DIASTASIS RECTI: A STUDY ON HOW A SAFE AND EFFECTIVE PILATES PROGRAM CAN IMPROVE THIS CONDITION EVEN EIGHT YEARS POSTPARTNUM

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Abstract

A diastasis recti is the unnatural distancing of the right and/or left halves of the rectus abdominus from the midline caused by a weakening and stretching of the connective tissue called the linea alba. Diastasis of this muscle principally occurs in two populations: newborns and pregnant women. It is also known to affect men, particularly those who are overweight.

In this paper, I focus on how diastasis recti affects women postpartum generally and more specifically, by focusing on my client’s case, who is eight years postpartum. This paper will discuss the anatomical and musculoskeletal changes of the early postpartum period and how a diastasis recti affects movement. More specifically, I will be looking at the role and anatomy of the abdominal muscles to see how they can be recruited and reconditioned after a diastasis recti using a safe and effective Pilates program. The paper will also focus on how certain traditional Pilates exercises can be modified in order to aid proper postural alignment and good body mechanics and help to prevent and alleviate the symptoms often common with this condition such as pelvic/lower back tightness and pain.
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Anatomical overview

Anatomy of the abdominal muscles and the linea alba.

The abdominal wall is comprised of four different paired muscles and together they cover and support the entire abdominal cavity.

1. The outermost muscle is the Rectus Abdominus (“RA”) – these fibres run vertically down the centre of the torso. This is the “six-pack muscle” and its main function is to produce trunk flexion.

2. The external and internal obliques – these fibres run diagonally from the sides of the abdomen by the ribs toward the midline. Together, they produce trunk rotation and lateral flexion of the spine. The internal obliques also assist the Transverse Abdominus (“TA”) in creating spinal stability and can also help to flatten the abdominal wall.

3. The Transverse Abdominus (“TA”) - the deepest layer of abdominal muscle and wraps around the torso horizontally like a corset. The principal function of the TA is to achieve postural control and spinal and core stability. Along with the obliques, the TA helps to compress the abdominal wall to create a narrowing of the waist.

If we look at the above muscles in unison, we can appreciate that to achieve good alignment, functional movement and to provide support to the lower back and spine, the above muscle fibres must all knit together and work simultaneously in the correct manner to maintain optimum usage. In order to achieve this, there has to be a balance between the different ranges and planes of movement such as spinal flexion, spinal extension, rotation and lateral flexion.

At this point, I should also highlight the vital role of the pelvic floor muscles, which in conjunction with the TA, function to enhance support and stabilization of the core.
Musculoskeletal changes during and post pregnancy.

During pregnancy, the growing dimensions and weight of the foetus and uterus influence the musculoskeletal morphology of the pregnant woman:

1. The spatial relationship between the superior and inferior abdominal muscles attachments changes, altering the line of pull of the abdominal muscles. Also, the hormonal surge during pregnancy which allows muscles to relax and stretch, also affects the ability to stabilize the pelvis. The pelvis tends to go into an anterior tilt due to the altered centre of gravity caused by the forward pull of the uterus.
2. There is an increase in overall abdominal muscle length in particular in the RA
3. The increase in anterior abdominal dimensions causes the RA muscles to move laterally rather than vertically across the torso. This in turn, affects the body’s ability to produce trunk flexion.

After birth, the abdominal muscles are left greatly increased in length and without any pull. Some studies have shown that separation and widening of the abdominal muscles and linea alba after birth return to that of weeks 22-26 gestation. These fatigued and over lengthened muscles are unable to contract in their usual manner to produce trunk flexion with control and pelvic stability.

What is a diastasis recti (DR) and how does it affect movement?

A DR is caused by the thinning and stretching of the linea alba causing the RA muscles to separate unnaturally from each other (commonly defined as a gap of roughly 2.7cms or greater.) This is a common occurrence during late pregnancy, however, the severity of a DR is dependent upon numerous factors, such as the age of the pregnant lady, genetics, the recovery time between pregnancies, multiple pregnancies and the general condition of the abdominal muscles prior to pregnancy. A 1-2 fingertip separation between the RA muscles at the linea alba after birth is considered normal. A separation larger than 2 fingers is considered mild to severe DR and exercise considerations and modifications should be made, given that the functionality of the abdominal muscles is compromised. A DR can be seen above or below the umbilicus but is most often seen at the umbilicus.
A significant DR can affect the overall integrity and functionality of the abdominal muscles by compromising their functional role in producing flexion, rotation and lateral flexion of the trunk, postural support and control, trunk and pelvic stability and preventing lower back pain. In severe cases, a DR may result in herniation of the abdominal wall.

There are certain movements that should be avoided when there is a DR:

1. Traditional spinal flexion in a supine position with load and without assistance, such as the hundred, Roll-Up and Chest Lift.
2. Oblique strengthening exercises in a supine position such as Chest Lift with Rotation
3. Lowering straight legs to the floor in a supine position such as bicycle or scissors.
4. Front support positions where both legs are extended.
5. Exercises involving long levers without assistance such as the Double Leg Stretch.

**What movements/exercises would be good for a DR?**

In general, a program based on machine work, in particular the Reformer, is very beneficial given that there is a lot of repertoire throughout the BASI block system which focuses on using the deep abdominal/core muscles as stabilizers (the TA and multifidus) as opposed to movers (the RA and obliques) and teaches how to recruit the TA and the Multifidus.

1. Trunk Stabilization exercises – all exercises that have trunk stabilization as one of the primary objectives should be focused on, in particular FBI exercises that are executed in a posterior pelvic tilt are especially beneficial such as scooter, round back etc. Most, if not all, abdominal work from the abdominal block needs to be modified to give less emphasis to the RA and more to the function of the abdominals as stabilizers.
2. Pelvic/Lumbar Stabilization exercises- these help to correct any anterior tilt and help strengthen the muscles around the pelvic/lumbar area for example all the hip work series are extremely beneficial.
3. Stretching the Oblique’s - Oblique work needs to emphasize more stretching of these muscles (such as Mermaid on the reformer) and their function as stabilisers of the core (Leg Circles, Spine Twist Supine) as opposed to specific strengthening exercises. Research has shown that strengthening the oblique’s can increase the pull on the DR therefore aggravating the separation of the RA muscles.
Case Study

Name: Elke Sheriff

Age: 43

Background: Mother of three children, born in 2005, 2007 and 2009 weighing 8lbs 15ozs, 8lbs 10ozs and 9lbs 5 ozs respectively at birth. She is of petite build and height. In particular, she has a short and narrow trunk and has always had very tight abdominal muscles prior to her pregnancies. She leads a very active lifestyle balancing her family life, love of fitness and a healthy lifestyle with also working for a family business. She exercises on average 4-5 times a week, combining cardio and weight workouts with suspension TRX training. She first noticed her diastasis recti about six months postpartum from her first pregnancy. In addition to this condition, she also has an abdominal hernia although she is not sure exactly when this first appeared.

Symptoms: When Elke first came to see me, she was experiencing tightness in her lumbar spine and moderate lower back pain, in particular, after her training sessions. She had noticed that when performing traditional flexion exercises in a supine position that her abdomen and hernia would protrude especially when raising her legs to a table top position or extending the legs out to a diagonal. Also, when in a front support position with both legs extended, her abdomen would also pop out. She also complained of abdominal discomfort and digestion problems such as acid reflux, especially after eating, which she believes to be caused or aggravated by her hernia.

Observations/limitations: After carrying out the test for DR, it became apparent that Elke had a DR of 3 ½ fingers at the umbilicus. She also has an abdominal hernia that protrudes above the umbilicus along the linea alba. On initial observation and using the Roll Down as a body scan, it became apparent to me that Elke was lumbar lordotic, and that she had weak core muscles and tight hip flexor and lower back extensor muscles. When performing a traditional chest lift exercise for example, her abdomen did in fact protrude. She could achieve relatively little trunk flexion and she compensated by digging her chin into her chest and bringing her elbows forward causing tension to the cervical spine and shoulder girdle. She also had a tendency to externally rotate her hips when standing and walk with her feet in turn out, indicating a weakness in her hip adductors. She appeared to be much stronger on the right side of the body, which became apparent during the execution of the footwork and hip work on the machines.

Program goals:

1. To rehabilitate and strengthen the abdominal muscles in a safe and efficient manner, particular emphasis on strengthening the TA to help minimize the DR and learning how to engage the pelvic floor muscles. Exercises that work the abdominals as stabilizers of the trunk and pelvis are particularly useful and effective, in particular, exercises in upright sitting positions as they avoid loading the RA.

2. To bring awareness to ideal postural alignment, neutral foot position and encourage neutral pelvis alignment and to re-educate the neuromuscular system to encourage correct movement
patterns and encourage good body mechanics when carrying out daily activities and other exercise classes.

3. To stretch and strengthen the gluteals, piriformis and to lengthen and stretch her tight hip flexors to support proper alignment of the pelvis and as mentioned earlier, to stretch the tight oblique muscles and improve their stabilizing function. Stretching the RA abdominals in back extension exercises is also good.

4. Strengthen the hip adductors to encourage proper alignment and core stability.

5. To stretch and lengthen the lower back extensors and iliopsoas to help release tightness in the lumbar spine and also to strengthen in particular the multifidus back extensor muscle, which in conjunction with the abdominal muscles, is very important for stabilization and to prevent back pain

6. To encourage lateral breathing and strengthen the muscles attached to the thoracic ribcage, including the abdominals, pectorals and diaphragm.

7. To restore muscular balance and harmony within the body and achieve overall mind-body harmony and oneness.

Conditioning program based on the BASI Block System

Phase 1 – sessions 1 – 10

The initial sessions focused on fundamentals such as teaching awareness of correct alignment, core stability, bringing the pelvis into neutral alignment and engaging the core muscles. Emphasis was also given to lateral breathing and how to maintain the inward pull of the abdominal wall during this method of breathing.

1. Warm up

   . Pelvic tilts, pelvic curl – focus on activating the deep pelvic floor and TA muscles, and co-contracting the hamstrings and abdominals to curl the pelvis and achieve spinal articulation and a neutral spine position.

   . Spine twist supine – at first, we modified this exercise by keeping toes on the mat and heels raised to avoid the abdominals bulging when in a table top position. We also used a fitness ball as an assist by placing the calves on the ball and legs in a table top position to ease tension in the lower back and maintain correct alignment in the hips by keeping the knees level. Emphasis was placed on learning to rotate the pelvis and trunk as one unit, engaging the TA and the oblique’s while avoiding hyperlordosis in the lumbar spine.

   . Abdominal warm up – fundamental exercises from the Injuries and Pathologies Advanced Course such as Modified Hundreds Level 1 & 2, Modified Single Leg Stretch (Leg Slides) Level 1, Single Leg Lifts, Leg Changes levels 1 & 2 – focus on maintaining pelvic lumbar stabilisation and hip disassociation.
. Trunk flexion and trunk flexion with rotation in a seated position with legs crossed in front of body- to avoid trunk flexion in a supine position such as chest lift, this provides a good alternative. Emphasis on hollowing the abdominal wall inwards, engaging the pelvic floor muscles and encouraging lumbar flexion and posterior tilt of the pelvis. Activating the oblique’s in a gentle manner.

. Leg circles – we kept the circles small within the range of pelvic lumbar control at first and increased range of movement and fluidity as awareness and strength increased.

2. **Footwork- reformer**

   Footwork series on the reformer with focus on lateral breathing, engaging the pelvic floor and deep abdominal muscles to maintain neutral pelvis and neutral spine position and encourage pelvic stability. Pelvic stability became particularly challenging when executing prances and the single leg work.

3. **Abdominal work – reformer**

   . Hundred prep and hundred – we modified these exercises by raising the headrest up to keep the sensation of trunk flexion but not actually flexing the trunk and keeping the legs at a tabletop position throughout. We moved only the arms and focused on working the breath pattern (engaging the TA and not bulging the abdominals)

   . Round back, flat back and tilt from the Short box series – we kept the range of motion small focusing on trunk stabilization in a seated position. The round back exercise was particularly beneficial for Elke to counteract her tendency to push the pelvis into an anterior tilt and the other positions promoted co-contraction of the abdominals and back extensor muscles.

4. **Hip work - reformer**

   . Supine leg series (frog, circles down and up and openings) and extended frog and extended frog reverse - Emphasis on pelvic lumbar stabilization, neutral spine position, plus hip disassociation throughout the circles and engaging the pelvic floor and hip adductors during openings.

5. **Stretches – reformer**

   Standing lunge -

6. **Full Body Integration (Fund/Int) – introduced by the 8th session**

   . Scooter – keeping the resistance light and the range of movement controlled in order for the focus to be on core stability and to teach pelvic lumbar and trunk stabilization whilst in spinal flexion. Emphasis on the exhale in drawing the abdominals in towards the spine as the hip and knee extensors are strengthening.
7. **Arm work –reformer**

   . **Arms sitting series (chest expansion, biceps, rhomboids, hug a tree, salute)** – This arms series is beneficial as the abdominals work as stabilizers and there is no load on the RA. Emphasis is on trunk and spinal stabilization, creating awareness of postural deviations such as anteriorly rotated shoulders or hyperlordotic lumbar curves.

8. **Leg work – mat/reformer**

   . **Skating single leg** – focus on pelvic lumbar stabilization, maintaining a neutral pelvis and strengthening the hip abductors

   . **Side split** – focus on maintaining a neutral pelvis and spine throughout, strengthening and stretching the hip adductors and engaging the pelvic floor muscles to pull up from the centre of the body when adducting the legs whilst maintaining a co-contraction of the abdominals and back extensors.

9. **Lateral flexion and rotation (LFR) – mat/reformer**

   . Oblique exercises focused on stretching and lengthening these muscles and improving their stabilising function so we concentrated on exercises such as Mermaid on the reformer, Side Stretch Pole series and side stretches on the Ladder Barrel and Spine Corrector.

10. **Back extension – mat/reformer**

    . **Back extension** – focus on hollowing the abdominals to provide abdominal support when in spinal extension. Also teaching Elke to keep lower back in a stable position and focus work on the mid-upper back extensor muscles

    . **Cat stretch** – focus on engaging abdominals to emphasize maximum flexion in the lumbar spine and stretching the spinal extensors.

    . **Back extension (mat and reformer)** – lying prone on the long box holding the rails of the reformer

**Phase 2 (sessions 11 – 20) and beyond.**

As the sessions progressed and the fundamental program goals were achieved, we moved on to more challenging exercises and expanded our work to the Wunda Chair and the Cadillac. We slowly introduced Spinal Articulation and FBI exercises into the sessions and introduced footwork on the Wunda Chair to encourage trunk stabilization and co-contraction of the abdominals and back extensors. We used the foam roller for abdominal warm up exercises as we found that the foam roller provided great feedback to help maintain lumbo/pelvic stability at the same time as adding greater challenge. Abdominal work on the WC included the Standing and Sitting Pike and Torso Press Sit. On the Cadillac, exercises such as Bottom Lift with RU Bar were introduced. Hip work was introduced on the Cadillac, initially the supine series and then the single leg supine series. Spinal Articulation work included exercises such as Spine Stretch which provided a
dynamic stretch for the hamstrings and lower back extensors and Bottom Lift and Bottom Lift with Extensions on the Reformer, (emphasis on activating the TA to maximise spinal articulation and lumbar flexion) and Short Spine (modified version of the short spine by keeping legs together in a table top position and keeping the movement small.). FBI work included the Knee Stretch Group and Stomach Massage Series on the Reformer, in particular the Round Back exercise keeping the resistance light and the movement small and controlled. The Up Stretch Series was also introduced with the exception of Up Stretch 3 and Long Stretch until sufficient strength had been achieved. Reverse Knee Stretch on the reformer was also valuable as it focuses on using the abdominals as stabilisers and emphasizes trunk stabilization and abdominal strength. The Arm work progressed to the Arms Standing Series on the Cadillac and the Kneeling Series on the Reformer once sufficient trunk stabilization had been achieved and Elke had sufficient awareness and control of pelvic alignment and posture. Leg work expanded to more intermediate/advanced repertoire to include initially the Gluteal Side Lying Series, Squats on the Cadillac, Leg Press Standing on the WC and Frog Front. After the first 20 sessions, Leg work exercises also included more advanced exercises on the Wunda Chair like Backward Step Down and Forward Lunge (both were great to address the imbalance in leg strength.) LFR work continued to focus on stretching and encouraging the stabilizing function of the obliques with modified Side Kneeling Stretch on the Wunda Chair (adding a bit more load and giving emphasis to stretching the obliques as the pedal is pushed down on the inhale), modified Side Bend Level 1, the assisted Spine Twist Supine on the Avalon and the Quadratus Lumborum Stretch on the reformer. From the FBI block, the Side Reach (oblique stretch) and Saw (Abdominal Oblique Control) from the Push Through Group were also added in to the classes. Finally, Back Extension exercises included Breastroke Prep and Pulling Straps 1 & 2, Swan on Floor (WC) and Prone 1 (Cadillac).

**Conclusion**

After completion of the first 20 sessions, Elke started to notice that her initial symptoms of lower back tightness and pain had significantly improved and that she was starting to achieve the program goals that we had set out at the start of the program. Above all, she observed a vast improvement in her overall strength (in particular her abdominal strength), pelvic stability and alignment and general postural awareness/body control. Her new found love and passion for Pilates is such that she has reduced her other fitness classes to once a week and instead is focusing on furthering the benefits a complete Pilates programme has to offer by committing to three weekly sessions.

There is no doubt that following a safe and efficient Pilates Program based on the BASI Block System can improve the symptoms of a DR even eight years postpartum. By adhering and honouring the Pilates Principles throughout the program, Elke is learning how to regain control of her body and achieve harmony and balance that transcends into her everyday life by focusing on the mind-body form of conditioning that Pilates has to offer. I am extremely happy that she now shares this passion for Pilates and is inspired to further continue this exciting journey of learning and self-evolving in order to achieve ultimate wellbeing!
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