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Original Article

The TOR concept (training, operation, and rehabilitation) applied to a cohort of postpartum women with training-resistant symptomatic rectus diastasis: evaluation 1 year after surgery

A. Olsson[1,2,*], K. Woxnerud[2,3], O. Kiwanuka[1,4], G. Sandblom[1,4] and O. Stackelberg[1,4,5]

[1]Department of Clinical Science and Education, Karolinska Institute, Södersjukhuset, Stockholm, Sweden
[2]Stockholm Hernia Center, Stockholm, Sweden
[3]Women's Health Department, Hela Kvinnans Klinik, Stockholm, Sweden
[4]Department of Surgery, Södersjukhuset, Stockholm, Sweden
[5]Unit of Nutritional Epidemiology, Karolinska Institute, Institute of Environmental Medicine, Stockholm, Sweden

Correspondence to: Anders Olsson, PhD, Department of Clinical Science and Education and Department of Surgery, Södersjukhuset, Sjukhusbacken 10, 118 83 Stockholm, Sweden (e-mail: anders.olsson@ki.se)

Abstract

Background: Rectus diastasis is a common sequela of pregnancy and is associated with functional disabilities such as back pain, abdominal core instability, abdominal muscle weakness, urinary incontinence, and psychological issues such as a negative body image. The aim of this study was to evaluate the effect of the TOR concept (training, operation, and rehabilitation), a novel concept for treating abdominal wall insufficiency combined with rectus diastasis, after pregnancy. TOR consists of preoperative evaluation of symptoms and custom-designed abdominal core training, tailored rectus diastasis repair, and individual progressive postoperative rehabilitation.

Methods: A consecutive series of women diagnosed with rectus diastasis and core dysfunction resistant to training, underwent plication of the linea alba between 2018 and 2020. After surgery, all patients participated in an individually designed rehabilitation programme over a 4-month interval. Physical function was recorded before surgery and 1 year after surgery using the disability rating index questionnaire. Symptoms associated with core instability were recorded before and 1 year after surgery. Quality of life was assessed using the SF-36. The abdominal wall anatomy was assessed with ultrasound before and 1 year after surgery.

Results: Seventy-one women were included and all attended 1-year follow-up. Response rate was 81.7 per cent (58) for the disability rating index, and 59.2 per cent (42) for SF-36. Self-reported physical function (disability rating index) improved in 54 of 58 patients (93.1 per cent), with a median score reduction of 91.3 per cent. Core instability symptoms decreased significantly. All SF-36 subscales improved significantly compared with preoperative scores, reaching levels similar to or higher than the normative Swedish female population. No recurrence of rectus diastasis was seen at the 1-year follow-up.

Conclusions: Surgical reconstruction within the TOR concept resulted in significant improvements in physical function and quality of life as well as a significant decrease in symptoms of core instability.

Introduction

Rectus diastasis (RD) is a common sequela of pregnancy, often defined as an inter-recti distance exceeding 22 mm[1]. Clinically, it may present as a bulging or sagging of the midline during abdominal muscle contraction and is associated with an increased risk for midline hernias[2]. RD can present in isolation but is also an important component of a postpartum general abdominal wall insufficiency[3]. Predisposing factors are pregnancy, obesity, and collagen predisposition[4].

The development of RD is a normal physiological anatomical change during pregnancy due to the stretching of the abdominal wall combined with hormonal changes[5,6]. In approximately one-third of postpartum women the RD is persistent[7], a prevalence that may be underestimated[8]. RD is associated with functional disabilities such as back pain, abdominal core instability, abdominal muscle weakness, urinary incontinence, and psychological issues such as a negative body image[9–12] A concomitant general abdominal wall insufficiency may have a greater impact on the development of severe core instability symptoms than RD alone[3], illustrated in *Fig. 1*.

Management of RD differs widely regarding core training, indication and method of surgical repair, and postoperative rehabilitation. Core training is recommended as first-line treatment[13], followed by surgical repair if symptoms persist[14–17]. Improvement in functional outcome after surgical reconstruction of RD has been observed, including decreased back pain, improvements in urinary incontinence, and gastrointestinal problems, improved abdominal core stability and body posture, as well as increased quality of life (QoL)[18].

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Fig. 1 Preoperative abdominal postpartum deformation with severe rectus diastasis and an epigastric hernia and restored abdominal anatomy after surgery

a Preoperative front view. **b** Postoperative front view. **c** Preoperative side view. **d** Postoperative side view.

In a previous cohort, it was observed that surgical repair restored abdominal core function after 1 and 3 years of follow-up (investigating objective core function tests, self-reported physical function, urinary incontinence, and QoL)[19,20]. Even though that study was carried out at a teaching hospital with good postoperative resources, a common feedback complaint from study participants was the lack of encouragement to engage in postoperative rehabilitation, which may have affected the results. A structured concept involving focused training, tailored surgical repair, as well as individualized rehabilitation may therefore provide improvements in both observed and self-reported physical function and QoL, as compared with surgical repair alone.

The aim of this study was to prospectively evaluate a locally developed concept entitled 'training, operation, and rehabilitation' (TOR), including preoperative evaluation of symptoms, customized preoperative abdominal core training,

tailored surgical repair of the RD, and an individual postoperative rehabilitation programme. The primary objective was to evaluate postoperative core function and QoL compared with preoperative scores.

Methods

Study population

A consecutive series of women with symptomatic RD were recruited prospectively over a 30-month interval (January 2018 to June 2020) at a private healthcare centre. Inclusion criteria were: non-smoking; age 18–55 years; BMI less than 35; RD width more than 3 cm measured by ultrasound; core instability symptoms resistant to standard core stability training; more than 1 year since last partus; and no further pregnancies intended. Exclusion criteria were pregnancy, smoking, and repair with prosthetic material. Written informed consent was obtained from all participants. The local ethics committee approved the study and all procedures (Dnr. 2020-02804).

Evaluation of symptoms

All women were initially examined with ultrasound to measure the width of the RD space, and a functional assessment by a therapist (physiotherapist/naprapath) primarily regarding the ability to activate deep abdominal core muscles assessed with standardized physical tests as well as ultrasound examination. The primary outcome was abdominal core function, and the secondary outcomes were QoL, and symptoms associated with core instability. These were examined before and 1 year after surgical reconstruction. The RD was examined with ultrasound before and 1 year after the repair, by the operating surgeon. Ultrasound findings were documented and stored.

Core function was evaluated using a self-rating scale regarding physical function (disability rating index (DRI)); a validated self-rating scale that covers 12 general activities of daily life measured on a standard 100 mm visual analogue scale providing scores ranging from 0–100 for each activity, where 0 represents no difficulty in performing the specific task, and 100 as not able to perform the task at all[21]. The 12 activities were: getting dressed and undressed without help, taking walks, climbing stairs, sitting down for longer periods of time, standing bent while doing the dishes, carrying a suitcase or bag, making the bed, running, doing light work, doing heavy work, lifting heavy objects, and doing exercise/sports.

QoL was evaluated using the SF-36 questionnaire[22]. Recurrence of RD was evaluated by ultrasound 1 year after surgery, and was defined as a persisting diastasis more than 1 cm. All patients reported the presence (yes/no) of symptoms associated with core instability (back pain, core control, core weakness, bulging, cosmetic issues, abdominal pain, constipation, and urinary incontinence, before surgery and at the 1-year follow-up). Results were documented in the patient's medical notes.

Training

All participants were assessed by a physiotherapist/naprapath before the decision to operate. Participants were either recommended a specific core stabilization training programme or had already participated in a specific core training programme without improvement in core stability or relief of symptoms. The training programme was a minimum of 3 months of specific deep core muscle exercises[13]. These began with light loads to gain effective force transmission and technique. First was pelvic floor activation and then activation of all abdominal muscles creating tension in the linea alba without compensation mechanisms. Training then progressed to heavier loads with more complexity.

Concurrent with the core training exercises, participants were asked to start strength training at an individual level progressing to heavier loads, if possible, as well as performing cardiovascular exercises. The goal was to reach the levels of physical activity recommended by the World Health Organization (WHO)[23].

Furthermore, during the preoperative interval patients were encouraged to perform general flexibility exercises focusing on the thoracic region, working in all planes of motion. Deep breathing exercises were carried out daily to train the diaphragm and improve synergy between pelvic floor muscles and core stabilizing muscles. Core function was assessed with ultrasound specifically evaluating the ability to activate the deep transverse oblique muscles as well as evaluating the tension and shape of linea alba during contraction of deep core muscles[24].

To be categorized as 'training resistant', the participant must have exercised at the individual level for at least 6–9 months, with at least 3 months of specific core exercises, preferably in the early stages of the programme.

Surgical technique

All RD reconstructions were performed at the clinic, Stockholm Hernia Center. The surgical procedure was standardized suture repair of the diastasis with double row plication using a slowly absorbable, monofilament, self-locking suture (Quill® 0:0)[25], which has shown a similar good outcome as non-absorbable sutures in RD repairs[26]. Access to the linea alba depended on anatomical conditions, figure, and skin excess. Three standardized approaches, described in a previous study, were used: a midline incision without any skin excision, a limited low transverse incision including a limited resection of excessive skin and a floating umbilicus, or a wide low transverse incision including resection of excessive tissue and umbilical transposition, similar to the abdominoplasty procedure[19].

The width of the diastasis was measured at the widest distance with measuring tape before plication of the diastasis, which was identical in the different approaches. Decision on which method to use was based on anatomical features, ultrasound findings, and the woman's preference after receiving detailed information regarding risks associated with the three methods. *Fig. 1* shows preoperative pictures of a patient with postpartum abdominal wall deformation, and postoperative pictures showing the restored abdominal anatomy at the 1-year follow-up after repair with a low transverse wide incision.

All procedures were performed by one consultant surgeon (A.O.). All patients received antibiotic prophylaxis with clindamycin 600 mg orally. To minimize bleeding, tranexamic acid 1 g×3 was given the day before and 24 h after surgery. In the two low transverse approaches, two active 14-French drains were inserted during surgery and removed by the surgeon or by a nurse at the earliest the first day after surgery or when total drainage flow was less than 50 ml/day. After closure of the surgical wound, 50 ml 0.5 per cent bupivacaine/adrenaline was injected via one of the drains into the surgical area. Drains were kept closed for 30 min while the drugs took effect and then opened. All participants stayed overnight for postoperative observation.

Postoperative management

Patients were planned for 24 h postoperative observation for adjustment of pain medication, early mobilization, and

detection of early postoperative complications. The first postoperative appointment with the surgeon or an appointed nurse for a routine check-up was at 10–14 days. At a second appointment 2 months after surgery, the diastasis repair was assessed with ultrasound by the surgeon, and any complications registered. All participants were instructed to wear an abdominal binder for 12 weeks (day and night week 1–8, and daytime only week 9–12).

Rehabilitation

All participants were examined and assessed by a therapist (physiotherapist/naprapath) before surgery and an individual postoperative rehabilitation programme planned to take into consideration the patient's preoperative training level and method of repair. The purpose was to design a rehabilitation programme that would provide a smooth and quick recovery without stressing the healing process of the repaired midline.

Before surgery, participants were introduced to the programme with four intervals of home-based daily exercises to familiarize with its structure. The first interval, covering the first 4 weeks after surgery, included progressive movement exercises. During the second interval, covering week 5–8 after surgery, progressive light load exercises were added. The third interval, covering week 9–12 after surgery, included progressively heavier load exercises, and at the fourth and final interval, covering week 13–16, heavier exercises was performed until normal physical training was possible.

Rehabilitation progress was assessed by the therapist once a month, either physically or via a video-linked meeting. After approximately 4 months of rehabilitation, the participants were evaluated regarding recovery and physical condition. After completing rehabilitation, participants were recommended continued training to rebuild a fully functioning core.

The postoperative rehabilitation programme is described in detail in *Supplementary material*.

Statistical analyses

Descriptive statistics were used to characterize demography. Pairwise correlation coefficients were performed between measurements of inter-recti diastasis, comparing preoperative ultrasound with intraoperative measurements. For continuous variables, paired *t* tests and Wilcoxon signed rank tests were used to identify changes in symptoms at the 1-year follow-up. McNemar's test was used to evaluate contingency of dichotomous variables. All tests were two-sided and $P < 0.050$ was considered statistically significant. For the DRI, each parameter was investigated individually and the total DRI scores were compared. The SF-36 was analysed using the standardized protocol, and results were compared with data from 2679 women aged 15 to 44 in the Swedish SF-36 Health Survey[22].

Table 1 Preoperative characteristics of the 71 included patients who underwent rectus diastasis repair

Preoperative characteristics	
Patients (*n*)	71
Age (years), median (range)	39 (29–58)
BMI, kg/m^2, median (range)	22.3 (17.5–33.7)
Births, median (range)	2 (0–5)
RD width (cm), median (range)	
Ultrasound	5.0 (2.0–8.0)
Intraoperative	5.0 (3.0–13.0)

RD, rectus diastasis.

Linear regression was utilized to test whether the degree of symptoms before surgery was associated with changes in symptoms after surgery. Non-linearity was investigated by adding a quadratic term of the preoperative variable investigated in the model. Statistical analyses were calculated with Stata 12.1 (Stata Corp, College Station, TX, USA).

Results

Seventy-five women were eligible for participation. Four participants were excluded due to intraoperative decision to use mesh reinforcement (2) and declining to participate (2), resulting in 71 included participants. *Table 1* summarizes the preoperative demographics of included participants. Median (range) age at time of surgery was 39 (29 to 58) years. Response rate of included participants was 100 per cent (71 of 71) for the 1-year clinical control, 81.7 per cent (58 of 71) for the DRI, 98.8 per cent (68 of 71 for the patient-reported symptoms, and 62 per cent (44 of 71) for the SF-36 questionnaires.

Surgery

Of all patients, six (8.5 per cent) underwent repair with a midline incision, 16 (22.5 per cent) with limited transverse incision, and 49 (69 per cent) with a wide transverse incision and abdominoplasty. In 47 patients (66.2 per cent), there was one or more concomitant midline fascial defects including symptomatic and asymptomatic midline hernias diagnosed either before or intraoperatively. The correlation coefficient between the inter-recti distance measured with ultrasound and the perioperative findings was 0.71. In general, ultrasound tended to underestimate the mean diastasis width by 4 mm ($P = 0.007$). Sixty-five participants had two active drains inserted during the operation. Median (range) drainage duration was 1 (1–4) day. Median (range) hospital stay was 1 (0–2) day.

Postoperative complications and recurrence

All participants underwent a postoperative examination 8–10 weeks after surgery performed by the surgeon. Ten patients reported an early postoperative complication. Three patients developed a haematoma managed conservatively, three presented with a surgical site infection that was treated with antibiotics for 7–14 days. Four patients later developed a seroma, one treated with repeated aspiration. No early complication resulted in long-term sequelae at the 1-year follow-up. No recurrence (defined as a persisting diastasis more than 10 mm) was observed after 8–10 weeks, or at the 1-year follow-up.

Functional outcome

The primary outcome, core function, assessed with the DRI questionnaire, showed significant improvements in all 12 parameters ($P < 0.001$), as well as in the total DRI score ($P < 0.001$) compared with preoperative scores, illustrated in *Figs. 2* and *3*.

There were significant improvements in the secondary outcomes, self-reported symptoms, back pain, abdominal pain, core control, core weakness, bulging, constipation, and cosmetic issues (all $P < 0.001$), as well as urinary incontinence ($P = 0.008$) at the 1-year follow-up compared with preoperative reports (*Table 2*).

Quality of life

Mean scores of the SF-36 subscales, and comparisons between pre- and postoperative results and expected ratings derived

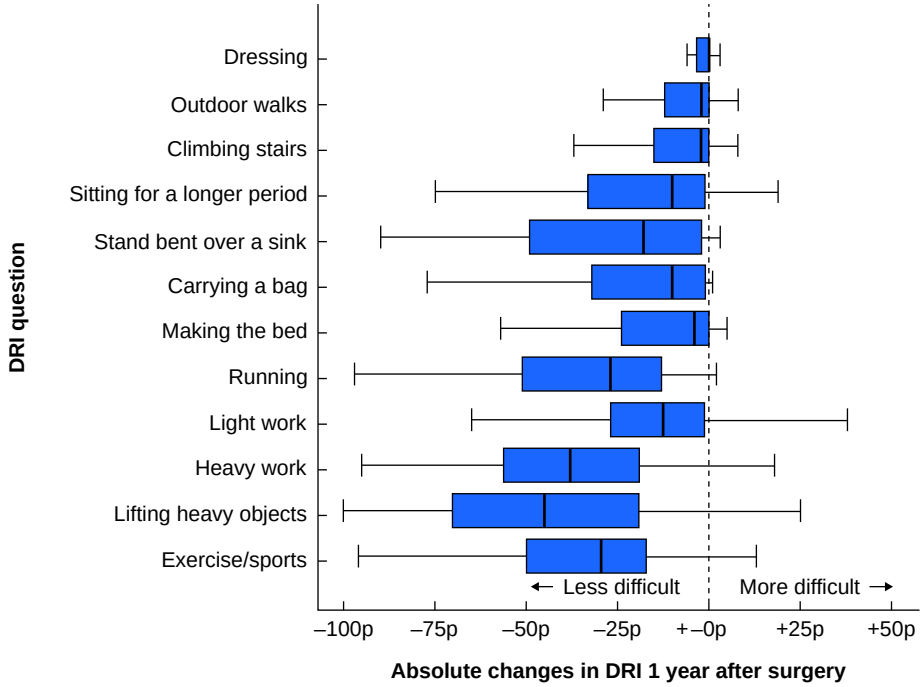

Fig. 2 Absolute change in mean disability rating index (DRI) at 1-year follow-up compared with before surgery

DRI was scored on a visual analogue scale measured in millimetres giving scores ranging from 0–100 for each activity, where 0 represents no difficulty in performing the specific task, and 100 not being able to perform the task at all.

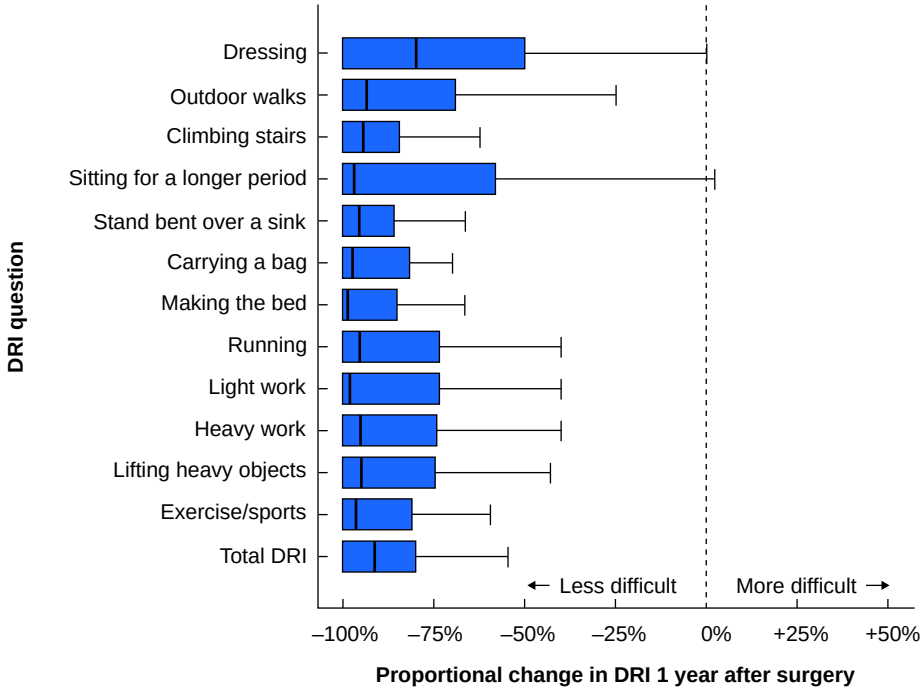

Fig. 3 Proportional change in mean disability rating index (DRI) at 1-year follow-up compared with before surgery

DRI was scored on a visual analogue scale measured in millimetres giving scores ranging from 0–100 for each activity, where 0 represents no difficulty in performing the specific task, and 100 not being able to perform the task at all.

from the Swedish female background population are illustrated in *Fig. 4*. Before surgery, patients had a lower QoL for all subscales in the SF-36 questionnaire ($P < 0.002$) compared with the Swedish female population. After surgery, QoL improved significantly compared with preoperative scores for all subscales. After surgery, patients rated their QoL as being close to the normative Swedish female population, while levels higher than the general population were reported regarding physical function, role physical, body pain, general health, and social functioning ($P < 0.001$). *Supplementary data* in *Supplementary material*.

Table 2 Disability rating index results and self-reported physical symptoms before surgery and at the 1-year follow-up after rectus diastasis repair

	Before surgery (*n* = 68)	1 year follow-up (*n* = 58)	*P** (*n* = 58)
Specific DRI (0–100)†, median (range)			
Getting dressed and undressed without help	0 (0–68)	0 (0–7)	<0.001
Taking a walk	3 (0–84)	0 (0–32)	<0.001
Going up stairs	2 (0–83)	0 (0–32)	<0.001
Sitting down for longer periods	16 (0–90)	0 (0–74)	<0.001
Standing bent while doing the dishes	21 (0–100)	1 (0–47)	<0.001
Carrying a suitcase or bag	17 (0–84)	0 (0–53)	<0.001
Making the bed	6 (0–97)	0 (0–25)	<0.001
Running	45 (0–100)	1 (0–96)	<0.001
Light manual work	16 (0–89)	0 (0–54)	<0.001
Heavy manual work	45 (0–100)	2 (0–69)	<0.001
Lifting heavy objects	61 (0–100)	3 (0–72)	<0.001
Doing exercise/sports	38 (0–100)	2 (0–74)	<0.001
Total DRI (0–1200), median (range)	313 (0–1050)	26 (0–624)	<0.001
Physical symptoms	(*n* = 71)	(*n* = 71)	(*n* = 71)
Back pain	51 (71.8)	2 (2.8)	<0.001
Abdominal pain	16 (22.5)	2 (2.8)	<0.001
Core control	48 (67.6)	0 (0.0)	<0.001
Core weakness	32 (45.1)	1 (1.4)	<0.001
Bulging	29 (40.9)	5 (7.0)	<0.001
Constipation	15 (21.1)	1 (1.4)	<0.001
Urinary incontinence	7 (9.9)	0 (0.0)	0.008
Cosmetic issues	23 (32.4)	9 (12.7)	<0.001

Values are *n* (%) unless otherwise indicated. Wilcoxon signed rank test was used for non-parametric data, paired *t* test for normally distributed data, and McNemar's for binary contingency. DRI, disability rating index. †DRI was measured in a standardized manner using a visual analogue scale measured in millimetres, providing scores ranging 0–100 for each activity, where 0 represented no difficulty performing the specific task, and 100 not being able to perform the task at all. *Wilcoxon signed test was used for non-parametric data, paired *t* test for normally distributed data, and McNemar's for binary contingency.

Discussion

The TOR concept is a novel multimodal approach for patients with symptomatic postpartum abdominal wall insufficiency combined with RD. The concept includes preoperative structured core training, evaluation of function and anatomy with ultrasound, tailored surgery, and an individual postoperative rehabilitation programme. This prospective cohort study showed that abdominal core function and QoL at the 1-year follow-up were significantly improved compared with before treatment, and equal to the reference population. The results were similar to a previous study that examined a similar cohort at a teaching hospital[19]. The TOR concept seems to be a promising management solution for postpartum women with persistent RD where core stabilizing training has been unsuccessful.

The main benefit of the TOR concept is its holistic patient-orientated management and supervised guidance during the process that involves preoperative training, surgery, and postoperative training until rehabilitation is complete and the patient is fully recovered. The individually designed postoperative rehabilitation regimen was developed as a supervised programme with progressively increasing load exercises. The purpose was to optimize recovery without stressing the healing process of the repaired midline.

Core stabilizing training is still the recommended first-line treatment and has been reported to improve core stability in many cases[27]. Several core training programmes have been presented with varying results regarding reduction of the inter-recti distance and abdominal core function[13]. Due to the heterogenous studies and varying outcomes, several management recommendations have been presented[28]. Specific core stabilizing exercises have been suggested to provide support to the abdominal canister[29], but improvements arising from core training are, by nature, temporary and require continued training if they are to persist.

The participants in the present study were not successful with core training resulting in the second-line surgical treatment. The preoperative training was considered beneficial reflecting better body control and stronger core musculature that favoured the postoperative rehabilitation. One participant was nulliparous but had developed an RD of 55 mm without any midline hernia following a limited laparotomy. Due to similar clinical presentation and symptomatic panorama as the postpartum participants she was accepted for inclusion. These results warrant future studies to explore whether TOR could be beneficial in RD with other underlying causes, for example after surgery and obesity.

Several surgical techniques with generally positive outcomes, low recurrence rates, and low postoperative complication rates have been presented. Plication of RD is an established component of the abdominoplasty procedure performed mainly for a cosmetic reason. In recent decades, abdominal wall surgeons have presented repair techniques with or without mesh reinforcement[30,31], different open approaches[19,32], and a variety of endo-laparoscopic methods as an alternative to open repairs such as endoscopic-assisted linea alba repair (ELAR), subcutaneous onlay laparoscopic approach (SCOLA), preaponeurotic endoscopic repair (REPA), total endoscopic-assisted linea alba reconstruction (TESLAR) and the robotic transabdominal retromuscular rectus diastasis (r-TARRD) repair[33–38]. Both open and endo-laparoscopic repairs have shown to be safe and effective[39].

The open approaches chosen for this study were well established surgical techniques described in the previous study[19]. The advantage with the open procedures is the ability to combine the RD repair with an aesthetic correction to meet the patient's preferences regarding cosmetic outcome. The disadvantage is the more extensive dissection which increases the risk for several postoperative complications[40], as well as hypoaesthesia, which is mainly temporary.

The postoperative rehabilitation regimen was reported as successful and received positive feedback from the participants. The frequent follow-up appointments presented an opportunity to encourage the participants, promote or slow down the frequency of rehabilitation exercises as well as respond to queries regarding the core function. The ambitious rehabilitation programme may result in an increased short-term cost but could be justified by the improved long-term outcomes.

The study showed significant improvements in function. The self-reported symptoms back pain, abdominal pain, core control, core weakness, bulging, constipation, urinary incontinence, and cosmetic issues showed significant improvements at the 1-year follow-up. The two most common symptoms reported before surgery were back pain and lack of core control, and these also showed the greatest improvement at follow-up. Even though symptoms before and after surgery were registered as dichotomous yes/no answers, the findings reflect the panorama of functional disabilities reported in previous studies[9–11].

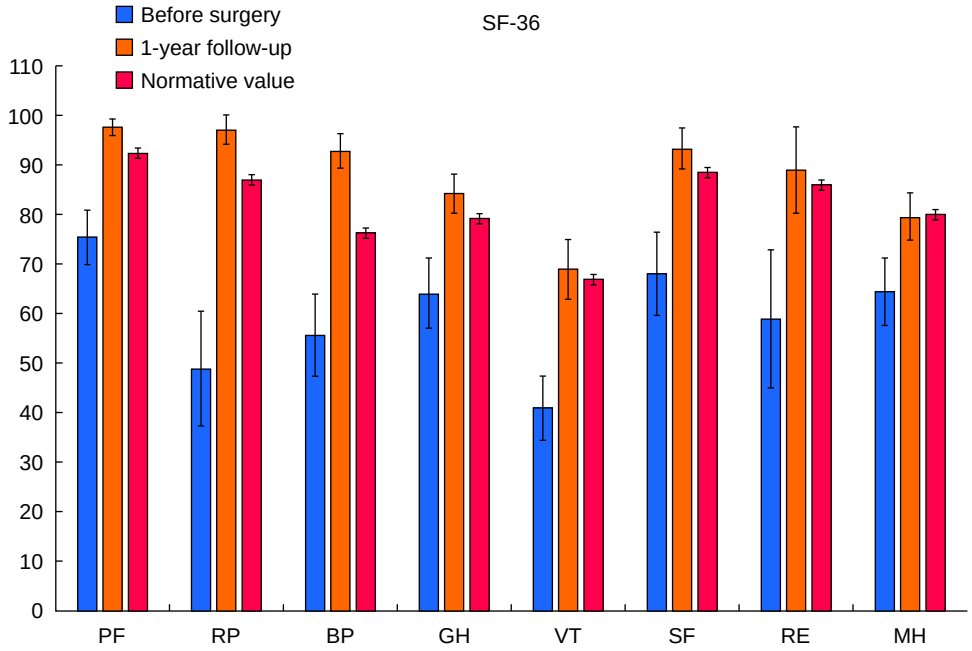

Fig. 4 Histogram showing the medical outcome survey short form (SF-36) questionnaire scores for patients with symptomatic rectus diastasis before and after surgery compared with normative values among women in the Swedish SF-36 health survey aged 15 to 64 years ($n = 3994$)

Range plots with capped spikes represent 95 per cent confidence intervals. PF, physical function; RP, role physical; BP, body pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health.

All participants reported less difficulty in performing the 12 activities in the DRI form, with a mean reduction of 81.3 per cent of the total DRI score. The improvements seen were similar to results reported in the previous cohort study that showed an average of 79.1 per cent reduction of the total DRI score[19,20]. The DRI results in the previous study were congruent with results from structured physical tests monitored by a physiotherapist, underlining the reliability of the DRI[19].

The SF-36 questionnaire captures both physical and mental function in eight subscales: physical function; role physical; body pain; general health; vitality; social functioning; role emotional; and mental health. General laxity of the abdominal core muscles postpartum may result in physical disability as well as a negative body image and a decrease in aesthetic experience that affects QoL in several ways.

The self-reported symptoms, bulging, and cosmetic issues significantly improved but remained to some extent. These 'body image' symptoms may need specially designed management. In cases with severe abdominal wall insufficiency, RD repair alone may not be sufficient. In such cases, other components of general abdominal wall laxity need to be addressed and, if necessary, reconstructed. In cases of severe laxity or a severely deformed abdominal wall, linea alba diastasis repair may be accomplished by reconstruction methods such as re-approximation of the posterior rectus sheets or medial transposition of the external oblique muscles[41]. The diversity of postpartum anatomical changes requires a larger selection of surgical techniques to enable the best repair technique for the patient. Studies on other more advanced reconstruction techniques are ongoing.

Fifteen patients reported preoperative constipation that was significantly reduced after surgery. This improvement may be explained by a limited intra-abdominal space after surgery that prevents intestinal bloating, restricts the development of constipation, and shortens colonic transfer time. There are no reports in the literature supporting this finding, and studies on gastrointestinal problems related to postpartum RD are warranted.

Three participants developed bleeding/haematoma, three participants a seroma, and three participants a surgical site infection after surgery. These rates of postoperative complications were comparable to the previous cohort that showed four haematomas, four seromas, and two surgical site infections after surgery. The combination of careful surgical technique, bupivacaine/adrenaline injected into the surgical wound, and tranexamic acid treatment before and after surgery seems to be a promising strategy to avoid postoperative complications.

The panorama of symptoms as well as the heterogeneity of persistent anatomical changes in the abdominal wall after pregnancy, including the RD, underline the complexity of this condition. Nevertheless, this and other studies show that RD repair provides significant improvements in function in the majority of women. Indications for surgery, on the other hand, must be thoroughly evaluated before deciding on surgery. A careful preoperative assessment with dynamic imaging of the abdominal wall is recommended for optimal planning of surgical approach and repair technique[42]. Postpartum core instability is common and mainly affects a young healthy population. RD reconstruction is a surgical procedure that can result in a long healing process and postoperative complications.

Surgical treatment of a benign condition in young healthy individuals requires careful patient selection and an optimal management programme.

There are some limitations to this study. There was no control group, thus preventing far-reaching conclusions. The response rate for the SF-36 questionnaire was lower than for the other instruments used in this study. Nine incomplete questionnaires from the early phase of the inclusion process, were excluded, which partly explains the low response rate.

The self-reported symptoms back pain, abdominal pain, core control, core weakness, bulging, constipation, cosmetic issues,

and urinary incontinence, were not defined in detail which may have resulted in subjective interpretation of the meaning of these symptoms resulting in responder bias.

The participants were somewhat homogenous regarding age, activity level, and occupation, making extrapolation of results to the general population difficult. On the other hand, the typical postpartum woman with no further plans for children and persistent core instability, are probably in a narrow age range with moderate physical activity.

The TOR concept is a safe and efficient management regimen for postpartum women with abdominal wall insufficiency combined with RD, where training has not restored core stability. The condition is complex, and it is important to tailor the best treatment regimen for each patient, with careful selection of those requiring surgery. The TOR concept could serve as a model for the optimal management of RD patients.

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Disclosure

A.O. is the founder of Stockholm Hernia Center. K.W. is cofounder of Hela Kvinnans Klinik. The authors declare no other conflicts of interest.

Supplementary material

Supplementary material is available at *BJS Open* online.

Data availability

All data are saved and available for review.

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