

Efficacy of Tupler Technique on Reducing Post Natal Diastasis Recti a controlled study

Mohamed A. Awad 1, Magda A. Morsy1, Marwa A. Mohamed1*, Amir A. Gabr 2

1 Department of physical therapy for Obstetrics and Gynaecology, Faculty of physical therapy, Cairo University, Egypt.

2 Department of Obstetrics and Gynecology, Faculty of medicine, Cairo University, Egypt.

Authors' contributions:

This work was carried out in collaboration between all authors. "Author M.A' designed the study, performed the statistical analysis, 'Author M.A.' wrote the protocol, 'Author M.M*' managed the analyses of the study and wrote the first draft of the manuscript. 'Author A.G.' managed the literature searches; all authors read and approved the final manuscript."

ABSTRACT

Aims : This study was conducted to determine the effect of tupler technique on post natal diastasis recti.

Study design: Pretest post-test design.

Place and Duration of Study: Subjects of this study were selected from physical therapy department in Kasr Al Aini university hospital. This study was conducted from August 2014 to January 2015.

Methodology: Sixty women complained from diastasis recti (diagnosed by gynecologist/ physician) in this study. Their ages were ranged from 25 to 35 years old and their diastasis recti more than 2.5 cm after normal vaginal delivery. Women were divided into two groups equal in number, group (A) consisted of 30 women wore tupler splint only and did not perform any exercises. While, group (B) consisted of 30 women wore tupler splint and performed tupler technique for 18 weeks. Diastasis recti were evaluated by digital caliper for both groups before and after 18 weeks.

Results: The obtained results were statistically analyzed by using paired *t*- test and showed that there were a highly significant decrease ($P < 0.001$) in BMI, waist/hip ratio and diastasis recti in both groups (A&B) after 18weeks. But, there was a significant difference between both groups after 18 weeks (more decrease in group B).

Conclusion: It could be concluded that tupler technique is very effective in reducing post natal diastasis recti.

Key words: Diastasis recti –Digital caliper-Tupler technique- Post natal.

1. INTRODUCTION

Diastasis recti is a condition in which the rectus abdominis muscle separates in the mid line at the linea alba. The diastasis is defined as a gap between the recti abdominis muscles of greater than 2.5cm; palpated just superior to the umbilicus. The separation of linea alba may occur during pregnancy or in the expulsive stage of labour [1].

This separation can affect the ability of the abdominal wall to dynamically stabilize the trunk and may contribute to back and pelvic pain post natally [2].

Rectus diastasis is thought to be the result of mechanical strain of enlarging uterus placed on the abdominal wall [3].

In some cases when the linea alba is placed under too much pressure, rather than the rectus abdominis muscles stretching, the fibers of linea alba may tear. This is known as diastasis of the rectus abdominis [4].

The abdominal separation reduces the integrity and functional strength of the abdominal wall and can aggravate lower back pain and pelvic instability. Separation in a previous pregnancy significantly increases the probability, and severity of the condition in subsequent pregnancies [5].

A large majority of the pregnant population, as much as 80% to 90% will develop a diastasis by their final trimester. Unless pregnant and postpartum women learn to exercise and use their abdominal muscles correctly, these complaints might plague their pregnancies and extended recoveries [6].

The posture changes as the pregnancy progress, the pelvis tilts and the back arches to help keep balance. Poor posture occurs due to the stretching of the woman's abdominal muscles as the fetus grows. These muscles are less able to contract and keep the lower back in proper alignment [7].

A serious complication associated with diastasis recti is hernia. Pregnant women with diastasis recti may experience umbilical hernia when extra pressure placed on the abdominal wall during the second and third trimester of pregnancy causes the pregnant uterus to bulge through the wall. In addition, premature newborns with diastasis recti may develop hernia when separated abdominal muscles allow part of the intestine to protrude through a weakened or poorly formed abdominal wall [8].

A common complication associated with diastasis recti is low back pain, according to Minnesota's Sport and Spine Physical Therapy Practice. Abdominal muscles support the back so separated or weakened muscles can lead to chronic pain [8].

Metal markers and serial radiographies were utilized to verify rectus diastasis correction [9]. Computed tomography is considered the method of choice to examine the abdominal wall, but it is expensive and also exposes the patient to radiation risks [10].

Management of rectus diastasis ranges from conservative approach of external support and exercises to the extreme of surgical repair [11].

Strengthening the transverse muscle with the Tupler Technique exercises will bring blood flow to the connective tissue helping it heal and make it strong enough to engage this muscle in different exercises [12].

Tupler technique is the only evidence based, non-surgical way to close the gap and heal the connective tissue. This program will help to get a strong core and a flatter stomach [13].

Most abdominal exercises are too difficult or place too much stresses on the body to be appropriate for a woman postpartum. Some exercises, however, should be done to strengthen the muscles of the abdomen and the core. These exercises will focus on the deep abdominal muscles of the transverse abdominis to make this muscle strong before emphasizing the rectus abdominis and obliques [14].

The Tupler technique focuses on strengthening the inner-most abdominal muscle, which is called the transverse muscle. This muscle is like a corset and wraps around the women midsection. The action of the muscle is forward and backward. The inner most muscle is attached to the outer-most muscle. So, when it goes back towards the spine, it brings the outermost muscle with it, making this separation smaller [12].

A common misconception after pregnancy is that doing sit-ups and crunches will help to re-strengthen the abdominals and achieve flat abdomen again. Crunches and sit-ups exercise the rectus abdominus muscle and cause it to bulge; however, they will not help the two halves fuse back together and can in fact further separate them. Focus on exercises that target deeper abdominal muscles such as the transverse abdominus and internal obliques is much important, which are responsible for holding the rectus abdominus together [8].

Splinting is an important step of the tupler technique however; just wearing the diastasis rehab splint will not close diastasis. The women must do all 4 steps of the program [12].

The purpose of the splint is to approximate or manually bring together the two separated muscles. This puts the connective tissue in a better position to heal and puts the muscles in a better position making the exercises more effective. Wearing the splint will not weaken muscles. It just putting muscles in a better position. The purpose of other binders is compression or bringing the women's belly to her spine. They will weaken abdominal muscles [12].

The aim of this study was to investigate the efficacy of tupler technique on reducing post natal diastasis recti.

2. MATERIAL AND METHODS

I-SUBJECTS:

Sixty postpartum, multiparous women complained from diastasis recti (diagnosed by gynecologist/ physician and confirmed by digital caliper instrument) with diastasis recti more than 2.5 cm just superior to the umbilicus after normal vaginal delivery shared in this study. They were selected from Kasr Al Aini University Hospital. Their ages were ranged from 25 to 35 years old. Any women with chest disease, cardiac disease, delivered by cesarean delivery or had abdominal or back surgery were excluded as well as women with heavy bleeding, pain and breast infection or abscess confirmed by obstetrician.

Every woman was asked to sign a consent form before participating in this study. This study was conducted from 1 August 2014 to 15 January 2015. They were divided randomly into two equal groups. Group (A) (Control group): Included 30 women didn't perform any exercise. Group (B) (Study group): Included 30 women were treated with tupler technique.

II- INSTRUMENTS

EVALUATING INSTRUMENTS:

1- Weight-height scale: It was used to measure the body weight and height to calculate the BMI before and after treatment program for both groups (A and B).

2- Tape measurement: It was used to measure the waist and hip circumferences to calculate waist/hip ratio before and after treatment program for all women in both groups (A and B).

3- Digital caliper (Electronic Calipers): It was used to assess the amount of separation between the two recti before and after treatment program for all women in both groups (A and B), fig. (1).

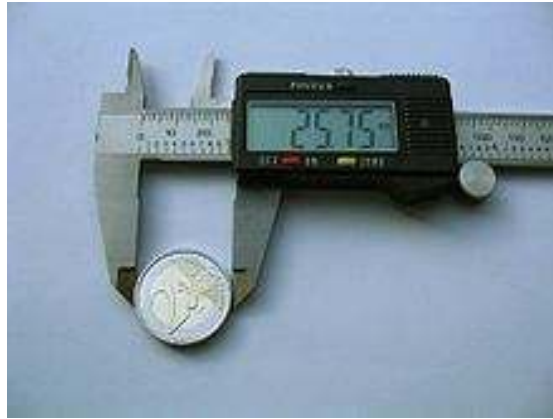


Fig. (1): Digital caliper.

THERAPEUTIC INSTRUMENTS:

Tupler splint:

The purpose of the Diastasis Rehab Splint is to approximate or pull the two halves of the muscles closer together; it was used for treatment of both groups (A and B). Just wearing the diastasis Rehab Splint will not close the diastasis. Patients performed all 4 steps of the program. The splint was worn between the bottom of the rib cage and the top of the hip bones, so each side of the recti can be brought towards the middle, fig. (2).

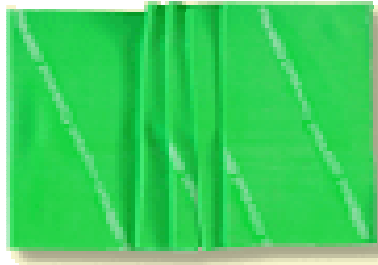


Fig. (2): Tupler splint.

III- PROCEDURES:

A) Assessment of BMI:

149 Weight and height were measured while the woman wearing a thin layer of clothes to
150 calculate the BMI before and after treatment program for all women in both groups (A and B)
151 according to the following equation:
152 $BMI = \text{weight} / \text{height}^2 \text{ (Kg/m}^2\text{)}$

153 **Waist and hip circumference measurements:**

154 Waist circumference was measured pare skin at the narrowest level between the costal
155 margin and the iliac crest at the end of gentle expiration, and the hip circumference was
156 measured at the widest level over the buttocks. Then, waist/hip (W/H) ratio was calculated
157 by dividing the waist by the hip circumference before and after treatment program for all
158 women in both groups (A and B).

159 **Measurement of separation between the 2 recti by digital caliper:**

160 Digital caliper was used to assess the amount of separation between the two recti just
161 superior to the umbilicus before and after treatment program for all women in both groups (A
162 and B). The tips of the caliper were adjusted to fit across the points to be measured.

163 **B) Therapeutic procedure:**

164 This program rehabilitates the abdominals through 4 steps. It takes 18 weeks (**Julie Tupler**
165 **and Jodie Gould, 2004**) [12]., as the following:

166 **I. Splinting with the Diastasis Rehab Splint:**

167 It was used for treatment of both groups (A and B) . It was used to approximate or manually
168 bring together the two separated muscles. It can be used after 2 days of delivery. The splint
169 was worn between the bottom of the rib cage and the top of the hip bones. So, each side of
170 the recti can be brought towards the middle.

171 **II. Tupler Technique Exercises:**

172 It was used for treatment of group B only.

173 **1. Head Lifts**

174 The woman was asked to lie on her back with the knee flexed, and her hands crossed at the
175 waist to push the recti muscle toward the midline and then the women was asked to take in a
176 deep breath and as she exhale she was asked to raise her head off the bed and pull the
177 underlying muscles together with both hands. The woman slowly returned to the starting
178 position as she breathes in, this exercise was repeated 10 times every session for 3 times
179 daily. This exercise was also done by wrapping a sheet or towel around the body, grasping
180 the ends with opposite hands, while doing the same motion.

181 **2. Chest stretch/upper back strengthening:**

182 The woman was holding a resistance band in both hands from sitting position, and then she
183 was asked to take a lateral costal breathing and pull the resistance band during this and then
184 expire and pull her transverse muscle to the spine. This exercise was repeated 30 times
185 each session and 5 sessions was performed daily.

186 **3. Tupler Technique:**

187 The woman was asked to lie flat on her back with knees bent at a 45-degree angle and her
188 feet on the plinth, and then she was asked to breathe in through the nose and let the belly fill
189 with air. As she exhales, she was asked to pull the bellybutton back toward the spine. This
190 position was kept for 30 seconds. This exercise was repeated five more times for 10 sets
191 daily.

192 **4. Leg slides:**

193 The woman was asked to lie on her back with both legs slightly bent and the pelvis in a
194 neutral position. Then she was asked to exhale and tighten abdominal muscles while
195 pressing lower back against the floor, and slowly slide right foot out along the floor until the
196 leg is straight, then pull her foot back toward her body and repeat with left leg. This exercise
197 was repeated 10 to 20 times for each side. As a progression, the woman was asked to
198 slowly extend both legs down with each other. The back was flat while moving legs down.
199 Once the woman was able to easily do 20 leg slides, the exercise was done by keeping the
200 sliding foot lifted 2 to 3 inches off the floor rather than sliding it along the plinth.

201 **5. Leg lifts:**

202 The woman was asked to lie on her back with both legs stretched out straight and place her
203 hands underneath her buttocks. The woman was asked to slowly raise her legs until they
204 come 6 to 10 inches up from the floor. This position was maintained as long as possible
205 without arching the lower part of the spine or straining the neck. Then, the woman was
206 asked to slowly bring her legs back down. The lower back was on the floor and abdominal
207 muscles were contracted at all times. This exercise was repeated as many times as
208 possible.

209 **6. Pelvic bridges:**

210 The woman was asked to lie on her back with the knee flexed using a pillow between knees then
211 she was asked to exhale as she contract abdominal muscles and do posterior pelvic tilt, then
212 raise her pelvis up until coming to the bridge position. Tilt the pelvis toward each side 5
213 times. The woman then asked to slowly breathe in and return to the neutral position on the
214 back.

215 **7. Abdominal crunches:**

216 Everywoman was laid with back flat on an exercise mat or the floor with knees toward the
217 chest, ankles were crossed and hands were placed behind head or crossed over the chest.
218 Then the woman was asked to engage her abdominal muscles and raise her shoulders from
219 the floor, this position was maintained for five seconds then the woman returned to the
220 starting position and relaxed for ten seconds. The lower part of back was touching the floor
221 at all times. This exercise was repeated 10 to 12 times every session.

222 **8. Reverse Crunch:**

223 The woman was asked to lie down on her back, bend her knees and position her feet flat on
224 the floor. The palms of the hands were flat on the floor. Then the woman was asked to raise
225 knees up in the direction of her chest until legs are bent. Using a very small movement, the
226 woman was asked to engage her abdominal muscles and raise hips up off the floor. Then,
227 Lower hips and repeat. This exercise was repeated 10 to 15 repetitions.

228 **III. Using the abdominal muscles correctly with activities of daily living:**

229 It was used for treatment of group B only as in baby care, lifting and carrying the baby,
230 correct sitting position, correct driving position and correct lifting position.

231 **IV. Getting up and down correctly:**

232 a-To get up from the floor the women can use one of the following 3 methods (bend
 233 technique, squat technique and lunge technique).
 234 b- To get up from sitting position.
 235 1. Take a deep breath into her abdomen and then pull her abdomen in.
 236 2. Push upward by her legs to stand up.
 237 c- Standing up from lying position.
 238 Turn on her side, draw up both knees and swing her legs on the side of the bed. Sit up by
 239 pushing herself up with her hands.
 240 **Statistical analysis:**

241 Results were expressed as mean, standard deviation (SD) and standard error of mean (SE).
 242 Comparison between the mean values of different variables measured pre- and post-
 243 treatment program was performed using paired student t- test.

244

245 **3. RESULTS**

246 The results of this study were represented as follow:

247 **Rectus diastasis measurement:**

248 Table (1) demonstrated the rectus diastasis measurement before and after treatment for
 249 both groups (A and B). There was highly significant difference ($P<0.0001$) between before
 250 and after treatment rectus diastasis measurement with mean difference of (0.29, 1.17 cm)
 251 and percentage of improvement equal (9.26 %, 36.67 %) in both groups (A and B)
 252 respectively.
 253 On comparing both groups using independent t-test results showed no significant difference
 254 in before treatment values where the t-value was (0.64) and p-value was (0.52). But there
 255 were significant differences in the after treatment values ($P<0.05$) where the t-value was
 256 (11.55) and p-value was (0.0001).

257 **Table 1. Mean values of rectus diastasis measurement before and after treatment of**
 258 **both groups (A and B).**

	Group A	Group B	t-value	P-value	
	(n=30)	(n=30)			
Before	3.13±0.33	3.19±0.3	0.64	0.52	NS
After	2.84±0.31	2.02±0.22	11.55	<0.0001	S
t-value	18.25	36.31			
P-value	<0.0001	<0.0001			
S	HS	HS			

259 * P: probability, S: significance, HS: highly significant, NS: non-significant.

260 **BMI:**

261 Table (2), demonstrated the BMI before and after treatment for both groups (A and B). There
 262 was highly significant difference ($P<0.0001$) between before and after treatment BMI with

mean difference of (0.4, 1.62 kg/m²) and percentage of improvement equal (1.34 %, 5.43 %) in both groups (A and B) respectively.

On comparing both groups, results showed no significant difference in before treatment values where the t-value was (0.14) and p-value was (0.88). But there was significant difference in after treatment where the t-value was (2.21) and p-value was (0.03).

Table 2. Mean values of BMI before and after treatment of both groups (A and B).

	Group A (n=30)	Group B (n=30)	t-value	P-value	
Before	29.71±2.05	29.79±2.12	0.14	0.88	NS
After	29.3±2.02	28.16±1.96	2.21	0.03	S
t-value	16.45	16.13			
P-value	< 0.0001	<0.0001			
S	HS	HS			

* P: probability, S: significance, HS: highly significant, NS: non-significant.

Waist hip ratio:

Table (3), demonstrated the waist hip ratio before and after treatment for both groups (A and B). There was highly significant difference ($P<0.0001$) between before and after treatment waist hip ratio with mean difference of (0.03, 0.07) and percentage of improvement equal (3.33 %, 7.77 %) in both groups (A and B) respectively.

On comparing both groups results showed no significant difference in before treatment values where the t-value was (0.07) and p-value was (0.94). But there was a significant difference in the after treatment values where the t-value was (10.1) and p-value was (0.0001).

Table 3. Mean values of waist hip ratio before and after treatment of both groups (A and B).

	Group A(n=30)	GroupB(n=30)	t-value	P-value	
Before treatment	0.9±0.01	0.9±0.01	0.07	0.94	NS
After treatment	0.87±0.01	0.83±0.01	10.1	0.0001	S
t-value	15.54	21.52			
P-value	<0.0001	<0.0001			
S	HS	HS			

*SD: standard deviation, P: probability, S: significance, HS: highly significant, NS: non-significant.

3. Discussion:

In this study we found that there was a highly significant decrease in BMI, waist/hip ratio and diastasis recti in both groups (A&B) after 18weeks. But, there was a significant difference between both groups after 18 weeks (more decrease in group B).

The results of the study were supported by **Pascoal et al., (2014)¹⁵** who found that exercise during pregnancy and reinstituted soon after delivery ensures quicker postpartum healing, with renewal of positive body image and self-esteem.

Regarding to the diastasis recti distance, the result of the study was in agree with **Julie Tupler and Jodie Gould, (2004)¹²** who found that the women utilizing the Tupler Technique exercises had a smaller diastasis than the control group who did not do these exercises.

Also, results confirmed with **Sara Rose, (2006)¹⁴** who found that most abdominal exercises are too difficult or place too much stress on the body to be appropriated for a woman postpartum. Some exercises, however, should be done to strengthen the muscles of the abdomen and the core. These exercises will focus on the deep abdominal muscles of the transverse abdominis to make this muscle strong before emphasizing the rectus abdominis and obliques.

Results of this study agreed with this of **Elaine, (2006)⁶** who found that a large majority of the pregnant population, as much as 80% to 90% will develop a diastasis by their final trimester. Unless pregnant and postpartum women learn to exercise and use their abdominal muscles correctly, these complaints might plague their pregnancies and extended recoveries.

The result of the study was supported with those of **Rebecca et al., (2007)¹⁶** who found that abdominal exercise during pregnancy reduces the diastasis recti effect. They also reduce back pains, as abdominal exercises not only strengthen the abdomen area, but the back as well.

Hickey et al., (2011)¹⁷ found that patients and physicians should be advised that surgical correction is largely cosmetic. Progressive techniques have resulted in risk reduction with no associated surgical mortality. However, the outcomes may be imperfect, with unsightly scarring, local sepsis and the possibility of recurrence. The most common complication seen was the development of a seroma. Other common complications included hematomas, minor skin necrosis, wound infections, dehiscence, post-operative pain and nerve damage, the rate of which may be as high as 40%.

Results of this study disagreed with **Ferreira et al., (2001)¹⁸** who found that the triangular mattress suture is a simple, quick, and effective way to correct abdominal diastasis and to avoid the epigastric bulge deformity with no added morbidity.

Also the result of this study disagreed with the results of **Paul, (2005)¹⁹** who found that rectus diastasis most commonly occur in pregnant women with spontaneous resolution within 6 weeks postpartum.

Results of this study contradicted with **Coldron et al., (2007)²⁰** who found that consideration should be given for a surgical repair of a diastasis rectus abdominis when the woman at least 1 year postpartum and a proper multi-modal program for restoration of effective load transfer through the lumbopelvis has failed to restore optimal strategies for function, resolve lumbopelvic pain and/or urinary incontinence.

CONCLUSION:

It could be concluded that tupler technique is very effective in reducing post natal diastasis recti.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

- 361 **10-Rayh A, Attali P and Dumas J.** The abdominal linea alba, an anatomo-
362 radiologic and biomechanical study. Surg. Radiol. Anat. 1996; 18(4):281-
363 288.
- 364 **11-Kasee H.** Abdominal muscles activity while performing trunk exercises
365 using the A13 roller, AB slide fit ball, and performed trunk curls. J. Athl
366 .Train. 2004; 39 (1):37-43.
- 367 **12- Julie Tupler and Jodie Gould.** Lose Your Mummy Tummy, United
368 States of America, Library of congress, pages (34-36)-(70-74)-(84-92).
369 Published by Da Capo Press 2004.
- 370 **13-Chiarello and Cynthiam,** The Effects of an Exercise Program on
371 Diastasis Recti Abdominis in Pregnant Women, Journal of Women's
372 Health Physical Therapy. 2005; 29, (1)30-34.
- 373 **14-Sara Rose,:** Exercise Ball, Published by Parragon Publishing, 2006;
374 ISBN 1405446463 .
- 375 **15-Pascoal AG, Dionisio S, Cordeiro F, Mota P.** Inter-
376 rectus distance in postpartum women canbe reduced by isometric contract
377 ion of the abdominal muscles: a preliminary case-control study.
378 Physiotherapy. 2014; 100(4):344-348.
- 379 **16-Rebecca G, Rebecca A and Pesic M.** The value of abdominal exercise
380 during pregnancy: Obstetric and gynecologic care in physical therapy,
381 Textbook. 3rd ed., Slack publisher, London. 2007; pp: 1-3.
- 382 **17-Hickey F, Finch JG and Khanna A.** A systematic review on the
383 outcomes of correction of diastasis of the recti, Hernia. 2011; 15(6):607-
384 14.
- 385 **18-Ferreira L, Castilho H, Hochberg J, Ardenghy M, Toledo S, Cruz R**
386 **and Tardelli H.** Triangular mattress suture in abdominal diastasis to
387 prevent epigastric bulging, Annals Plast. Surg. 2001; 46(2):130-134.

- 388 **19- Paul D.** Diastasis recti abdominis in HIV infected men with lipodystroby.
389 HIV medicine. 2005; 6(1):54-56.
- 390 **20- Coldron Y, Stokes MJ, Newham DJ and Cook K.** Postpartum
391 characteristics of rectus abdominis on ultrasound imaging. Manual
392 Therapy. 2007.Epub.333-348.