

ABDOMINAL RECTUS DIASTASIS (ARD) CORRECTION FOR PAIN REDUCTION AND IMPROVEMENT OF ABDOMINAL WALL MUSCLE STRENGTH

Dr. Kaustubh Vasant Waikar

Associate Professor, Dept. of General Surgery Sindhudurg Shikshan Prasarak Mandal Medical College and Life time Hospital Sindhudurg, Maharashtra.

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Corresponding author: Dr. Kaustubh Vasant Waikar

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Abstract

Introduction: Rectus abdominis diastasis (RAD) can be described as a condition in which rectus abdominis muscles are separated by an abnormally wide distance i.e. any separation of more than 2 cm is considered to be abnormal. Several aetiological factors may lead to protrusion of the anterior abdominal wall. It is a common complaint in women after childbirth. Abdominal rectus diastasis (ARD) is a sequela of the expansion of the abdominal contents during pregnancy or massive weight loss and/or congenital disproportion of the collagen III/I ratio. Operative repair of ARD can improve abdominal wall function. Various methods for ARD repair have been described. These differ by approach like open versus laparoscopic, the position of suture placement, numbers of layers of sutures, suture material, and use of mesh. Also it can be combined with mesh augmentation in the IPOM technique for enhanced stabilization of the abdominal wall.

Material and Methods: Eligible patients were randomized to either one of two operative procedures or a 3-month, dedicated training program which serve as a control group. ARD width was assessed clinically and confirmed with computed tomography scanning. Endpoints were assessed after 6 months for relapse of the ARD, pain, restriction of daily activities and improvement in muscle strength. Abdominal wall strength was assessed by Visual analogue scale (VAS).

Results: A total of 72 patients were enrolled into the study (70 female and 2 male). 24 patients were enrolled in each group. 13 patients had undergone cesarean section in the Quill group and 12 in the mesh group. According to VAS scale no statistically significant difference was seen between the two operative groups regarding perceived improvement in abdominal wall strength. But it was significantly higher in operated group as compared to training group. Abdominal muscular strength was improved in all the three groups. Improvement in abdominal wall strength was lower in training group compared to operative groups. No relapse was observed in operative groups.

Conclusion: Operative repair of ARD can provide functional stability and improvement in pain and physical parameters it also improves quality of life, and reduce functional disability.

Keywords: ARD, Quill SRS, Mesh repair, VAS, linea alba (LA)

Introduction

The anterior side of the abdominal wall includes the paired rectus muscles and the muscles that run antero-laterally on the abdominal wall i.e. aponeurosis of the external, internal and transverse muscles. The rectus muscle extends caudally on each side of the umbilicus from the xiphoid process to the crest of the pubis. Rectus muscles show difference in its insertion to the costal cartilage of the ribs from five to sevenⁱ. The linea alba (LA) can be defined as the midline fibrous structure which separates and connects the rectus muscles to the aponeurotic system. It is made up of collagen and elastin and is structurally similar to tendons and ligaments. Intra-abdominal pressure and linear traction exerted by the three muscles of the flank are the forces act on the LAⁱⁱ. Rectus abdominis diastasis (RAD) can be described as a condition in which rectus abdominis muscles are separated by an abnormally wide distance i.e. any separation of more

than 2 cm is considered to be abnormal. Several aetiological factors may lead to protrusion of the anterior abdominal wallⁱⁱⁱ. It is a common complaint in women after childbirth. Abdominal rectus diastasis (ARD) is a sequela of the expansion of the abdominal contents during pregnancy or massive weight loss and/or congenital disproportion of the collagen III/I ratio. Operative repair of ARD can improve abdominal wall function^{iv}. But it not yet proven that ARD repair provides long-term relief of symptoms (eg, pain) and improvement of function or improves abdominal wall muscle strength^v. It has been shown that RAD produces deterioration in the functions of the abdominal wall with associated muscular imbalance and chronic back pain^{vi}. At present, there is no consensus among the surgical communities on the surgical treatment of RAD as regards indications or surgical techniques⁶.

Various methods for ARD repair have been described. These differ by approach like open versus laparoscopic, the position of suture placement, numbers of layers of sutures,

suture material, and use of mesh^{vii}. For treatment of ARD Laparoscopic plication of the linea alba is recommended without using the mesh^{viii}. Also it can be combined with mesh augmentation in the IPOM technique for enhanced stabilization of the abdominal wall^{ix}.

In the present study two operative techniques were used 1. Implantation of a retromuscular lightweight mesh and 2. Double-row suture of the anterior rectus sheath with Quill sutures with an aim to assess the outcomes of abdominal wall muscle strength and pain.

Material and Methods:

This randomized control trial was carried at SSPM Medical College and Life time Hospital Sindhudurg in department of General surgery. Subjects included were patients diagnosed of ARD and a history of functional disabilities, like abdominal discomfort, back pain, and pain from the abdomen, or symptoms of weakness of the abdominal girdle.

Inclusion criteria:

Rectus diastasis ≥ 3 cm

For women: at least 1 pregnancy

Older than 18 years

Abdominal wall discomfort or tenderness

Wish to have abdominal wall reconstruction

Exclusion criteria:

Pregnant women

Breastfeeding

Patients on Immunosuppressive therapy

Smoking

Eligible patients were randomized to either one of two operative procedures or a 3-month, dedicated training program which serve as a control group.

Randomization:

All patients who fulfill the inclusion criteria were first randomized in a 2:1 ratio to either operative repair or training, respectively. Patients in operative group were further randomized into either repair with a retromuscular, lightweight polypropylene mesh or to double-row plication of the anterior rectus fascia with Quill SRS suture. Randomization was done by computer software programme.

Prior to randomization ARD width was assessed clinically and confirmed with computed tomography scanning. Clinical measurements of ARD were performed halfway between the xiphoid process and the umbilicus and halfway between the umbilicus and the pubic symphysis.

Measurements were taken 3 times by the same investigator using a measuring tape. Mean values were calculated and expressed in centimeters.

In the mesh group, Incision was given on the anterior rectus fascia along the medial border of the rectus muscle bilaterally. The retromuscular space was prepared from the xiphoid process to mons pubis, and a lightweight, polypropylene mesh was applied. The anterior rectus fascia was closed using a running suture. In the suture group, repair of the ARD was operated with dual closure of the anterior rectus fascia using Quill SRS sutures^x. In training group general abdominal wall muscle training exercises were selected, which included rectus, oblique and transversus abdominal muscles^{xi}.

Endpoints were assessed after 6 months for relapse of the ARD, pain, restriction of daily activities and improvement in muscle strength. Abdominal wall strength was assessed by Visual analogue scale (VAS).

Statistical analysis

Statistical analysis was done using Medcalc software. Comparisons of continuous variables were made by the Mann-Whitney *U* test, whereas dichotomous data were compared using the χ^2 test.

Results:

A total of 72 patients were enrolled into the study (70 female and 2 male). 24 patients were enrolled in each group. 13 patients had undergone cesarean section in the Quill group and 12 in the mesh group.

Table 1: Patient demographic data

Demographic characteristics	Operation with Quill (n = 24)		Operation with mesh (n = 24)		Training group (n = 24)	
	Mean	SD	Mean	SD	Mean	SD
Age (Years)	41.7	6.54	48.4	6.31	41.8	4.59
BMI (kg/m ²)	24.5	3.25	24.9	4.21	21.6	3.11
Pregnancy (n)	1.9	0.98	2.1	1.02	2.3	1.06
ARD at X-U/2 (cm)	3.5	0.9	3.7	0.7	4	0.8
ARD at U-P/2 (cm)	3.7	1	3.9	0.7	4.1	0.8

BMI, Body mass index; X-U/2, halfway between xiphoid process and umbilicus; U-P/2, halfway between umbilicus and pubic symphysis;

Table 2: VAS score after 6 months follow-up

VAS	Quill (n = 24)	Mesh (n = 24)	Training (n = 24)
Mean \pm SD	6.2 \pm 2.3	7.4 \pm 2.4	4.1 \pm 2.4

According to VAS scale no statistically significant difference was seen between the two operative groups regarding perceived improvement in abdominal wall strength. But it was significantly higher in operated group as compared to

training group. Abdominal muscular strength was improved in all the three groups. Improvement in abdominal wall strength was lower in training group compared to operative groups. No relapse was observed in operative groups.

Discussion:

Till now there is no there is no consensus in surgeons on the best surgical technique for repair of umbilical and epigastric hernias with concomitant RAD and both laparoscopic procedures and sublay technique are used^{xii, xiii}. In our study CT-scanning was used to exclude intra-abdominal pathology but also to provide a radiologic assessment of the width of the ARD. Ultrasound investigation is another method but it is highly dependent on the skills of the sonographer^{xiv}. General surgeons repair ARD and incisional hernias using a retromuscular mesh, undermining the rectus muscles while mesh repair can provide more long-lasting stability of the abdominal wall^{xv, xvi}. Incidence of ARD was reported from 30 to 60% of women during the postpartum period in western countries^{xvii, xviii}.

In present study Operated patients by both the methods reported significant improvement in abdominal wall strength as compared to training group at the 1-year follow-up. Similar results were observed in abdominal muscle strength using a VAS scale seen in the mesh group at the 3-month follow-up^{xix}.

In our study muscular strength of the abdominal wall was improved both after surgery and physical training and was assessed by VAS scoring system. It was observed that 20 patients included in the training group were not satisfied with the outcome because of persistent bulging of the midline and pain. In a randomized trial of training program for ARD only 4 of 30 patients were satisfied with the improvement in symptoms and abdominal wall stability and VAS ratings in the training group appeared to be significantly lower compared to those who were operated^{xx}.

Conclusion:

Operative repair of ARD can provide functional stability and improvement in pain and physical parameters it also improves quality of life, and reduce functional disability. Training can improve the muscle strength but the satisfaction level of the patients is low. Abdominal wall repair can be considered in patients with an ARD wider than 3 cm.

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