

Original Research Article

Efficacy of Tupler Technique on Reducing Post Natal Diastasis Recti

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 showed that there was 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].

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

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

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

43 To test for a rectus diastasis, lie flat on back with bended knee, place fingers across the
44 midline of the abdomen just above the belly button, perform as sit up and feel for a vertical
45 gap between fingers [4].

46 Metal markers and serial radiographies were utilized to verify rectus diastasis correction [9].

47 Computed tomography is considered the method of choice to examine the abdominal wall,
48 but it is expensive and also exposes the patient to radiation risks [10].

49
50 Management of rectus diastasis ranges from conservative approach of external support and
51 exercises to the extreme of surgical repair [11].

52
53 Strengthening the transverse muscle with the Tupler Technique exercises will bring blood
54 flow to the connective tissue helping it heal and make it strong enough to engage this
55 muscle in different exercises [12].

56
57 The Tupler Technique Program runs over eighteen weeks. During the first six weeks the
58 women will learn the 4- step Tupler Technique. The women need to wear the splint until her
59 diastasis is closed. Once it is closed the women does not need to wear the splint. However,
60 to prevent the diastasis from opening up again, the women will need to continue doing the
61 Tupler Technique exercises. Walking and running are acceptable activities to do [12].

62
63 Tupler technique is the only research-supported, non-surgical way to close the gap and heal
64 the connective tissue. This program will help to get a strong core and a flatter stomach [13].
65 Most abdominal exercises are too difficult or place too much stresses on the body to be
66 appropriate for a woman postpartum. Some exercises, however, should be done to
67 strengthen the muscles of the abdomen and the core. These exercises will focus on the
68 deep abdominal muscles of the transverse abdominis to make this muscle strong before
69 emphasizing the rectus abdominis and obliques [14].

70
71 The Tupler technique focuses on strengthening the inner-most abdominal muscle, which is
72 called the transverse muscle. This muscle is like a corset and wraps around the women
73 midsection. The action of the muscle is forward and backward. This inner most muscle is
74 attached to the outer-most muscle. So, when it goes back towards the spine, it brings the
75 outermost muscle with it, making this separation smaller [12].

76
77 A common misconception after pregnancy is that doing sit-ups and crunches will help to re-
78 strengthen the abdominals and achieve flat abdomen again. Crunches and sit-ups exercise
79 the rectus abdominus muscle and cause it to bulge; however, they will not help the two
80 halves fuse back together and can in fact further separate them. Focus on exercises that
81 target deeper abdominal muscles such as the transverse abdominus and internal obliques is
82 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].

Three absolute contraindications to exercise during the first six weeks postpartum are heavy bleeding, pain and breast infection or abscess [12].

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 randomly 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. 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).

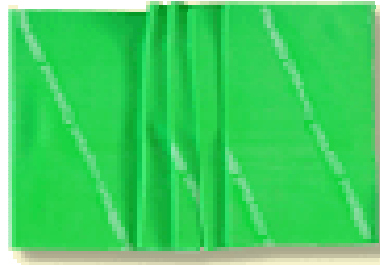


Fig. (2): Tupler splint.

III- PROCEDURES:

A) Assessment of BMI:

141 Weight and height were measured while the woman wearing a thin layer of clothes to
142 calculate the BMI before and after treatment program for all women in both groups (A and B)
143 according to the following equation:
144 $BMI = \text{weight} / \text{height}^2 \text{ (Kg/m}^2\text{)}$

145 **Waist and hip circumference measurements:**

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

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

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

155 **B) Therapeutic procedure:**

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

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

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

163 **II. Tupler Technique Exercises:**

164 It was used for treatment of group B only.

165 **1. Head Lifts**

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

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

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

178 **3. Tupler Technique:**

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

184 **4. Leg slides:**

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

193 **5. Leg lifts:**

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

201 **6. Pelvic bridges:**

202 The women was lied on her back with the knee flexed using a pillow between knees then
203 she was asked to exhale as she contract abdominal muscles and do posterior pelvic tilt, then
204 raise her pelvis up until coming to the bridge position. Tilt the pelvis toward each side 5
205 times. The women then asked to slowly breathe in and return to the neutral position on the
206 back.

207 **7. Abdominal crunches:**

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

214 **8. Reverse Crunch:**

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

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

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

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

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

233 Results were expressed as mean, standard deviation (SD) and standard error of mean (SE).
 234 Comparison between the mean values of different variables measured pre- and post-
 235 treatment program was performed using paired student t- test.
 236

237 **3. RESULTS AND DISCUSSION**

238 The results of this study were represented as follow:

239 **BMI:**

i) Within subjects:

240

241 Table (1), demonstrated the BMI before and after treatment for both groups (A and B). There
 242 was highly significant difference ($P < 0.0001$) between before and after treatment BMI with
 243 mean difference of (0.4, 1.62 kg/m²) and percentage of improvement equal (1.34 %, 5.43 %)
 244 in both groups (A and B) respectively.
 245

246 **Table 1. Mean values of BMI before and after treatment of both groups (A and B).**

BMI	Group A (n=30)		Group B (n=30)	
	Before treatment	After treatment	Before treatment	After treatment
Mean	29.71	29.3	29.79	28.16
±SD	±2.05	±2.02	±2.12	±1.96
Mean difference		0.4		1.62
Percentage of improvement		1.34 %		5.43 %
t-value		16.45		16.13
P-value		< 0.0001		<0.0001
S		HS		HS

248 *SD: standard deviation, P: probability, S: significance, HS: highly significant.

249 **ii) Between groups:**

Table (2), revealed the independent t-test results before and after treatment between groups A and B. There was no significant difference in before treatment values where the t-value was (0.14) and p-value was (0.88). But there was a significant difference in the after treatment values ($P < 0.05$) where the t-value was (2.21) and p-value was (0.03).

Table 2. Independent t-test between groups A and B for BMI before and after treatment.

Independent t-test	BMI			
	Before treatment		After treatment	
	Group (A) (n=30)	Group (B) (n=30)	Group (A) (n=30)	Group (B) (n=30)
Mean	29.71	29.79	29.3	28.16
±SD	±2.05	±2.12	±2.02	±1.96
Mean difference	0.08		1.14	
t-value	0.14		2.21	
P-value	0.88		0.03	
S	NS		S	

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

Waist hip ratio:

i) Within subjects:

261

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.

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

Waist hip ratio	Group A (n=30)		Group B (n=30)	
	Before treatment	After treatment	Before treatment	After treatment
Mean	0.9	0.87	0.9	0.83
±SD	±0.01	±0.01	±0.01	±0.01
Mean difference	0.03		0.07	
Percentage of improvement	3.33 %		7.77 %	

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.

ii) Between groups:

Table (4), revealed the independent t-test results for the waist hip ratio before and after treatment between groups A and B. There was 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 (P<0.05) where the t-value was (10.1) and p-value was (0.0001).

Table 4. Independent t-test between groups A and B for waist hip ratio before and after treatment.

Independent t-test	Waist hip ratio			
	Before treatment		After treatment	
	Group (A) (n=30)	Group (B) (n=30)	Group (A) (n=30)	Group (B) (n=30)
Mean	0.9	0.9	0.87	0.83
±SD	±0.01	±0.01	±0.01	±0.01
Mean difference	0.0003		0.04	
t-value	0.07		10.1	
P-value	0.94		0.0001	
S	NS		S	

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

Rectus diastasis measurement:

i) Within subjects:

283

Table (5), demonstrated the rectus diastasis measurement before and after treatment for both groups (A and B). There was highly significant difference (P<0.0001) between before and after treatment rectus diastasis measurement with mean difference of (0.29, 1.17 cm) and percentage of improvement equal (9.26 %, 36.67 %) in both groups (A and B) respectively.

Table 5. Mean values of rectus diastasis measurement before and after treatment of both groups (A and B).

Rectus diastasis measurement	Group A (n=30)		Group B (n=30)	
	Before	After	Before	After
	treatment	treatment	treatment	treatment
Mean	3.13	2.84	3.19	2.02
±SD	±0.33	±0.31	±0.3	±0.22
Mean difference	0.29		1.17	
Percentage of	9.26 %		36.67 %	
t-value	18.25		36.31	
P-value	<0.0001		<0.0001	
S	HS		HS	

291 *SD: standard deviation, P: probability, S: significance, HS: highly significant.

292 **ii) Between groups:**

293 Table (6) revealed the independent t-test results for the rectus diastasis measurement
 294 before and after treatment between groups A and B. There was no significant difference in
 295 before treatment values where the t-value was (0.64) and p-value was (0.52). But there was
 296 a significant difference in the after treatment values (P<0.05) where the t-value was (11.55)
 297 and p-value was (0.0001).

298

299 **Table 6. Independent t-test between groups A and B for rectus diastasis measurement**
 300 **before and after treatment.**

301

Independent t-test	Rectus diastasis measurement			
	Before treatment		After treatment	
	Group (A) (n=30)	Group (B) (n=30)	Group (A) (n=30)	Group (B) (n=30)
Mean	3.13	3.19	2.84	2.02
±SD	±0.33	±0.3	±0.31	±0.22
Mean difference	0.06		0.82	
t-value	0.64		11.55	
P-value	0.52		<0.0001	
S	NS		S	

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

303

304 **Discussion:**

Diastasis recti abdominis is also defined as a separation of the two bellies of rectus muscle along the linea alba. The separation is not painful or harmful to the mother or the baby and usually located above and below the umbilicus where the abdomen is stretched, but can run the entire length of the linea alba. This loss of core integrity, coupled with the bulk and weight of the uterus, encourages an anterior pelvic tilt and increase lumbar compression. With the help of the hormone relaxin, a hormone synthesized in the ovaries and stored in the placenta which relaxes the elastic ligaments of the pelvic bones, the hips widen and the ribs expand as much as 2 to 3 inches antero-lateral (**Elaine, 2006**). [6].

This study was conducted to investigate the effect of tupler technique on reducing postnatal diastasis recti by using digital caliper instrument for the evaluation of the diastasis recti. Sixty postpartum, multi parous women complained from diastasis recti (diagnosed by gynecologist/ physician and confirmed by digital caliper instrument) with diastasis recti more than 2.5 cm after normal vaginal delivery shared in this study. They were selected randomly from Kasr Al Aini university hospital. Their ages were ranged from 25 to 35 years old. They 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. The results of this study 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 18weeks (more decrease in group B).

The results of the study are supported by **Noble, (1999)**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.

The result of the study agreed 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.

The results of the study were supported by **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.

The results of the 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 agreed 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.

The result of the study agreed with those of **Hickey et al., (2011)**¹⁷ who 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%.

The 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.

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

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

366 **CONCLUSION:**

367
 368 It could be concluded that tupler technique is very effective in reducing post natal diastasis
 369 recti.

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