than 5 cm but difficulties arise in avoiding the challenges and complications of laparoscopy [4]. While recurrence decreases in the subject in whom mesh are used, problems such as seroma, infection and intestinal issues might occur [2,6-9]. In practice, complications associated with mesh used such as fixing the mesh and subsequent adhesion, contraction, migration and infection might develop [2].
Due to all these reasons, the laparoscopic repair failure results in 3.7% recurrence. Moreover, the complications of umbilical hernia surgeries are more prevalent in laparoscopic repair. We believe that the most significant cause of this is the lack of surgical experience. Besides, general anesthesia is required in laparoscopy [3,5]. We preferred local anesthesia during surgery thanks to its practical use, bleeding control and low costs.
In our study, the seroma in 6 patients, who developed seroma and were not placed a drain, was resorbed without any surgical intervention. Furthermore, we implemented mesh repair in 9 patients in group 1 and 16 patients in group 2 who had a recurrence, and we did not place a drain in them. There was no complication and repeating recurrence during the follow-up. The fact that all of the females having recurrence had pregnancy and delivery after the surgery made us think that there is a close link between recurrence and pregnancy.
In this present study, we observed almost none of the complications mentioned above. The reason behind this is the patient selection. Thus, we do not recommend this technique for the patients we excluded having hernia defect larger than 2 cm, and BMI over 30, and chronic lung disease and severe coronary heart disease, and recurring umbilical hernia and previous multiple laparotomies which weaken the fascia.
The small number of the recurrence might perhaps stem from the patient selection, which might constitute the weak aspect of our study justifying criticism. Nevertheless, the objective here is to allow the chance to repair the hernia defect of the patient in its inception by means of early intervention. Moreover, even though most umbilical hernia surgeries require a short-term hospital stay, the costs involved are not proportional. In our study, we found that the costs decreased significantly as the hospital stay is shortened.
The reason why we divided the study into two groups, in the beginning, was to have research plan where we would initially compare the group for which we implemented our technique, which has not been used before, based on defect diameter with the control group where the patients' defects with the same diameter were repaired. However, we later aimed to assess other surgical techniques as well and thus demonstrate the differences among the techniques in another study.
In an average follow-up of 5.15 +-2.45 years, 9 (4.94%) recurrences were observed in defects smaller than 2 cm, which is below the literature average, while the rate of 16 (16%) in the repair conducted with the standard technique was found to comply with the literature [1,8-10].
In conclusion, we found that our double layer circular repair technique, as an open method, was implemented successfully considering all the reasons mentioned. We believe that circular suture technique implemented as the double layer is practical, inexpensive and effective in the repair of umbilical hernia defects, which are in particular smaller than 2 cm with a likelihood to grow larger in later ages.

Riassunto

L'ernia ombelicale, a differenza di altre ernie della parete addominale, si verifica quando l'anello ombelicale si apre e si espande. I sintomi e le complicanze sono simili a quelli delle altre ernie. Mentre vi sono numerose tecniche riparative, non ne è stata ancora standardizzata una. In questo studio si indaga sui risultati di una tecnica di sutura circolare a doppio strato quale nuovo approccio alla riparazione dell'ernia ombelicale.
Lo studio è stato condotto su un totale di 282 pazienti, comprensivi di 102 uomini e 180 donne con età variabile da 18 a 89 anni, la cui ernia ombelicale è stata riparata tra il 2002 e il 2013. Si è trattato di uno studio retrospettivo suddividendo i pazienti in due gruppi: gruppo 1 della tecnica di sutura circolare, e gruppo 2 della riparazione con sutura diretta. La cosistica è stat studiata riguardo all'età, sesso, BMI, comorbilità, metodo di anestesia, complicanze chirurgiche, durata della degenza postoperatoria, costi totali, mortalità e recidive. La casistica di 282 ha un età media di 49, 09 ± 16, 62 annni, comprendente 182 pazienti del primo gruppo (con rapporto uomo/donna 76/106) e 100 pazienti del secondo gruppo (con rapporto uomo/donna 26/74). Si è riscontrata una differenza significativa tra i due gruppi in termini di tempo e di recidiva. Durante il follow-up, 9 pazienti del gruppo 1 (4.49%) e 16 pazienti del gruppo 2 (16%) sono andati incontro a recidiva, e questo risultato è statisticamente significativo (p=0.014).
In conclusione riteniamo che la tecnica di sutura circolare in doppio strato è pratica, poco costosa ed efficace nella riparazione dei difetti dell'ernia ombelicale quando è inferiore ai 2 cm di diametro.

Acknowledgment

This article was presented as an oral presentation 20. The Turkish national surgery congress. Antalya / Turkey

References

1. Earle DB, McLellan JA: *Repair of umbilical and epigastric hernias.* Surg Clin North Am, 2013;93(5):1057-89. doi: 10.1016 /j.suc.2013.06.017

2. Nguyen MT, Berger RL, Hicks SC, Davila JA, Li LT, Kao LS, Liang MK: *Comparison of outcomes of synthetic mesh vs suture repair of elective primary ventral herniorrhaphy: A systematic review and meta-analysis.* JAMA Surg, 2014; 149(5):415-21.

3. Lau H, Patil NG: *Umbilical hernia in adults.* Surg Endo sc 2003; 17(12):2016-20. Epub 2003 Oct 28.

4. Ponten JE, Thomassen I, Nienhuijs SW: *A collective review on mesh-based repair of umbilical and epigastric hernias.* Indian J Surg, 2014; 76(5):371-77. doi: 10.1007/s12262-013-0920-6. Epub 2013 Apr 28

5. Wright BE, Beckerman J, Cohen M, Cumming JK, Rodriguez JL: *Is laparoscopic umbilical hernia repair with mesh a reasonable alternative to conventional repair?* Am J Surg, 2002; 184(6):505-8; discussion 508-9.

6. Bensaadi H, Paolino L, Valenti A, Polliand C, Barrat C, Champault G: *Intraperitoneal tension-free repair of a small midline ventral abdominal wall hernia: Randomized study with a mean follow-up of 3 years.* Am Surg, 2014; 80(1):57-65.

7. Berrevoet F, Van den Bossche B, de Baerdemaeker L, de Hemptinne B: *Laparoscopic evaluation shows deficiencies in memory ring deployment during small ventral hernia repair.* World J Surg, 2010; 34(7):1710-15. doi: 10.1007/s00268-010-0600-7.

8. Yao JJ, Pham T, Mokdad AE, Huerta S: *Predictors of recurrence of umbilical hernias following primary tissue repair in obese veterans* Am J Surg, 2015. pii: S0002-9610(15)00246-9. doi: 10.1016/j.amjsurg.2015.03.014

9. Stabilini C, Stella M, Frascio M, De Salvo L, Fornaro R, Larghero G, Mandolfino F, Lazzara F, Gianetta E: *Mesh versus direct suture for the repair of umbilical and epigastric hernias. Ten-year experience.* Ann Ital Chir, 2009; 80(3):183-87.

10. Di Muria A, Formisano V, Di Carlo F, Aveta A, Giglio D: *Small bowel obstruction by mesh migration after umbilical hernia repair.* Ann Ital Chir, 2007; 78(1):59-60.