Rectus abdominis diastasis

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Abstract
Because of the lack of agreement on when rectus diastasis (RD) is pathologic, the aim was to investigate indications for surgical repair. This study presents classifications of RD, current knowledge on the relation to pregnancy, and conservative and surgical management. A systematic search in Pubmed, Embase, Cochrane, and Cinahl revealed 437 studies. Inclusion criteria were applied according to the above mentioned subjects of interest. In total 28 studies were included, representing 3725 patients, 11 of these by assessing reference lists of included studies. Only one RCT was found; most studies were case-series lacking statistical analysis. RD was common in post-partum women. Antepartum activity level may have a protective effect on RD and exercise may improve post-partum symptoms of RD. Repair was done during abdominoplasty or laparoscopically. The patient-satisfaction was high and long-term recurrence was reported by one study, while five reported no recurrence. Overall major complications were few, while minor complications were primarily seroma and wound complications. RD is by itself not a true hernia and, therefore, not associated with the risk of strangulation. Repair is mostly done due to cosmetic reasons. The condition does not necessarily require repair, and conservative management may be an alternative. If done, the protrusion of the abdomen, rather than the diastasis itself should influence the decision of repair. It is recommended that future studies use the established classifications (e.g. Beer, Rath, or Nahas) when reporting RD and long-term outcome of treatment. Comparison of surgical techniques and studies that address and compare conservative management with surgery are needed.

Key Words: Rectus abdominis diastasis, diastasis recti, pregnancy, abdominoplasty, conservative management, physiotherapy, abdominal wall, divarication recti, linea alba

Introduction
Acquired rectus abdominis diastasis (RD) is a complication of conditions weakening the linea alba resulting in abdominal protrusion. Thus, it can be caused by elevated intra-abdominal pressure, such as in pregnancy and obesity [1], or by previous abdominal surgery [2]. Plastic surgeons often correct RD during abdominoplasties [2]. Larger RDs are repaired consistently if there are significant symptoms, whereas there can be doubt if smaller defects are to be corrected.

The anteromedial abdominal wall consists of the abdominal rectus muscles separated by the linea alba, which is a fascia stretching from the xyphoid process to the pubic symphysis. It consists of the aponeuroses of the transverse abdominal, external and internal abdominal oblique muscles [1].

Simplified, rectus abdominis diastasis (RD) is a condition with laxity of the linea alba. The diastasis between the rectus muscles may cause protrusion of the abdomen [1]. It is important, though, to note that there is controversy regarding definition of normal inter-rectal distance (IRD), and when it can be classified as pathologic [1]. Three major classifications are found in the literature. Nahas [3] presented a qualitative classification based on the myofascial deformity, whereas Beer et al. [1] and Rath et al. [4] classified RD quantitatively, determining normal values of IRD at three reference points. The classifications are detailed in Tables I, II,III respectively. The interesting question is whether pathological diastasis recti can be defined as protrusion caused by laxity of the linea alba. In a study of 92 abdominoplasty patients, the IRD was measured intraoperatively and compared to the degree of protrusion of the abdominal wall, suggesting that protrusions can be caused by stretching of the entire abdominal wall, and not only the linea alba [2]. It was furthermore concluded that evaluation of the abdominal protrusion, rather than the diastasis itself, should primarily influence the decision of surgical repair [2].

Because of the lack of agreement on when diastasis of the recti muscles is pathologic, we wanted to investigate indications for surgical repair of RD. We will present current knowledge on the surgical treatment methods and related complications, post-operative patient-satisfaction, long-term outcome of surgery, relation to pregnancy, conservative management, and the spontaneous resolution, by a comprehensive study of the literature.

Materials and methods
In this systematic review, articles concerning rectus diastasis (RD) were included if they met the inclusion criteria stated below. We assessed interventions for RD, including surgical interventions with RD repair during open abdominoplasty, laparoscopic, and endoscopic procedures. Furthermore, we assessed conservative interventions for treatment of RD in the form of physical activity, muscular training, and physiotherapy.

We defined outcome measures as all outcomes of the above interventions. In particular these were:

(1) Spontaneous resolution.
(2) Patient-satisfaction.
(3) Long-term assessment of repair.
(4) Complications related to surgical repair.
We evaluated the level of evidence of the included studies according to the PRISMA statement (preferred reporting items for systematic reviews and meta-analyses) [5]. We have selected the studies according to the PRISMA flow chart and performed evaluation of the studies and outcome measures according to the PRISMA checklist [5].

Inclusion criteria
(1) Method: Randomised clinical trials, meta-analyses, prospective studies, case-control studies (n > 30) and cohort studies.
(2) Language: English or Danish.
(3) Publication Year: Articles newer than 1988.
(4) Considering following causes of or definition of rectus diastasis: Overweight, pregnancy, or clinical anatomy.
(5) Considering spontaneous outcome or conservative management of rectus diastasis.
(6) Considering surgical correction of rectus diastasis, when the diastasis is of primary concern.

Quality of evidence on outcome measures
In this systematic review we have performed the study selection and evaluation of evidence quality on outcome measures according to the PRISMA statement (preferred reporting items for systematic reviews and meta-analyses) [5]. We have selected the studies according to the PRISMA flow chart and performed evaluation of the studies and outcome measures according to the PRISMA checklist [5].

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Evidence level of included studies
We evaluated the level of evidence of the included studies according to the Oxford Centre of Evidence-based Medicine–Levels of Evidence from March 2009 [www.cebm.net]. We used a standard data extraction form to extract reference, objective, study design, number of patients, intervention, control, outcome, and statistical analysis from each study.

Literature search
The search was conducted in October 2012. The largest databases were chosen for the study: PubMed, Cochrane, and Embase. To avoid overseeing literature about physiotherapy or other conservative treatment modalities we also included Cinahl in our search.

Results
We initially evaluated 437 studies from the research databases (PubMed, Embase, Cochrane, and Cinahl), and 11 by assessing the reference lists of included studies (Table IV). We finally included 28 papers, representing a total of 3725 patients. These studies were selected and evaluated according to the PRISMA statement and retrieved by applying the inclusion criteria mentioned in the Methods section.

Spontaneous resolution, conservative management, and relation to pregnancy
The literature addressing spontaneous resolution and conservative management was limited, and only a few studies presented the correlation between RD and pregnancy, as summarised in Table V. Boissonnault and Blaschak [6], Liaw et al. [7] and Coldron et al. [8] provided evidence that RD was related to pregnancy and persisted post-partum. Furthermore, Turan et al. [9] found a significant positive correlation between parity and RD, and caesarean section and RD. Candido et al. [10] noted that multipara who exercised had none-to-mild diastasis. In contrast, inactive women had moderate-to-severe diastasis.

We defined conservative management as non-surgical treatment such as physical activity, muscular training, or physiotherapy. Only two papers addressed conservative management. A case-control study by Lo et al. [11] showed a protective effect of the antepartum activity level. This was also the case in the study by Chiarello et al. [12].

Surgical repair of diastasis
Surgical repair of RD with different techniques was done either through an open or laparoscopic/endoscopic procedure. One study compared these two approaches and two studies compared suture materials. The studies are summarised in Table VI.

The open approach was used in 15 studies, with variations in the number of sutured layers and whether the anterior, posterior or both rectus sheaths were plicated. The overall procedures were: (1) plication during limited dissection [13], mini- or classic abdominoplasties [15-25]; (2) plication using absorbable [25] or non-absorbable sutures [3,13-15,18,19,21,22,24,26]; (3) plication combined with absorbable [16] mesh and sutures; and
(4) correction of RD based on the type of myloponeurotic deformity [3] (Table III).

One study was conducted on a laparoscopic approach in which plication was performed with non-absorbable sutures [27].

Comparison of suture materials was done in two papers: In the only randomised clinical trial (RCT) on RD repair [20], absorbable suture (polydioxanone) was found to be as efficient for diastasis repair as non-absorbable (nylon). The patient number was low though, with 10 subjects randomised to each group. In a retrospective study of 34 patients, no recurrence was found regarding the use of absorbable (polydioxanone) or long-lasting barbed absorbable suture [23].

Table IV. The number of studies (n) from each database and/or reference list are stated below.

<table>
<thead>
<tr>
<th></th>
<th>PubMed (n)</th>
<th>Embase (n)</th>
<th>Cochrane (n)</th>
<th>Cinahl (n)</th>
<th>References (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Records screened</td>
<td>184</td>
<td>224</td>
<td>1</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Duplicate articles</td>
<td>2</td>
<td>60</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Excluded (after screening of title, abstract, year of publication)</td>
<td>138</td>
<td>151</td>
<td>0</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Excluded (language other than English/Danish)</td>
<td>15</td>
<td>7</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Full-text articles assessed for eligibility</td>
<td>29</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Excluded (inclusion criteria’s not met)</td>
<td>18</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Studies included</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>In total</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table V. Studies on spontaneous resolution of RD and relationship to pregnancy.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Oxford level of evidence (study design)</th>
<th>No. of patients</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Statistical analysis and p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liaw et al. [7]</td>
<td>Level 2b (prospective longitudinal study)</td>
<td>60</td>
<td>Ultrasound measurement of IRD in 20 nullipara and 40 women at 4–32 weeks post-partum</td>
<td>Negative correlation between IRD and abdominal muscle function</td>
<td>&lt; 0.05 &lt; 0.05</td>
</tr>
<tr>
<td>Turan et al. [9]</td>
<td>Level 3b (case-control study)</td>
<td>95</td>
<td>RD in nullipara: 0% in primipara: 2% in Multipara: 59%</td>
<td>Positive correlation between parity/second caesarean section and RD</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Coldron et al. [8]</td>
<td>Level 2b (cross-sectional/longitudinal study)</td>
<td>184</td>
<td>Ultrasound measurement of IRD in 115 postnatal women compared to 69 nullipara</td>
<td>IRD decreased 12 months post-partum but did not return to normal</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Chiarello et al. [12]</td>
<td>Level 2b (prospective study)</td>
<td>18</td>
<td>IRD measured above/below the umbilicus in 8 prenatal exercising women and 10 non-exercising pregnant women</td>
<td>90% non-exercising had RD, 12.5% exercising had RD</td>
<td>Not significant</td>
</tr>
<tr>
<td>Candido et al. [10]</td>
<td>Level 2b (prospective study)</td>
<td>208</td>
<td>IRD measured above, below and at umbilicus</td>
<td>34.9% had RD Women with none/mild RD were more often involved in exercise than women with moderate/severe RD</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Lo et al. [11]</td>
<td>Level 3b (case-control study)</td>
<td>55</td>
<td>Comparison of 55 women with RD to 1180 controls</td>
<td>Multiparity and weight-gain during pregnancy was related to RD Protective effect of antepartum and pre-pregnancy activity level</td>
<td>&lt; 0.05 NS</td>
</tr>
<tr>
<td>Boissonnault et al. [6]</td>
<td>Level 3b (cross-sectional study)</td>
<td>89</td>
<td>6 groups: (1) 18 nullipara (2) 15 primipara in first trimester (3) 15 primipara in second trimester (4) 15 primipara in third trimester (5) 15 women immediately post-partum (6) 11 women 5–12 weeks post-partum</td>
<td>RD appears in the second trimester, peaks in the third trimester, and declines but remains post-partum</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>
Table VI. Studies on surgical correction of RD (listed after publication year).

<table>
<thead>
<tr>
<th>Reference</th>
<th>Oxford level of evidence (study design)</th>
<th>No. of patients</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Statistical analyses, $p$-Value</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanjoor and Singh [13]</td>
<td>Level 4 (retrospective review)</td>
<td>146</td>
<td>Limited dissection lipoabdominoplasty with plication of RD</td>
<td>94% patient-satisfaction</td>
<td>No control group</td>
<td>None</td>
</tr>
<tr>
<td>Tadiparthi et al. [24]</td>
<td>Level 2b (prospective study)</td>
<td>28</td>
<td>Vertical midline plication of RD Ultrasound follow-up</td>
<td>No recurrence of RD 12 months postoperatively (significant) Extent of RD and previous abdominal surgery had no significant effect on durability</td>
<td>Student’s $t$-test</td>
<td>None</td>
</tr>
<tr>
<td>Rosen and Hartman [23]</td>
<td>Level 4 (retrospective review)</td>
<td>34</td>
<td>Abdominoplasty with RD repair 17 with absorbable polydioxanone suture 17 with barbed suture</td>
<td>2 minor seromas and 1 infected haematoma in barbed suture group 1 minor seroma in absorbable suture group</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Pechter [21]</td>
<td>Level 4 (retrospective review)</td>
<td>35</td>
<td>Abdominoplasty with RD repair</td>
<td>Excellent result (follow-up ranging from 3–30 months) Minor complications: 1 umbilical stenosis, 1 MRSA infection and 1 interstitial haematoma</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Braun and Capocci [17]</td>
<td>Level 4 (prospective series)</td>
<td>337</td>
<td>Abdominoplasty, liposuction and segmental RD repair</td>
<td>Minor complications only (5 seroma infections, 6 marginal necroses) High patient satisfaction</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Batchvarova et al. [16]</td>
<td>Level 4 (retrospective review)</td>
<td>52</td>
<td>Abdominoplasty with plication of posterior rectus fascia with absorbable mesh reinforcement in multipara with severe laxity</td>
<td>All patients satisfied (follow-up ranging from 6–132 months) Complications: 1 bladder injury, 2 seromas, 1 skin flap necrosis, 1 umbilical necrosis and 4 minor scar revisions</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Dabb et al. [18]</td>
<td>Level 4 (case-report series)</td>
<td>32</td>
<td>Abdominoplasty through small periumbilical incision and ultrasound-assisted liposuction Plication of anterior rectus fascia</td>
<td>All patients satisfied Minor complications: 5 seromas, 1 subdermal burn, 2 smaller revisions</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Cardenas Restrepo and Munoz Ahmed [14]</td>
<td>Level 4 (case-report series)</td>
<td>42</td>
<td>Miniabdominoplasty and liposuction along with a half-moon plication of the infraumbilical fascia</td>
<td>Excellent results and all patients were satisfied (median follow-up of 15 months) Only minor complications, seen in 59.5%: 20 seromas, 2 dog-ears, 1 epidermolysis</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ferreira et al. [19]</td>
<td>Level 4 (case-report series)</td>
<td>56</td>
<td>Abdominoplasty with interrupted non-absorbable triangular mattress sutures</td>
<td>No epigastric bulging was seen after follow-up of 36 months</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>van Uchelen et al. [25]</td>
<td>Level 4 (case-report series)</td>
<td>63</td>
<td>Abdominoplasty with plication of the anterior rectus sheath with absorbable suture</td>
<td>Of 40 patients two-thirds had separation of recti 40% of these had RD (median follow-up of 64 months in 40 patients) Complications: 1 DVT, 10 wound complications, 51 had sensibility disorder</td>
<td>Student’s $t$-test, $p \leq 0.35$ and 0.45 (above and below the umbilicus)</td>
<td>None</td>
</tr>
<tr>
<td>Nahas et al. [20]</td>
<td>Level 1b (randomised Clinical Trial)</td>
<td>20</td>
<td>Abdominoplasty and plication of anterior rectus sheath with non-absorbable suture in control-group and absorbable in experimental group Pre- and postoperative CT-scan</td>
<td>Maintained correction of RD was seen after 6 months Complications: 5 seromas, 2 in the control group and 3 in the experimental group</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Nahas [3]</td>
<td>Level 4 (case-report series)</td>
<td>88</td>
<td>Abdominoplasty with myosaponeurotic correction based on type of deformity</td>
<td>All patients were satisfied except for one who gained weight Complications: 31 minor scar complications, 12 seromas</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Table VI. (Continued).

<table>
<thead>
<tr>
<th>Reference</th>
<th>Level of evidence (study design)</th>
<th>No. of patients</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Statistical analyses, ( p )-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramirez [22]</td>
<td>Level 4 (case-report series)</td>
<td>104</td>
<td>Abdominoplasty with dermolipectomy, umbilicoplasty, and RD correction by myofascial release and plication</td>
<td>High patient satisfaction</td>
<td>None</td>
</tr>
<tr>
<td>Zukowski et al. [27]</td>
<td>Level 4 (retrospective review)</td>
<td>85 + 25</td>
<td>Liposuction and laparoscopic plication in 85 patients, compared with 25 open abdominoplasties with plication of RD</td>
<td>Lower hospitalisation length and lower complication rate of 15% in the laparoscopic group vs 25% in the abdominoplasty group</td>
<td>None</td>
</tr>
<tr>
<td>Asaadi and Haramis [15]</td>
<td>Level 4 (case-report series)</td>
<td>39</td>
<td>Abdominoplasty with plication of RD</td>
<td>All patients without recurrence after follow-up of 25 months</td>
<td>None</td>
</tr>
<tr>
<td>Ranney [26]</td>
<td>Level 4 (case-report series)</td>
<td>1738</td>
<td>RD corrected during abdominal hysterectomies in parous women 553 had mild and 108 had moderate RD</td>
<td>Average follow-up of 14.77 years in 67% of patients showed improved abdominal wall strength</td>
<td>None</td>
</tr>
</tbody>
</table>

Outcomes of surgical repair

We categorised the studies on surgical correction into two main outcome measures: (1) patient satisfaction, and (2) long-term assessment of recurrence. The rest of the studies reported neither patient-satisfaction nor long-term recurrence.

Patient satisfaction

The level of patient-satisfaction was reported to be high in nine papers [3,13-18,22,26], although only two reported a measuring questionnaire or grading system [2,16].

Long-term assessment of recurrence

Five studies found no recurrence [19-21,23,24], of which two used an objective method of measuring recurrence (ultrasound [24], CT-scan [20]). On the contrary, one study reported recurrence of RD after surgery [25]. The range of follow-up in the mentioned studies varied from 3–64 months.

Complications related to surgical repair

Surgical repair primarily resulted in minor complications, with seroma being the most common (Table VI). Other minor complications were pneumonia, chronic pain, sterile and infected fat necrosis, umbilical stenosis, local sensibility disorders, and wound complications (haematomas, infected haematomas, wound infections, hyper pigmented and hypertrophic scars, marginal necrosis, sub dermal burn, dog-ears). Major complications were rare, including a case of deep venous thrombosis, an incidence of umbilical necrosis and three cases of skin flap necrosis.

A retrospective study found 94% patient satisfaction and fewer complications in laparoscopic plication (15%), compared with RD repair during abdominoplasty (25%). However, the difference was not supported by statistical analysis [27].

Discussion

Descriptions of rectus abdominis diastasis (RD) have often appeared unclear in the literature and a thorough evidence-based classification, including a consensus on when the condition is pathologic, is lacking. In addition to the existing reviews on RD [24,28,29], we discuss the use of classification tools to define pathological RD, and when surgery may be indicated. In the presented study we also investigated interventions in the form of conservative management, spontaneous resolution, the relation between RD and pregnancy, and surgical repair of RD (open, laparoscopic, and endoscopic). Furthermore, we investigated outcome measures of RD repair, considering complications related to surgical repair, patient-satisfaction, and long-term assessment of recurrence. As most of the studies on surgical repair of RD are of evidence level 4, and only one randomised clinical trial (RCT) exists (Table VI), the quality of evidence on surgical repair of RD is questionable. This is also the case regarding conservative management and spontaneous resolution of RD, as there are only a few studies, and these are mainly level 2b or 3b, but no RCTs (Table V). Furthermore, most of the studies do not provide information on the type and width of diastasis or the indication for repair. Even though the lack of studies of high scientific quality is the main weakness of this systematic review, some conclusions can be drawn.

RD is by itself not a true hernia and, therefore, not associated with the risk of strangulation [28]. It is a condition with protrusion of the abdomen due to laxity of the myoaponeurotic system. There is not necessarily coherence between the anatomic location, severity of the diastasis, and the protrusion of the abdomen [2]. The prevalence of repair is high, and is often done along with abdominoplasties [3]. There is no consensus on the definition of when a myoaponeurotic laxity requires repair, thus repair is mostly done due to cosmetic reasons [3]. If repair is to be undertaken, the protrusion of the abdomen rather than the diastasis itself should influence the decision of repair [2]. The surgical correction should be done respecting the type of myoaponeurotic deformity (Table III) [3,29]. The risk of complications, such as infection, sensibility disorder, flap necrosis, seroma formation, local wound complications, and recurrence, should be weighed against the benefit. Overall, on the other hand, repair is safe and effective, as major complications are few. In addition, the patient-satisfaction is high and with low long-term recurrence rates.
Overall complication rates varied between studies, and were primarily minor and related to the simultaneously performed abdominoplasty. In the mentioned papers, no complication was found specifically related to the RD repair, and only a few authors reported major complications (e.g. one deep venous thrombosis, one ileus). However, the cause of the mentioned ileus was not explicitly stated [27].

Patient satisfaction was generally reported to be high, although only a few papers assessed patient-satisfaction with grading scales or questionnaires [2,16]. As there were no randomised clinical trials (RCT) on this matter, an exposure to publication bias can be the case.

Long-term recurrence rates were reported to be low (no reported recurrence in five papers) and two of these used objective measuring methods (CT, ultrasound). Statistical analysis was done in one of the papers [24]. On the contrary, only one paper reported recurrence. The study by van Uchelen et al. [25] reported surgery-requiring recurrence in 40%. This could have been caused by the used plication technique further than to the medial rectus muscle edge resulting in failure of the sutures because of increased tension [29].

Solid evidence on the repair of RD is lacking. Only a few studies using statistical analyses were found. One of these was a RCT [20] indicating that absorbable midline plication was as efficient as non-absorbable. However, the study was underpowered, due to the low patient number (10 in each group). A prospective study [24] found significant durability of midline plication of RD after 12 months. One paper compared laparoscopic with open repair [27], and showed a trend to a lower complication rate in the laparoscopic group. However, the results were not supported by statistical analysis and the study design was retrospective with selection bias (e.g. patients were discarded if they had striae or excessive skin laxity).

Regarding the relation to pregnancy, there was a significant relation between parity and RD [9]. Rates of RD in multipara ranged between 34.9% [10] and 59% [9]. Secondly, all found studies reported persisting RD after childbirth [6-9]. Even though most studies indicate post-partum RD, the severity may not be classified as pathological: Liaw et al. [7] found the post-partum inter-rectal-distance (IRD) as being significantly higher than in nulliparous women. However, the values were below the pathologic “threshold” if evaluated according to the Beer et al. [1] classification (Table I). In the study by Coldron et al. [8], IRD was found to persist after 12 months. Also in this case, the umbilical IRD would not be classified as pathologic according to the Rath et al. [4] classification (Table II). IRD was not quantified in the remaining two studies [6,7].

As mentioned earlier a prospective study by Chiarello et al. [12] suggested a positive effect of physiotherapy on symptoms of RD. The latter showed a lower rate of RD in the prenatal exercise group, but the results were not significant (low patient number). Also the case-control study by Lo et al. [11] showed a protective effect of antepartum activity level on RD. Muscular exercise or physiotherapy tended to have an effect on RD [11,12], but a strong conclusion cannot be drawn from these few reports with a low patient number.

Accordingly, RD is a common phenomenon in post-partum women who are not necessarily pathological and not necessarily requiring surgical repair, as conservative management may be an alternative.

In conclusion, the lack of consensus on classification of RD, and definition of when the condition is pathologic, causes surgical corrections on incoherent indications. The use of generally accepted classifications may ease research on the area, clarifying the definition of pathological RD. We, therefore, recommend that future studies aim at using the established definitions (e.g. Beer, Rath, or Nahas classification: Tables I, II, III) when reporting diastasis. Objective parameters such as the RD type, inter-rectal-distances, and localisations must be reported according to these definitions, so that the indication for repair can be compared. This also applies to studies assessing the long-term outcome of repair or reporting recurrence. Patient satisfaction must be reported objectively by using grading scales or questionnaires so that inter-study comparison can be made. Furthermore, future studies need to address any symptoms related to the observed RD in order to clarify whether the indication for corrective surgery is of cosmetic or functional purpose. We also recommend RCTs comparing repair during abdominoplasty or miniabdominoplasties with laparoscopic/endoscopic repair. Studies addressing the spontaneous resolution and RCT’s that compare conservative management of diastasis with operative treatment must be prioritised.

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References