

Supplementary material

The TOR-concept (Training-Operation-Rehabilitation) applied to a cohort of postpartum women with training-resistant symptomatic rectus diastasis. Evaluation one year after surgery.

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Supplementary Methods

Postoperative rehabilitation 1st month

During postoperative Weeks 1-4, the aim was to achieve normal activities in everyday life, avoiding heavy loads and excessive stretching of the abdominal wall, with minimal sitting during the day. Shorter walks lasting 10-15 minutes were introduced Days 3-4, slowly increasing to several shorter walks each day, increasing in length. Maximum time for each walk was set at 45 minutes to avoid overdoing things and competitive thinking.

Rehabilitation training consisted of deep breathing exercises as well as easy movement exercises starting Week 2. Focus was set on regaining a neutral upright posture and removing any fear of movement. The patient was encouraged to perform five rehabilitation exercises daily, two minutes each.

Postoperative rehabilitation 2nd month

During Weeks 5-8, exercises aimed at increasing general movement in everyday life without heavy loads or excessive stretching of the abdominal wall were carried out. As sick leave usually ended at the beginning of this period, the patient increased everyday life activities according to their work situation. Daily walks with no time limitation were introduced, progressing from the individual's current ability to longer faster walks. Cardiovascular training generally started Week 6-8 when the skin wound had completely healed.

Additional individual rehabilitation training consisted of:

1. breathing exercises with conscious activation of the pelvic floor muscles, abdominal muscles, and the diaphragm
2. core exercises to regain control and stability, emphasising the importance of light tension throughout the abdominal canister with coactivation of the rectus abdominis muscles
3. general flexibility exercises focusing on a neutral upright posture.
4. progression to easy core activation, adding arm and leg movements in various body positions.

The patient was encouraged to perform two to three exercises daily each lasting two minutes and in varying body positions. The girdle was not used while performing exercises in the supine position. Muscle strengthening exercises targeting the major muscle groups were eventually added to the core exercises. The number of daily exercises increased during this period and focused on loads about 40 % of maximum ability. This was to improve blood circulation and general muscle strength, and to achieve mental acceptance of the new loading capacity of the core muscles. All exercises were performed breathing naturally, avoiding excessive intra-abdominal pressure, and starting from a neutral posture. The patient was recommended general flexibility exercises that did not stretch the abdominal wall excessively such as stretching of the glutes, hamstrings, shoulders, and back muscles. The patient was also encouraged to perform simple movements in all possible planes.

Postoperative rehabilitation 3rd month

During Weeks 9-12, the goal was to further increase general activities of daily life with reference to WHO's recommendations for level of physical activity.

Specific rehabilitation training consisted of core exercises to rebuild stability and strength on top of the other exercises, pointing out the importance of tension throughout the abdominal canister with coactivation of the rectus abdominis muscle, as well as general flexibility exercises with focus on the neutral upright posture.

Exercises progressed to more challenging core exercises:

1. longer levers and improved rotation control
2. different body positions such as supine, lying on the side, standing on all fours, and standing upright. No girdle was used in the supine position
3. common exercises such as supine head lift while focusing on breathing, straight leg raising, and "bird dog".

The patient was encouraged to perform two to three exercises each lasting two minutes each day, in varying body positions.

Cardiovascular training was then introduced. The recommendation was 15-20 minutes at comfortable intensity, increasing duration every 2-3 sessions, and after 4-5 sessions increasing intensity. The range of movements was adjusted according to the individual's ability. Walking uphill for 30 seconds and slowly down, with 7-10 repeats with a maximum intensity level of "a bit straining" (50-60% of maximum heart rate).

A whole-body muscle-strengthening programme with loads up to 50-55 % of maximum was introduced at the end of this period. Exercises such as lunges, deadlifts, combination of exercises like squatting with shoulder presses, as well as progression of supine bridging/hip thrusts were added to the programme. Challenging the body in ways other than just adding weights i.e., increased tempo, increased complexity, exercise with supersets, or Tabata programming were introduced.

All exercises were performed breathing naturally, avoiding excessive intra-abdominal pressure, and starting from a neutral posture. Flexibility exercises targeting the thoracic region, hips, and pelvis were added, as well as general motion in all possible planes.

Postoperative rehabilitation 4th month

The fourth and final period, Weeks 13-16, aimed to achieve full general activities of daily life based on WHO's recommendations for level of physical activity.

The use of a supportive girdle during the day was stopped and the patient was recommended to start exercising without a girdle.

Specific rehabilitation exercises focused on conscious activation of the pelvic floor muscles while breathing deeply as well as abdominal, diaphragm and core engaging exercises to rebuild strength and endurance.

More challenging core exercises with longer levers and improved rotational control in different body positions were introduced. The aim of this period was to perform previous exercises but without a supportive girdle. Exercises such as side planking on the knees, kneeling push-ups, and prone exercises for strengthening the lower back were introduced. The patient was encouraged to perform two to three exercises each day, two minutes each, in varying body positions.

Cardiovascular training such as indoor cycling, cross-trainer, and walking uphill was introduced. Interval training with increasing intensity and duration was initiated.

A whole-body muscle strengthening programme with advanced loading up to 60 % of maximum and flexibility exercises in all planes of movement were started at the end of this period. The goal was to reintroduce most exercises the patient usually performed prior to surgery without excessive stretching of the abdominal wall. The patient was encouraged to start exercising in the gym, if possible.

From Week 16, activities progressed to ordinary training and exercises. The patient was told to follow WHO's recommendations for physical activity, encouraging exercises that were most important. At this point, the repair usually had fully healed and the linea alba duplicate was no longer visible on ultrasound. Reintroduction of common core exercises focusing on muscle strength and movement, such as crunches, sit down to sit up, sitting twisting, planking on knees and then toes, progressing to "mountain climber". The patient was encouraged to continue easier core exercises and add more challenging ones for a complete loading spectrum.

The patient was encouraged to restart activities such as cross fit, heavier lifting, running, swimming, yoga, as well as racket sports such as tennis and paddle, as well as heavy lifting and bracing.

The general aim was that at 6 months after surgery the patient could perform at a level similar to that prior to surgery. Patients were told to avoid excessive stretching of the abdominal wall in the sagittal plane while extending the spine, such as the full cobra position in advanced yoga. Interval running progressing to longer intervals and higher intensities was introduced.

Supplementary Results

Supplementary data on SF-36

			Before			1-year			Normative value			SD
			Before surgery	SE	95% CI	1-year follow-up	SE	95% CI	Normative value	SE	95% CI	
Physical functioning	Fysisk funktion	PF	75,3779	2,7825	5,4538	97,5000	0,8562	1,678244	92,3000	0,3000	0,588	15,52772
Role physical	Rollfunktion-fysisk	RP	48,8372	5,8800	11,5248	97,0238	1,5247	2,988347	87,0000	0,5000	0,98	25,87953
Pain	Smärta	PI	55,6395	4,2037	8,2392	92,7381	1,7908	3,510041	76,2000	0,5000	0,98	25,87953
General health	Allmän hälsa	GH	64,0698	3,6350	7,1246	84,1667	2,0084	3,936423	79,1000	0,4000	0,784	20,70362
Vitality	Vitalitet	VT	40,9524	3,3052	6,4782	68,9024	3,0768	6,030571	66,8000	0,4000	0,784	20,70362
Social functioning	Social funktion	SF	68,0233	4,2888	8,4061	93,1548	2,0957	4,10765	88,5000	0,4000	0,784	20,70362
Role emotional	Rollfunktion - emotione	RE	58,9147	7,0886	13,8937	88,8889	4,4964	8,812956	86,0000	0,5000	0,98	25,87953
Mental Health	Psykiskt välbefinnande	MH	64,3810	3,4075	6,6786	79,3902	2,4297	4,762239	80,0000	0,4000	0,784	20,70362