Clinical Question: Is Inter-rectus distance the only meaningful measure in the rehabilitation of DRA?

Article: Behavior of the Linea Alba During a Curl-up Task in Diastasis Rectus Abdominis: An Observational Study


Presenters name: MEGHAN SWENCK, PT, DPT, WCS

Introduction: The relationship between the effect of muscle function on the linea alba (LA) and how to rehabilitate DRA patients is under debate. Widening of the inter-rectus distance (IRD) has been seen in “drawing in” maneuvers aimed at training the transversus abdominis (TrA). Current rehabilitation of DRA aims to reduce IRD, but this may reduce tension on the abdominal wall and reduce ability to transfer force.

Aim/Primary Aim: The authors test 2 hypotheses: (1) During a curl-up, the IRD would be greater in women with DRA if the curl-up involved voluntary pre-activation of the TrA. (2) Despite greater IRD during the curl-up with pre-activation, LA distortion would be less than without TrA pre-activation. Additionally, the authors predicted that in control subjects with little to no IRD that the distortion index would differ little between the curl up with or without pre-activation of TrA. (figure 1)

Study Design/Study Format: Observational Study. Developed a novel ultrasound measure called “distortion index” to describe the slackening or tensioning of the LA.

Methods: 26 women with DRA (25 parous, 1 nulliparous) and 17 volunteers without DRA recruited from personal trainers and physical therapy clinics, being treated for a “variety of conditions” concomitant with their DRA. Exclusion: current pregnancy, respiratory or neurological condition. DRA defined as IRD (on US) of > 22mm at 30 mm above the umbilicus or > 15mm inferior to xiphoid.

Ultrasound Imaging (12MHz linear transducer) and Procedure: measurement points at just above umbilicus (U point) and half way between xiphoid and umbilicus (UX point)- this order was randomized. 3 repetitions/images were recorded for each of the conditions (unable to randomize order due to instructions for 3rd task would affect 2nd task):

1. Rest

2. Automatic curl up: lift head and neck until top of scapula cleared table. Arms by sides. Instructed to perform slowly and smoothly about 3 seconds from start to end of curl up. Held for 3 seconds.

3. Pre-activation of TrA curl-up: Participants were trained to activate TrA (figure 2) using 3.5 to 5 MHz curvilinear probe with goal to isolate TrA and used instructions to cue activation of the pelvic floor muscles and drawing hip bones together (p.582 middle column ¾ down). Images were collected the same method as automatic curl –up with addition of pre-activation of TrA.

Results:

Inter-rectus Distance: IRD was wider at the U point than the UX point for DRA subjects (p < 0.001) ; for controls 0.78 vs 0.60 respectively, p = 0.08.

Raw data for DRA group (controls): (from table 2, p.585). (all data in cm).

| U point rest | 3.40 +/- 0.77 (0.78 +/- 0.34) | UX point rest | 2.11 +/- 0.70 (0.60 +/- 0.28) |
| U point automatic curl | 2.21 +/- 0.79* (0.85 +/- 0.37) | UX point automatic curl | 1.60 +/- 0.56* (0.62 +/- 0.26) |
| U point TrA curl up | 2.84 +/- 0.78* (0.92 +/- 0.40) | UX point TrA curl up | 2.09 +/- 0.08 (0.67 +/- 0.26) |

*p<0.001 (rest compared to automatic curl up at X and UX point and rest compared to TrA curl up at only UX location significantly different). Hypothesis #1 is supported.
**Distortion Index:** The distortion index was measured as the deviation of the linea alba from its shortest path between attachments (area under the curve in figure 3, p. 583). It is intended to be a measure of stiffness or tension, with a larger distortion index creating less tension. Distortion of the LA was greater in the automatic curl-up compared to the TrA curl-up (p=0.01). Hypothesis #2 is supported.

Raw data (Table 3, p. 586):

<table>
<thead>
<tr>
<th></th>
<th>U point rest</th>
<th>UX point rest</th>
<th>U point automatic curl</th>
<th>UX point automatic curl</th>
<th>U point TrA curl up</th>
<th>UX point TrA curl up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.066 +/- 0.040</td>
<td>0.043 +/- 0.037</td>
<td>0.083 +/- 0.059</td>
<td>0.067 +/- 0.049</td>
<td>0.059 +/- 0.046</td>
<td>0.046 +/- 0.037</td>
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</table>

**IRD and Distortion index:**
At the U point, IRD and distortion index were not correlated—meaning a larger DRA did not indicate larger distortion. At UX point, there was a significant relationship for controls and DRA subjects, in that as the IRD increased, so did the distortion (p = 0.05) (figure 5, p. 588). The point is that there is a non-linear association and we cannot create equation of sorts to use this for predicting IRD <-> Distortion index.

**Discussion/Conclusion:** This study demonstrates that use of TrA pre-activation in abdominal curl did not reduce IRD more than automatic curl-up but did demonstrate a tensioning, or reduced distortion on the LA. This indicates that load transfer may be optimized by this method of pre-activation and that rehabilitation of DRA should not solely focus on reduction of IRD. Authors note that the relationship between the distortion index and the IRD is not linear.

**Strengths:**
- Did check for gender differences in controls and found no difference
- Training of the TrA using ultrasound prior to testing
- Use of US measurements for accurate and precise data

**Weaknesses:**
- Could not concurrently collect images of the LA and TrA to be sure the TrA activation was as trained during testing conditions. 2 machines?
- Did not discuss breathing strategy for testing—authors note this in discussion that changes in IAP could affect the LA distortion (p. 587 3rd column at bottom). Authors discuss this as a reason for individualized rehabilitation for DRA.
- No functional testing (ASLR) but authors discuss that distortion is potentially linked to tensioning and force transmission in the pelvic girdle.

**Clinical Application:**
- Each patient must be evaluated individually for IRD AND tension/distortion of the LA.

**Discussion questions:**
1. For those treated DRA or identifying DRA, would you consider changing your assessment to include a measure of tensioning rather than just the IRD?
2. Should examination of a patient not only include the above measures but also functional movement assessment such as the ALSR test, squat test, single leg balance, etc
3. Does anyone have referrals to PT for DRA reduction for aesthetic purposes without any complaints of pain or other concerns?

**Additional resources:** November 2015, Trisha Jenkyns PT, DPT, WCS
The Immediate Effects on Inter-rectus Distance of Abdominal Crunch and Drawing-in Exercises During Pregnancy and the Postpartum Period. Mota PGF, Pascoal AGBA, Carita AIAD, Bo K. JOSPT October 2015, volume 45, number 10.

**CONCLUSION:** Overall, there was a contrasting effect of the 2 exercises, with the abdominal crunch exercise consistently producing a significant narrowing of the IRD. In contrast, the drawing-in exercise generally led to a small widening of the IRD.