

Kalinovskiy S.V.,*Central District Hospital, Slavuta, Khmelnytsky Region, Ukraine***Vlasov V.V.,***Khmelnytsky Regional Hospital, Khmelnytsky, Ukraine***Pashinskiy Y.M.***Vinnitsa National Medical University, Department of Surgery № 1, Vinnitsa, Ukraine***THE EXPANSION OF PRIMARY DEFECT OF LINEA ALBA HERNIA**

Abstract. *The structure of the anterior abdominal wall was studied by CT in 54 patients having linea alba hernia. The possibility to increase the hernia defect of the primary linea alba hernia was studied on 15 cadavers of adult. This expanding involves two curved sections of the front and rear plates of recti sheaths in the opposite directions. The proposed way to expand the primary linea alba hernia allows you to create the access from 7 to 11 cm. While carrying out this method of expansion there is provided free setting of hernia sac contents into the abdominal cavity and if necessary, the manipulations in the abdomen, saving the strength of the anterior abdominal wall. After carrying out the expansion of hernia defect of primary linea alba hernia, there must be taken the alloplastyc close of the hernia defect.*

Key words: *linea alba hernia, hernia defect, mesh.*

Introduction. The hernia defects plastic is the most frequent operation in the world surgery throughout the twentieth century [2]. Being considered as a rather solved problem, the primary linea alba hernia obviously attracts less attention of the surgeons [4]. But the surgeons often face some technical difficulties during the operations which have not been considered in the modern literature. One of the main points is the inability to repose the fixed linea alba hernia contents because of the relatively small diameter of hernia defect. It makes the surgeon expand the hernia defect. The most frequent operation is performed by means of cranially or caudally along the linea alba which leads to the further weakening of the abdominal wall. In other cases, the increase is carried out aside of hernia defect within the linea alba till the both recti medial edges. However, the received size of wound which is limited by the width of linea alba is not always sufficient enough to repose the hernia contents. As a rule, it leads to the omentum resection or the wound increases vertically along linea alba which respectively enlarges the intraoperative injury, the time of the operation, and weakens the abdominal wall [1].

Objective: to develop the way of hernia

defect increase in the experiment and apply it during the surgical treatment of the primary linea alba hernia which can't be reposed and make it possible to insert the hernia contents of considerable size into the abdominal cavity by means of this method.

Materials and methods. The structure of the anterior abdominal wall was studied by CT in 54 patients having linea alba hernia in order to determine the anatomical and physiological characteristics of the abdominal wall. The width of the linea alba, the hernia defect and recti were measured. The examined groups included the patients having the width linea alba of 1 cm, 1,1-2 cm, 2,1-3 cm, 3,1-4 cm or more 5 cm.

There is performed the section from xiphoid processus to the pubis on the abdominal wall of the male's or females cadaveris. The skin, subcutaneous fatty tissue was ripped reaching the linea alba aponeurosis. Then the skin with subcutaneous fat were separated sharply from the front plate of the recti sheaths on the both sides of the linea alba at a distance of 8-10 cm away from it.

The possibility to increase the hernia defect of the primary linea alba hernia was studied on 15 cadavers of adult. This expanding involves two curved sections of the front and rear plates

of recti sheaths in the opposite directions (fig. 1 a, b). After researching in the experiment, this way of the hernia defect expanding is introduced for the clinical use.

In order to determine its suitability, there was conducted the analysis of surgical treatment involving 296 patients having primary linea alba hernia. Because of difficulties to set the hernia sac contents into the abdominal cavity and the necessity to perform the simultaneous operation immediately on the abdominal organs, 22 patients were operated by means of the developed way to expand the linea alba hernia defect.

Results and discussion. There were more women (39) than the men (15) among the patients of all age groups. The minimum diameter of the hernia defect in patients screened with CT was 0,8 cm, the maximum – 4,6 cm. According to the classification of the EHS [3], patients with small sizes of umbilical hernia were (32 or 59,26%) dominated. The hernia defects were of average (in the range from 2 to 4 cm) in 20 (37,04%) patients. Only 2 patients with linea alba hernia had large hernia defects, that was higher than 4 cm. The sizes of hernia sac exceeded the sizes of the hernia defect in 6 surveyed patients.

During the study, there was found that the average width of linea alba at the umbilical level ($3,59 \pm 1,28$ cm) was significantly higher ($p < 0,05$) than the average width of the linea alba above ($2,79 \pm 1,23$ cm) and below umbilical ($1,95 \pm 1,54$ cm).

The distribution of the patients by gender and the width of linea alba showed that there was not anyone having the width of linea alba lower than 1 cm at the umbilical level among the patients with umbilical hernia. Only smaller number of the patients (4 or 7,41%) had a width of linea alba of 1,1-2 cm at this level. Most of the patients had a width of linea alba above 2 cm (92,59%). The women were dominated among the patients. The maximum width of linea alba measured by CT was 5,6 cm.

During the analysis concerning the dependence of the linea alba width and recti, these was found out that there was not any significant difference in patients having different

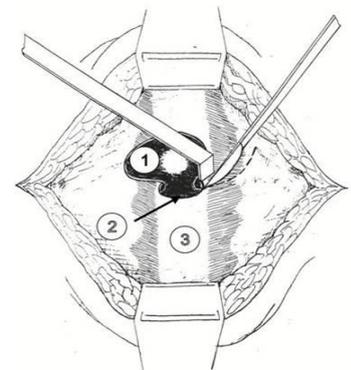
width of linea alba.

The study of the width of recti while using CT scans revealed that they have approximately of the same width on both sides. The minimum width of recti accounted for 2,1-2,3 cm. The maximum – 9,98 cm, 10,09 cm on the left and right. The average width of recti at the umbilical level was accounted to $6,66 \pm 1,58$ cm.

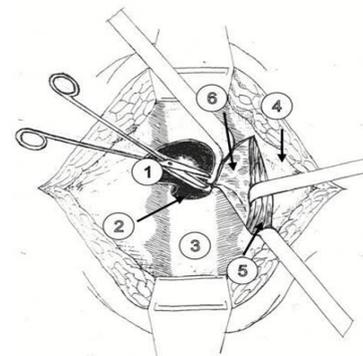
While conducting the experimental studies on cadavers of adults, we investigated the possibility of lateral expansion of the hernia defect.

Among the cadavers of men and women there was dominated the width of linea alba of type I (by Lavrova), with a maximum increase in the umbilical level. Mostly we observed the width of the linea alba at the umbilical level of 2,1-3 cm (63,4%). The width of recti at the umbilical level was almost the same on both sides $6,48 \pm 0,87$ cm.

The possible expansion of the hernia defect was modeled on the front abdominal wall of cadavers (figure. 1 a, b).



A



B

Figure. Expansion of primary defect of linea alba. 1 – hernia sac; 2 – hernia defect; 3 – linea alba; 4 – front plate of recti sheaths; 5 – recti; 6 – rear plate of recti sheaths.

The aponeurosis of linea alba was transversed cutting from the left side of the umbilical ring to the left edge of the medial of recti. Next, the section in the form of an arc centered on the midline and cranial direction goes on the front plate of the recti sheath. The edges of the front plate of the recti expanded aside the medial edge of the recti by the Farabef hook were diverged the laterally, thus these were formed the access to the back plate of the recti sheath. The back plate of the recti sheath was cut in the form of an arc centered on the midline and caudal direction. Spreading out the edges of the back plate of recti sheath and peritoneum, we get the laparotomy wound of the suitable size to repose the hernia contents into the abdominal cavity.

The extension was performed on the one side and on both sides. In this case the hernio-laparotomy wounds were increased in size. It was established that recti can be taken in the side with Farabef hook approximately for 2/3 of its width. So, in the course of the experiment, there was found out that if the hernia defect of umbilical hernia is smaller than the width of the linea alba, it can be expanded to fit linea alba and for 2/3 of the width of the recti on the side or on both sides.

So, on average, the patients who were examined by CT, the hernia defect of umbilical hernia may be expanded to fit the linea alba (from 2 cm to 5,6 cm) and another 5-6 cm (at unilateral expansion), or about 10-12 cm (bilateral increase). So, generally it is possible to get hernio-laparotomy wound in the patients having hernia defect of small size (for classification of EHS to 2 cm) but large-sizes hernia sac of about 12 to 17 cm. In this case, the strength of the necessary manipulations: reduction of hernia contents, possible resection of necrotic area of the intestine, omentum strands or perform simultaneous operations.

Analyzing the surgical treatment of 208 patients with umbilical hernia, in the vast majority of them (61,77%), the hernia protrusion was reposed into the abdominal cavity. But in the fourth part of patients (25,48%) the hernia was not reposed before operations. The rest – 33 (12,75%) the hernia

was inserted partly. In the most case (18 patients) the hernia sac sizes were much higher than the diameter of the hernia defect.

During the operation of the fixed umbilical hernia we resorted to expand the hernia defect along the linea alba in 6 cases. The following plastic hernia defect in these patients is made by the Sapezhko method (2) and alloplastic of preperitoneal mesh implant (4). In cases of hernia defect alloplastic such expansion led to the increased grid size of implant, since it has to replace, 3-4 cm wound edges.

In 22 cases besides the described in the literature methods to expand umbilical ring within the linea alba (in the transverse and longitudinal directions), there was performed the developed way to expand the hernia defect according to the methods of experimental study.

Among these patients, the vast majority (17) there was made unilateral (right left-hand) extension. In 5 cases there was performed bilateral increase of hernia defect.

The wound after expansion was being closed in the reverse order. First, we closed peritoneum by vicryl (monocryl) ligature – after its previous detachment in size. Then there was seven back plate of recti sheath to the hernia defect taking the hook away. The recti set aside before, was put on the proper place. The mesh was placed and fixed in the preperitoneal space in 16 patients. Then the wound of front plate of recti sheath was sutured up by polydakson or polypropilen ligature. Because of the mechanical damage of the peritoneum during the operation in 6 patients and rear leaf of recti sheath, there was mobilized the retromuscular space which the mesh was established. The further surgery didn't differ from that described.

Among the patients who experienced the expansion of hernia defect of primary linea alba hernia, the postoperative complications were not observed. The patients were being examined in terms of 0,5 to 3 years. The recurrence of hernia was found out in 2 patients who were completed the expansion of the hernia defect along the linea alba followed the grafting by the Sapezhko technique. Among the patients who were completed the expansion by the

developed method of hernia defect, the recurrence of hernia is not detected.

Conclusions. 1. The proposed way to expand the primary linea alba hernia allows you to create the access from 7 to 11 cm. 2. While carrying out this method of expansion there is provided free setting of hernia sac contents into the abdominal cavity and if necessary, the manipulations in the abdomen, saving the strength of the anterior abdominal wall. 3. After carrying out the expansion of hernia defect of primary linea alba hernia, there must be taken the alloplastyc close of the hernia defect.

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