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DIASTASIS RECOVERY AFTER PREGNANCY.

A FOLLOW UP ULTRASOUND STUDY ON CHANGES OF INTER-RECTI DISTANCE FROM LATE PREGNANCY TILL 6 MONTHS POSTPARTUM

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SUMMARY

An increased inter-rectus distance (IRD) is a common condition in late pregnancy and in the postnatal period. Little information exists on the short term and long term recovery of the IRD after pregnancy.

Ultrasound imaging has been tested to reliably measure Inter-rectus distance.

The purpose of the study was to describe longitudinally the morphologic changes in the abdominal wall from pregnancy to 6 months postpartum.

A sample of 41 healthy nulliparous pregnant women was followed and data regarding morphologic changes in the abdominal wall were collected at 4 timepoints: 35th gestational week (M1); 6-8 weeks postpartum (M2); 12-14 weeks postpartum, (M3) and 24-26 weeks postpartum (M4). An ultrasound scanner with a 39 mm linear transducer, operated by the same examiner, was used to collect images from 3 different locations on the abdominal wall: 5 cm and 2 cm above the umbilicus (A5 and A2) and 2 cm below the umbilicus (B2).

The analysis of variance (ANOVA) with repeated measures was performed to access the effect of time on the IRD. To see the influence of the IRD during pregnancy in the recovery of the abdominal wall, the ANOVA with repeated measures was also performed choosing the first moment as a covariate.

The values of the IRD measured on the postpartum period showed significant differences over time and the IRD measured during pregnancy is significantly influencing the reduction and recovery of the IRD in the postpartum period.

INTRODUCTION

Diastasis recti abdominis (DRA) has been defined as an impairment characterized by a midline separation of the two rectus abdominis (RA) muscles along the linea alba (LA). This increased inter rectus distance (IRD) has its onset during pregnancy and/or immediately after birth and the first weeks following childbirth [1]. As the fetus grows the two muscle bellies of the RA connected by the LA, elongate and curve as the abdominal wall expands, and separation of the two muscle bellies with protrusion of the umbilicus may occur [2]. Studies have found that DRA may affect between

30% and 70% of pregnant women, and that it may remain separated in the immediate postpartum period in 34.9% to 60% of women.

Ultrasound imaging has recently been used to assess muscular geometry and indirect measure of muscle activation via changes in muscle thickness and other characteristics of muscle function [3]. Mota et al. [4] found ultrasound imaging to be a reliable method for measuring inter-recti distance.

The purpose of the study was to describe longitudinally the morphologic changes in the abdominal wall from pregnancy to 6 months postpartum.

METHODS

A sample of 41 healthy nulliparous pregnant women was followed from 35th gestational week to 6 months postpartum. Data regarding morphologic changes in the abdominal wall were collected at 4 timepoints: 35th gestational week (M1); 6-8 weeks postpartum (M2); 12-14 weeks postpartum, (M3) and 24-26 weeks postpartum (M4). Pregnant women with any kind of illness of mother or child, stillbirth or delivery before week 37 were excluded. If the subjects missed one measurement they were excluded and considered a dropout.

An ultrasound scanner (GE Logic-e) with a 4-12 MHz, 39 mm linear transducer, operated by the same examiner, was used to collect images in brightness mode (B-mode). The examiner was a physiotherapist with specific training in ultrasound image capturing and measuring. The probe was placed transversely along the midline of the abdomen in three locations: 5 cm and 2 cm above the umbilicus (A5 and A2) and 2 cm below the umbilicus (B2). Still images were obtained with subjects in the supine resting position (knees bent at 90° and feet resting on the plinth, arms alongside the body). A set of 12 images per subject was collected (3 probe locations x 4 timepoints) and exported as DICOM images. The IRD was measured offline by the same investigator blinded to the result using a customized Matlab[®] code (Image Processing Toolbox, Mathworks) assuming each

ultrasound images as a pixel based 'xy' coordinate system. The contour of both RA was identified by ultrasound image segmentation using a parabola-like-curve fit approach. The inflexion point of the interpolated parabola-like-curve was overlapped on the original ultrasound image, to guide the examiner on the identification of the end points of the linea-alba and improve the accuracy of IRD measurement.

Statistical analyses

To evaluate the effect of time on the IRD the analyses of variance (ANOVAs) with repeated measures was performed. To see the influence of the IRD during pregnancy in the recovery of the abdominal wall, the ANOVA with repeated measures was also performed choosing the first timepoint as a covariate. When the main effect was significant, pairwise comparisons were performed using the Bonferroni adjustment for multiple comparisons.

RESULTS AND DISCUSSION

All the 41 subjects completed the study. Descriptive statistics about the IRD are shown in Table 1. The values of IRD for the first timepoint ranged from 2.5 -12.8 cm on the B2 location; 3.2 -11.9 cm on the A2 location; 3.1 – 12.8 cm on the A5 location during late pregnancy.

The values of the IRD measured in the postpartum period showed significant differences among the 3 locations tested (B2, A2 and A5) ($p<0.05$), and using the Bonferroni adjustment for multiple comparisons significant differences were found among all the timepoints in the postpartum period (M2, M3 and M4) ($p<0.05$), except on the B2 location where there were no differences between M2 and M3.

The reductions on the IRD during postpartum were relatively small, and our results are in line with the ones found by Liaw et al [5]. Coldron et al [3] found that the reduction in IRD reached a plateau at 6 months postpartum. In the present study IRD values changed significantly from 6 weeks until 6 months.

The IRD values were smaller in every location tested at the last timepoint compared to the first timepoint in the postpartum period. In addition, when considering the IRD measured during pregnancy (M1) as a covariate, there was a significant effect of this measure. There were no significant differences between the IRD measured in the postpartum period (M2, M3 and M4). This suggests that the IRD measured during pregnancy was significantly influencing the reduction and recovery of the IRD in the postpartum.

CONCLUSIONS

During the postpartum period the IRD reduced significantly over time at every location tested.

The recovery and reduction of the IRD during postpartum is influenced by the IRD at the end of pregnancy.

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Table 1: Mean and standard deviation (SD) of Inter-recti Distance (cm) between the first timepoint of measurement during late pregnancy (M1) and the 3 timepoints during the postpartum period (M2, M3 and M4) at each probe locations.

Probe Location	M1	M2	M3	M4	F *
2 cm Below umbilicus (B2)	6.36 (2.16)	2.03 (1.14)	1.97 (1.12)	1.65 (0.98)	5.586 (p = 0.005)
2 cm Above umbilicus (A2)	6.74 (2.01)	2.78 (1.08)	2.57 (0.85)	2.46 (0.90)	8.491 (p=0.001)
5 cm Above umbilicus (A5)	6.36 (2.19)	2.51 (1.07)	2.20 (0.98)	2.08 (1.05)	26.225 (p < 0.001)

*ANOVA with repeated measures between M2, M3 and M4 ($p<0.05$).