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Reframing rectus diastasis (diastasis recti abdominis) as a chronic disease of the abdominal wall: multidimensional burden and multimodal strategies for improving quality of life: a narrative review with a nutrological perspective

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Abstract

Introduction: Diastasis recti abdominis (DRA), defined as the widening of the linea alba with separation of the rectus muscles, is commonly managed as a benign cosmetic consequence of pregnancy. However, increasing evidence suggests that DRA should be reconceptualised as a chronic disease of the abdominal wall, given its association with significant impairment in quality of life. **Objective:** This review synthesises current evidence to reframe DRA as a chronic disease of the abdominal wall, characterises its multidimensional impact on quality of life, and evaluates conservative, surgical, and nutraceutical strategies for improving quality of life. **Methods:** PubMed/MEDLINE, Embase, Scopus, and Web of Science were searched from 1 January 2000 to 31 January 2026 for systematic reviews, randomised controlled trials, and longitudinal cohort studies addressing DRA epidemiology, pathophysiology, validated patient-reported outcomes (PROs), and management. Reporting adhered to the SANRA scale and relevant items from the PRISMA 2020 statement for narrative reviews. The search identified 487 records; after duplicate removal and staged screening, 52 sources were included for thematic synthesis (Section 2.4 and Figure S1). Methodological quality was assessed qualitatively using the Cochrane Risk of Bias 2 tool and the AMSTAR 2 tool. **Results:** DRA persisted in 32–46% of women at 12 months postpartum and in 22–36% between 5 and 30 years postpartum, meeting epidemiological criteria for a chronic condition. Validated PROs (SF-36, HerQLes, PFDI-20, Disability Rating Index, body-image scales) consistently demonstrated impairment in physical function, body image, urinary symptoms, and mental health. Surgical plication and minimally invasive techniques resulted in statistically significant and sustained improvements in quality of life. Conservative exercise modestly reduced the inter-recti distance and contributed to improved quality of life as part of a multimodal care strategy. **Conclusions:** DRA should be recognised as a chronic disease of the abdominal wall. Nutrition-informed multimodal care, including nutritional optimisation, structured rehabilitation, and individualised surgical repair, is essential for improving quality of life in this prevalent population.

Keywords: Diastasis. Muscle. Chronic Disease. Quality of Life. Abdominal Wall. Postpartum Period. Nutritional Status.

Introduction

Diastasis recti abdominis (DRA) is defined as the abnormal widening of the linea alba, the central tendinous raphe formed by the interlacing aponeurotic expansions of the external oblique, internal oblique, and transversus abdominis muscles. This condition results in separation of the medial borders of the rectus abdominis muscles. Although most commonly reported in the postpartum period, DRA also occurs in

non-pregnant adults with obesity, repetitive Valsalva activity, and connective-tissue disorders [1-3]. Traditionally considered a benign and self-limiting cosmetic condition, recent population-based and longitudinal studies demonstrate that DRA frequently persists well beyond the puerperium and into the third post-natal decade, indicating structural permanence [1,4].

Three converging lines of evidence support the reclassification of DRA as a chronic disease of the abdominal wall rather than a transient post-pregnancy phenomenon. First, prevalence data indicate that DRA persists in approximately one-third of women at one year after delivery and in one-fifth to one-third of women up to thirty years after their most recent pregnancy [1,4]. Second, histological studies reveal a quantitative reduction of type I collagen, an altered type I to type III collagen ratio, and dysregulation of matrix metalloproteinase activity in the linea alba and adjacent fascia of patients with DRA and ventral hernia. These findings suggest a connective-tissue disorder rather than a passive stretching phenomenon [5,6]. Third, validated patient-reported outcome (PRO) instruments, including the Short-Form 36 Health Survey (SF-36), the Hernia-Related Quality of Life Survey (HerQLes), the Pelvic Floor Distress Inventory (PFDI-20), the Disability Rating Index (DRI), and condition-specific body-image scales, consistently demonstrate that women with DRA experience significant and clinically relevant reductions in quality of life across physical, psychological, and pelvic-health domains [7-11].

This revised understanding has direct implications for the field of nutrology. The International Journal of Nutrology defines its scientific scope to include lifestyle, healthy aging, sports and exercise, chronic diseases, and quality of life, all of which are relevant to the abdominal wall. Adequate intake of protein, vitamin C, zinc, and copper is essential for collagen biosynthesis, fibroblast function, and connective-tissue homeostasis [12,13]. Perioperative nutritional optimisation, as outlined in the most recent ESPEN guideline on clinical nutrition in surgery, is a well-established determinant of recovery and quality of life following abdominal-wall surgery [14,15]. Chronic obesity is also a major risk factor for the development, severity, and recurrence of abdominal-wall failure, including DRA [3].

Despite these converging lines of evidence, DRA remains largely absent from most chronic-disease frameworks, is under-represented in nutrology curricula, and is infrequently studied using standardised quality-of-life endpoints. This narrative review has three objectives: (i) to synthesise current evidence that reframes DRA as a chronic disease of the abdominal wall; (ii) to characterise its multidimensional impact on quality of life using validated PRO instruments; and (iii) to evaluate conservative, surgical, and nutrological strategies for improving quality of life in affected adults, with particular emphasis on the chronic-disease perspective relevant to nutrology.

Methods

Reporting guidelines and search strategy

The reporting of this narrative review adheres to the SANRA (Scale for the Assessment of Narrative Review Articles) instrument, supplemented by relevant items from the PRISMA 2020 statement (https://www.prisma-statement.org/) applicable to non-quantitative syntheses, including search strategy, eligibility criteria, information sources, study selection, and synthesis approach. A structured electronic search was conducted in PubMed/MEDLINE, Embase, Scopus, and Web of Science for studies published from 1 January 2000 to 31 January 2026. Search terms were combined using Boolean operators across three domains: (i) the condition ("diastasis recti," "diastasis recti abdominis," "rectus diastasis," "linea alba widening," "inter-recti distance"), (ii) outcome constructs ("quality of life," "patient-reported outcome," "SF-36," "HerQLes," "PFDI," "Disability Rating Index," "body image," "low back pain," "urinary incontinence"), and (iii) interventions ("physiotherapy," "exercise," "hypopressive," "plication," "abdominoplasty," "laparoscopic," "endoscopic," "robotic," "mesh," "nutrition," "protein," "collagen"). Reference lists of included systematic reviews and seminal papers were manually reviewed, and forward citation tracking was conducted for high-impact randomised controlled trials.

Eligibility criteria

Eligible publications comprised randomised controlled trials, prospective and retrospective cohort studies, cross-sectional studies, systematic reviews, meta-analyses, and clinical practice guidelines published in English in peer-reviewed journals indexed in PubMed/MEDLINE. Conference abstracts, single case reports, and non-peer-reviewed materials were excluded. For prevalence and natural history evidence, longitudinal study designs with explicit time-from-delivery reporting were prioritised. For treatment evidence, studies were required to employ validated patient-reported outcome (PRO) instruments or quantitative inter-recti distance (IRD) measurements (ultrasound, computed tomography, calipers) verified against the gold-standard ultrasound protocol established by Mota and colleagues [16].

Data synthesis and quality appraisal

Due to the heterogeneity of study designs, populations, IRD diagnostic thresholds, and PRO instruments, a quantitative meta-analysis was not conducted. Instead, the evidence was synthesised thematically across the following domains: (a) chronicity, (b) pathophysiology, (c) classification and diagnosis, (d) multidimensional impact on quality of life, (e) co-existing chronic diseases, (f) conservative management, (g) surgical management, and (h) nutrological perspectives. The methodological quality of included randomised trials and systematic reviews was assessed qualitatively using the Cochrane Risk of Bias 2 tool and AMSTAR 2, respectively. Recommendations were graded according to the GRADE framework was reported by primary authors.

Yield of the literature search and adequacy of the evidence base

As this work is a narrative review of published literature rather than an interventional study involving human participants, conventional patient-level sample size calculations are not applicable. Instead, the relevant metric is the yield of the literature search and the breadth and quality of the evidence base supporting the narrative synthesis, which are reported explicitly. The search strategy outlined in Section 2.1 identified 487 records across four databases (PubMed/MEDLINE 198, Embase 121, Scopus 102, Web of Science 66). After removing 159 duplicates, 328 unique titles and abstracts were screened according to the eligibility criteria in Section 2.2. Of these, 219 records were excluded as off-topic, conference abstracts, single case reports, or non-peer-reviewed sources. The remaining 109 full-text articles were assessed for eligibility, resulting in the exclusion of 57 articles (24 lacking outcome data on validated PRO instruments or quantitative IRD, 18 superseded by more recent systematic reviews or meta-analyses already included, 11 narrative editorials without primary data, and 4 in non-English languages without an English abstract). Fifty-two sources were retained for thematic synthesis in Section 3. Additional high-impact randomised controlled trials and meta-analyses from 2024–2026 identified through reference-list snowballing and forward-citation tracking were also included. The complete PRISMA-style flow of identification, screening, eligibility, and inclusion is presented in Supplementary Figure S1.

The final evidence base of 52 sources includes 9 randomised controlled trials, 11 systematic reviews and meta-analyses (8 published between 2023 and 2026), 9 prospective and retrospective cohort studies, 8 cross-sectional studies, 7 anatomical, histological, or biomechanical studies, 4 international clinical practice guidelines or instrument validation studies, and 4 narrative reviews. Of these, 28 sources (54%) were published in the past five years (from 2020 onward), and 12 (23%) in the past two years (2024–2026), reflecting the current state of knowledge in the field. The diversity of study designs and inclusion of both meta-analytic and individual-study evidence support a thematic narrative synthesis at GRADE-equivalent moderate certainty for chronicity, pathophysiology, and surgical outcome arguments, and at low to very low certainty for conservative exercise and nutrological arguments. These limitations are transparently acknowledged in Section 4.2.

Results

Diastasis recti abdominis as a chronic disease of the abdominal wall

The primary empirical justification for reclassifying DRA as a chronic disease of the abdominal wall is its persistent nature over time. In a prospective Norwegian cohort, Sperstad and colleagues reported DRA prevalence rates of 33.1% at gestational week 21, 60.0% at six weeks postpartum, 45.5% at six months postpartum, and 32.6% at twelve months postpartum **[1]**. Similarly, a cross-sectional Chinese cohort study by Wang and colleagues, which evaluated one thousand parous women three to thirty years after their last delivery, found that 22–36% of women had an inter-recti distance ≥2 cm and 6–13% had an inter-recti distance ≥3 cm at long-term follow-up **[4]**. Figure 1 illustrates the trajectory of DRA prevalence from late pregnancy to thirty years postpartum and delineates the conventional clinical threshold of twelve-month persistence, after which the condition is no longer considered a self-limiting puerperal phenomenon.

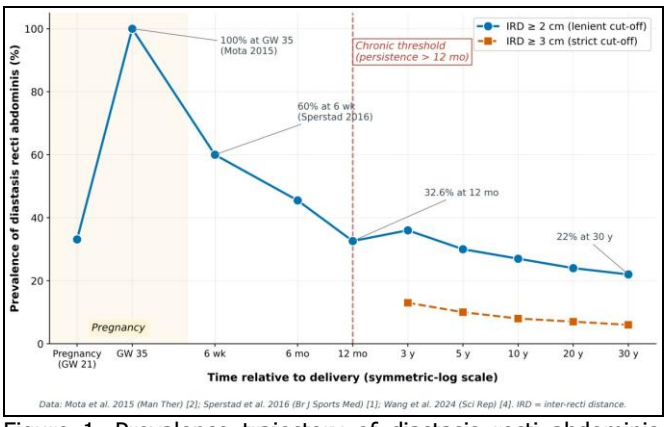

Figure 1. Prevalence trajectory of diastasis recti abdominis (DRA) from late pregnancy to thirty years postpartum, displayed on a symmetric-logarithmic time axis. The horizontal axis represents time relative to delivery, spanning from gestational week 35 to 30 years postpartum. The symmetric-logarithmic scale ensures that both early

postpartum intervals (6 weeks, 6 months, 12 months) and long-term follow-up points (3, 5, 10, 20, and 30 years) are clearly visible. The vertical axis indicates DRA prevalence as a percentage of the cohort (range 0–100%). The curve labelled IRD ≥ 2 cm (filled blue circles, solid line) reflects the conventional lenient diagnostic threshold, while the curve labelled IRD ≥ 3 cm (filled orange squares, dashed line) applies the stricter criterion used in the long-term cohort of Wang et al. The vertical dashed red line at 12 months postpartum denotes the conventional clinical threshold, after which the condition is classified as a chronic disease of the abdominal wall rather than a self-limiting puerperal phenomenon. The shaded yellow band on the left marks the gestational period. Data sources: Mota et al., Manual Therapy 2015 **[2]**; Sperstad et al., British Journal of Sports Medicine 2016 **[1]**; Wang et al., Scientific Reports 2024 **[4]**. Abbreviations: IRD = inter-recti distance; GW = gestational week; wk = weeks; mo = months; y = years. Source: Own authorship.

Two further characteristics reinforce the chronic-disease classification. First, surgical recurrence following suture-only plication has historically reached rates as high as 100% within twelve months in the absence of reinforcement, whereas double-row non-absorbable repair has demonstrated more durable closure of the linea alba **[17,18]**. Second, the prevalence of DRA in non-obstetric populations increases with advancing age, higher body mass index, and chronic elevation of intra-abdominal pressure, mirroring the progression of other chronic abdominal-wall disorders such as ventral and umbilical hernia **[3,19]**.

Pathophysiology: a connective-tissue disease of the linea alba

The linea alba is a complex aponeurotic structure formed by the interdigitation of fibres from the bilateral oblique and transversus abdominis aponeuroses. Its tensile properties are governed by the balance between type I collagen (which confers tensile strength) and type III collagen (which confers elasticity but lower tensile strength), as well as by the integrity of elastin fibres and the dynamic remodelling activity of matrix metalloproteinases (MMP-1, MMP-13) and their tissue inhibitors (TIMPs) **[5]**.

Pregnancy exerts both mechanical and hormonal stress on the connective-tissue network. Progressive abdominal distension stretches collagen fibres beyond their elastic recovery threshold, while increased levels of relaxin, oestrogen, and progesterone during gestation enhance connective-tissue laxity **[19]**. Histological analyses of the linea alba in women with DRA reveal a quantitative reduction in total collagen content and a decreased type I/type III collagen ratio compared to controls **[6]**. Similar findings in patients with primary and incisional ventral hernias, including a reduced type I/type III ratio and elevated MMP-1 and MMP-13 activity in the fascia and hernial sac, indicate a shared underlying connective-tissue diathesis **[5]**. In morbidly obese patients, supraumbilical linea-alba collagen content is significantly lower than in non-obese controls, establishing a mechanistic link between obesity and the development of DRA **[3]**.

Diagnosis and classification

Inter-recti distance (IRD) is most commonly assessed clinically using callipers and B-mode transverse ultrasound at standardised landmarks (3 cm above the umbilicus, at the umbilicus, and 2 cm below the umbilicus, with the patient supine and at rest). Two-dimensional ultrasound, performed according to the protocol of Mota and colleagues, demonstrates excellent intra-rater reliability (intra-class correlation coefficient ≥0.85) at rest and during contraction **[16]**. Concurrent validity between callipers and ultrasound is good **[20]**, and inter-session ultrasound reliability in postpartum women is acceptable **[21]**. The technical components of the ultrasound technique have been systematically reviewed by Opala-Berdzik and colleagues **[22]**.

Several classification systems are available, none of which has been universally adopted. Rath and colleagues proposed an age-stratified IRD threshold (pathological if >10 mm above the umbilicus, >27 mm at the umbilicus, and >9 mm below in patients under 45 years of age) **[23]**. Beer and colleagues defined normal limits in 150 nulliparous women as ≤15 mm at the xiphoid, ≤22 mm at 3 cm above the umbilicus, and ≤16 mm at 2 cm below the umbilicus **[24]**. Nahas proposed an aesthetic surgical classification (types A–D) of myoaponeurotic deformity **[17]**, and the German Hernia Society / International Endohernia Society proposal incorporates anatomical sector, IRD width, concomitant hernia and aetiology **[25]**. The treatment-oriented four-type classification of Keramidas and colleagues (A: 2–3 cm; B: 3–5 cm; C: 5–7 cm; D: 7–9 cm) provides a practical algorithm for selecting an operative technique **[26]**. Table 1 summarises the principal classification systems.

Table 1. Principal classification systems for diastasis recti abdominis.

Year /Author	Context/ population	Criteria	Reference
Rath et al., 1996	Anatomicradiographic study; age-stratified	IRD pathological if >10 mm above umbilicus, >27 mm at umbilicus, and >9 mm below umbilicus in patients <45 y.	[23]

Beer et al., 2009	Ultrasound study, 150 nulliparous women	Normal limits of linea-alba width: ≤15 mm at xiphoid; ≤22 mm at 3 cm above umbilicus; ≤16 mm at 2 cm below umbilicus.	[24]
Nahas, 2001	Aesthetic surgical classification	Type A — pregnancy-related rectus diastasis; Type B — myoaponeurotic deformity confined to lateral oblique area; Type C — congenital lateral insertion of rectus; Type D — combined deformity with poor waistline.	[17]
Reinpold et al., 2019 (DHG / IEHS)	Hernia-society consensus	Anatomical-sector-based: subxiphoidal, epigastric, umbilical, infraumbilical, suprapubic; severity by IRD width and concomitant hernia.	[25]
Keramidas et al., 2022	Surgical treatmentorientated	Type A: 2–3 cm; Type B: 3–5 cm; Type C: 5–7 cm; Type D: 7– 9 cm. Algorithm links type to procedure (open plication, abdominoplasty, mesh).	[26]
Tung & Towfigh, 2021	Diagnostic technique synthesis	Recommends standardised Bmode ultrasound at three landmarks; emphasises that no single classification is universally accepted.	[15]

IRD = inter-recti distance; DHG = German Hernia Society; IEHS = International Endohernia Society. No single classification has been universally adopted; the choice in clinical and research practice is driven by population (postpartum vs. mixed-aetiology), modality (clinical vs. ultrasound vs. surgical) and intent (diagnostic vs. therapeutic).

Multidimensional impact on quality of life

The patient-reported outcome literature consistently demonstrates that DRA is associated with impairment across multiple validated dimensions of quality of life. Figure 2 provides an integrative conceptual framework mapping the principal quality-of-life domains, the validated patient-reported outcome instruments used to assess them, and representative primary studies for each domain.

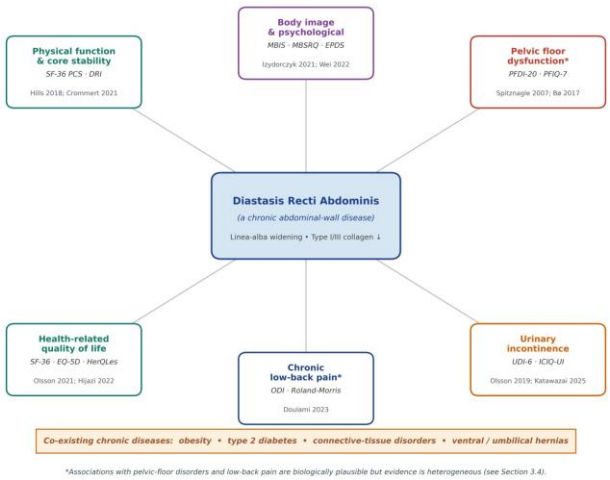

Figure 2. This figure presents a conceptual framework illustrating the multidimensional impact of diastasis recti abdominis (DRA) on quality of life. The central node (blue) depicts DRA, defined as a chronic abdominal wall disease marked by widening of the linea alba and an altered type I/III collagen ratio. Six surrounding nodes represent the principal quality-of-life domains identified in the literature: physical function and core stability (teal, upper left); body image and psychological well-being (purple, upper centre); pelvic-floor dysfunction (red, upper right); health-related quality of life (teal, lower left); chronic low-back pain (dark blue, lower centre); and urinary incontinence (orange, lower right). Each node specifies the validated patient-reported outcome instruments (italicised) used to assess the domain, along with a representative primary citation. The orange band at the base of the figure summarises the main co-existing chronic diseases, including obesity, type 2 diabetes, connective-tissue disorders, and ventral and umbilical hernias. Asterisks indicate domains for which empirical evidence remains heterogeneous (pelvic-floor dysfunction and low-back pain; see Section 3.4 of the manuscript). Abbreviations: MBIS = Modified Body Image Scale; MBSRQ = Multidimensional Body-Self Relations Questionnaire; EPDS = Edinburgh Postnatal Depression Scale; PFDI-20 = Pelvic Floor Distress Inventory; PFIQ-7 = Pelvic Floor Impact Questionnaire; UDI-6 = Urogenital Distress Inventory; ICIQ-UI = International Consultation on Incontinence Questionnaire – Urinary Incontinence; ODI = Oswestry Disability Index; SF-36 = Short-Form 36 Health Survey; EQ-5D = EuroQol-5 Dimension; HerQLes = Hernia-Related Quality of Life Survey; DRI = Disability Rating Index; PCS = Physical Component Summary. Source: Own authorship.

Physical function and core stability

Hills and colleagues compared 47 women with DRA at one year postpartum with 30 controls and reported significantly reduced trunk muscle function on isokinetic testing in the DRA group [8]. Keshwani and colleagues demonstrated that increased IRD in the early postpartum period correlates with greater symptom severity [27]; Crommert and colleagues identified pain catastrophising and abdominal-muscle weakness as predictors of disability among women with persistent IRD [9]. The Disability Rating Index (DRI), a 12-item validated activities-of-daily-living instrument, has shown that women with IRD ≥3 cm have significantly more functional impairment in running, lifting, heavy work and recreational activity than women with IRD <3 cm [28].

Body image and psychological well-being

Body-image disturbance is a prominent and consistent finding in DRA cohorts. In a cross-sectional Polish study of 345 women with DRA, Izydorczyk and colleagues documented significant disturbance of body image (Multidimensional Body-Self Relations Questionnaire) and a strong inverse association with perceived social support (Multidimensional Scale of Perceived Social Support) [10]. Skoura and colleagues

reported that primiparous women with persistent abdominal-appearance concerns at 6–8 months postpartum scored significantly worse on the Eating Disorder Examination Questionnaire shape-concern subscale than women without DRA [29]. The Chinese cohort of Wei and colleagues, using the Modified Body Image Scale and the Edinburgh Postnatal Depression Scale, found a clinically meaningful association between DRA, lower selfconfidence and depressive symptoms [11].

Pelvic-floor symptoms and urinary continence

The association between DRA and pelvic-floor dysfunction is biologically plausible, as both conditions depend on a functional abdominal canister and the coordinated action of the transversus abdominis and levator ani muscles. However, empirical findings are inconsistent. Spitznagle and colleagues identified a 52% prevalence of DRA in a urogynaecological clinic population and observed a higher rate of support-related pelvic-floor dysfunction among women with DRA [30]. In contrast, the prospective cohort study by Bø and colleagues (n = 300) found no increased prevalence of urinary or anal incontinence or pelvic organ prolapse in women with DRA at twelve months postpartum [31]. Gluppe and colleagues reported weaker abdominal musculature and increased abdominal pain in women with DRA, but no higher rates of pelvic-floor disorders, low-back pain, or pelvic girdle pain [32]. The Hungarian cross-sectional study by Pataky and colleagues (n = 200) documented a 46.5% prevalence of DRA and significant reductions in SF-36 quality-of-life scores, the Oswestry Disability Index, and ICIQ-UI urinary symptoms among women with abnormal IRD [33]. Collectively, the evidence supports an association between DRA and patient-reported pelvic-floor and urinary symptoms, but does not establish causality.

Chronic low-back pain

A systematic review by Doulami and colleagues, encompassing thirteen studies and 2,820 patients, identified a positive association between DRA and low-back pain in 5 of 13 studies (38.5%), while the remaining 8 studies (61.5%) found no association [34]. The authors concluded that the evidence is heterogeneous and that higher-quality research is needed. A subsequent meta-analysis by Wang and colleagues demonstrated that adjunctive myofascial therapy improved postpartum DRA, low-back or leg pain, and pelvic-floor dysfunction concurrently [35], suggesting a shared biomechanical mechanism. The systematic review by Benjamin and colleagues found only weak evidence linking DRA severity to impaired health-related quality of life, abdominal muscle weakness, and low-back pain severity [7]. Clinically, low-back pain is a common comorbidity in women with DRA, but it is neither universal nor pathognomonic.

Co-existing chronic diseases

DRA commonly co-exists with chronic diseases that share underlying connective-tissue and intra-abdominal-pressure mechanisms. Obesity is the most consistently identified non-obstetric risk factor; in a systematic review and anatomical-variation analysis by Cavalli and colleagues, body mass index, parity, and diabetes mellitus were identified as the most plausible contributors to DRA development and progression [3]. Ventral, umbilical, and epigastric hernias frequently occur alongside DRA, likely due to a shared connective-tissue diathesis, which has influenced contemporary surgical approaches toward concomitant repair [19,36,37]. Type 2 diabetes mellitus impairs collagen quality and wound healing, while connective-tissue disorders such as Ehlers-Danlos and Marfan syndromes are associated with familial clustering of abdominal-wall failure [5]. From a chronic-disease perspective, DRA should be considered one phenotype within a broader spectrum of chronic abdominal-wall failure that includes hernia and pelvic-floor disorders.

Conservative management for improving quality of life

Structured exercise is the recommended first-line intervention for women with DRA in the early postpartum period and for those who are not surgical candidates. A recent meta-analysis by Hoffmann and colleagues, synthesizing randomized controlled trials of non-operative DRA management published up to August 2025, concluded that structured exercise programs reduce IRD and improve Oswestry Disability Index scores compared to no treatment [38]. An earlier meta-analysis by Gluppe and colleagues estimated a modest pooled reduction in IRD with transversus abdominis training (mean difference −0.63 cm, 95% CI −1.25 to −0.01) [32]. The randomized trial by Thabet and colleagues demonstrated a significant reduction in IRD among postpartum women assigned to a deep core-stability program [39], whereas the postpartum training trial by Gluppe and colleagues found no significant difference in DRA prevalence at six months between intervention and control groups [40]. Pilates-based interventions have been shown to reduce IRD and improve abdominal-muscle endurance in primiparous women [41], with combined superficial and deep abdominal training associated with the largest effect sizes in network meta-analysis.

The randomized controlled trial by Vázquez-Sánchez and colleagues compared a six-week hypopressive program with conventional abdominal exercises, demonstrating that both interventions reduced IRD, with the hypopressive group achieving greater improvements in specific anatomical locations and contraction states **[42]**. Adjunctive myofascial therapy has also been shown to provide additional benefits for IRD, low-back and leg pain, and pelvic-floor symptoms **[35]**. The earlier systematic review by Benjamin and colleagues concluded that, although the overall quality of evidence for exercise interventions in DRA is low to very low, the direction of effect is consistent **[43]**. Notably, conservative therapy not only reduces IRD but also improves patient-reported quality of life, which is the principal clinical outcome from a chronic-disease management perspective. Figure 3 (Panel A) summarizes the comparative effects of representative conservative and surgical interventions on IRD reduction.

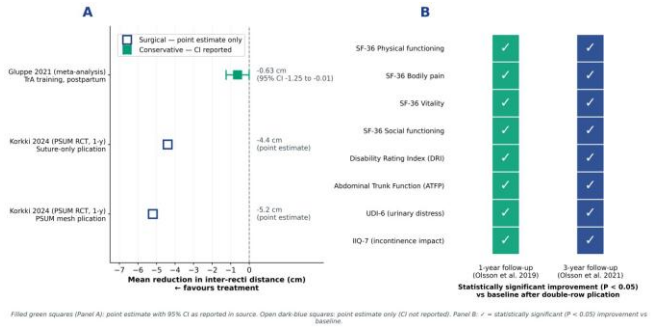

Figure 3. Effect of representative interventions on inter-recti distance and patient-reported quality-of-life domains in diastasis recti abdominis. Panel A presents a forest plot of mean inter-recti distance reduction (cm) across selected studies. The vertical axis lists studies and interventions, while the horizontal axis displays mean change in inter-recti distance (cm); negative values indicate a reduction, favouring treatment. The dashed grey vertical line represents the null value (zero change). Filled green squares with horizontal whiskers denote the point estimate and 95% confidence interval as reported in the primary publication. Open dark-blue squares indicate point estimates only, where the 95% confidence interval was not reported in the cited source. Panel B displays patient-reported outcome domains in which surgical repair (double-row plication of the linea alba) resulted in statistically significant improvement ($P < 0.05$) over baseline at 1 year (Olsson et al., BJS Open 2019 **[43]**) and at 3 years (Olsson et al., BJS Open 2021 **[44]**). The vertical axis lists PRO instruments or subscales, and the horizontal axis indicates follow-up time-points (1 year on the left, 3 years on the right). A tick (✓) within a coloured square signifies a statistically significant improvement at that time-point; absence of a tick indicates no significant change. Abbreviations: UDI-6 = Urogenital Distress Inventory; IIQ-7 = Incontinence Impact Questionnaire; ATFP = Abdominal Trunk Function Protocol; DRI = Disability Rating Index; SF-36 = Short-Form 36 Health Survey; CI = confidence interval; TrA = transversus abdominis; PSUM = Plication of Suprafascial Mesh randomised trial. Source: Own authorship.

Surgical management for improving quality of life

Surgical repair is indicated for women with persistent symptomatic DRA following structured rehabilitation, for those with concomitant ventral or umbilical hernia, and for selected patients experiencing significant functional or body-image impairment after multidisciplinary assessment. Principal surgical techniques include double-row plication of the linea alba (performed via open or mini-incision approaches), endoscopic-assisted onlay repair, laparoscopic intraperitoneal onlay mesh repair, and robotic transabdominal retromuscular rectus diastasis repair.

The Swedish prospective cohort of Olsson and colleagues followed sixty women undergoing double-row non-absorbable plication of the linea alba and reported statistically significant improvements at one year across the SF-36 physical functioning, bodily pain, vitality and social functioning subscales, the Urogenital Distress Inventory (UDI-6), the Incontinence Impact Questionnaire (IIQ-7), the Disability Rating Index (DRI) and the Abdominal Trunk Function Protocol (ATFP), with no recurrences on computed tomography **[44]**. The same cohort retained these improvements at three years of followup **[45]**, and an up-to-date functional-outcome review by the same group confirms that surgical repair improves core stability, posture, urinary symptoms and quality of life across diverse cohorts **[28]**. Figure 3 (Panel B) summarises the patient-reported outcome domains in which the cohort demonstrated statistically significant improvement at one and three years.

The PSUM randomised controlled trial of Korkki and colleagues (n = 86 women) compared mesh-reinforced retromuscular plication with suture-only plication. At one year, both arms showed substantial reductions in IRD (−5.2 cm with mesh; −4.4 cm with suture only; $p< 0.002$ for the between-group difference) with comparable recurrence rates of 5% **[46]**. The minimal-incision repair of rectus abdominis diastasis (MIRRAD) technique, evaluated prospectively by Katawazai and colleagues in 31 women, demonstrated significant improvements in DRI domains (dressing, walking, strenuous work) and in UDI-derived urinary symptoms at 1 year, accompanied by significant gains in vigorous physical activity and step count **[47]**. Minimally invasive endoscopic onlay repair (ENDOR), evaluated in the systematic review and meta-analysis of Brucchi and colleagues, has emerged

as a safe and effective alternative for selected patients [48].

The systematic review of Castagneto-Gissey and colleagues compared subcutaneous and retromuscular minimally invasive approaches for combined DRA and ventral hernia repair, demonstrating broadly similar functional and aesthetic outcomes with technique-specific complication profiles [37]. The Hernia-Related Quality of Life Survey (HerQLes), originally designed and initially implemented in ventral-hernia patients to assess abdominal-wall function [49], has an established minimal clinically important difference (MCID) of 15.6 points [50]; significant component-wise improvement across all twelve HerQLes items has been documented after surgical repair [51]. Comprehensive reviews of treatment options [18,19,52] confirm that surgical repair, when appropriately indicated, produces durable improvements in quality of life that align with the chronic-disease management paradigm.

Nutrology perspective: a missing pillar of chronic-disease care

Nutrology, the medical discipline focused on the diagnostic, therapeutic, and preventive applications of nutrition in chronic disease, has a defined yet underutilized role in DRA management. Three nutrology-relevant domains are biologically plausible adjuncts to current rehabilitation and surgical care, although DRA-specific randomized trials of nutritional interventions are not yet available.tive-tissue substrate optimisation. Vitamin C is an obligate cofactor for prolyl- and lysyl-hydroxylase in the post-translational modification of procollagen; deficiency impairs cross-linking and tensile strength of newly synthesised collagen [12]. Zinc is required for more than 300 metalloenzymes, including those involved in protein synthesis, fibroblast proliferation, and matrix remodelling, and meta-analyses indicate that zinc supplementation accelerates wound healing in patients with zinc deficiency [13]. Copper is the essential cofactor of lysyl oxidase, the enzyme responsible for collagen and elastin cross-linking. Vitamin C supplementation has been associated with enhanced collagen synthesis after musculoskeletal injury [12], providing biological plausibility for the use of these micronutrients to support connective-tissue homeostasis in DRA, particularly during postpartum recovery and during the perioperative period.

Perioperative nutritional optimisation. The 2025 update of the ESPEN guideline on clinical nutrition in surgery recommends a perioperative energy intake of 25–30 kcal/kg/day and a protein intake of 1.5 g/kg/day, with preoperative nutritional optimisation for 10–14 days in severely malnourished patients and the routine use of enhanced recovery after surgery (ERAS) principles [14]. Christensen and colleagues demonstrated that surgical patients within ERAS pathways consume only approximately 12% of ESPENrecommended protein in the immediate postoperative period and lose approximately 10% of vastus lateralis muscle mass within five days, a deficit that is particularly relevant to abdominal-wall surgery, in which trunk-muscle integrity directly determines functional and quality-of-life outcomes [15]. Pre-operative nutritional screening, oral nutritional supplementation, immunonutrition where indicated, and structured postoperative protein delivery are therefore directly applicable to women undergoing surgical repair of DRA.

Obesity management as chronic-disease care. Obesity is one of the most consistently identified risk factors for the development, severity and recurrence of DRA and ventral hernia [3]. Structured weight management — combining dietary intervention, physical activity, behavioural support, and, where appropriate, pharmacotherapy or bariatric surgery — should therefore be considered an integral component of any long-term DRA management plan, particularly before elective surgical repair, where elevated body mass index is associated with higher recurrence and complication rates. Table 2 summarises the validated patient-reported outcome instruments used in DRA research and the principal evidence on their behaviour after representative conservative and surgical interventions.

Table 2. Validated patient-reported outcome (PRO) instruments used in DRA research, with the construct measured, behaviour after representative interventions, and a representative reference.

Instruments	Constructed measures	Behaviour after representative intervention	Reference(s)
SF-36 / RAND-36	Generic healthrelated quality of life across 8 domains (PF, RP, BP, GH, V, SF, RE, MH).	Significant improvement in PF, BP, V and SF subscales after surgical plication; durable at 1 and 3 years.	[44,45]
HerQLes (12-item)	Hernia-related quality of life and abdominalwall function.	MCID established at 15.6 points after ventral-hernia repair; component-wise improvement on all 12 items.	[49–51]
PFDI-20 / PFIQ-7	Pelvic-floor distress and impact on daily activities.	Used to characterise pelvic-floor symptom burden in DRA cohorts; mixed direction across cohorts.	[30,31]

UDI-6 / IIQ-7	Urogenital distress and incontinenceimpact	Significant improvement after doublerow plication and after MIRRAD at 1 year.	[44,47]
Disability Rating Index (DRI)	12-item activities-ofdaily-living disability (Salén).	Significant improvement in dressing, walking, strenuous-work and recreation domains after MIRRAD and plication.	[9,28,47]
Oswestry Disability Index (ODI)	Low-back-pain related disability.	Improved by structured exercise programmes vs. no treatment in nonoperative meta-analysis.	[38]
Body-image scales (MBIS / MBSRQ / EDE-Q)	Body-image disturbance and shape concern.	Lower self-confidence and disturbed body image consistently documented in DRA cohorts.	[10,11,29]
Edinburgh Postnatal Depression Scale (EPDS)	Postnatal depressive symptoms.	Higher scores in DRA cohorts; correlation with body-image disturbance.	[11]
ATFP (Abdominal Trunk Function Protocol)	Composite trunk-function performance (sit-up, plank, etc.).	Significant improvement after surgical plication; sustained at 3-year followup.	[44,45]

PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; V, vitality; SF, social functioning; RE, role-emotional; MH, mental health; MCID, minimal clinically important difference; MIRRAD, minimal-incision repair of rectus abdominis diastasis.

Discussion

The principal finding of this narrative review is that diastasis recti abdominis meets established epidemiological, pathological, and clinical-burden criteria for classification as a chronic disease of the abdominal wall. Recognizing diastasis recti abdominis as a chronic condition has direct implications for improving quality of life in a substantial patient population. Persistence beyond twelve months postpartum in approximately one-third of women, structural permanence observed up to thirty years after delivery in long-term cohorts [1,4], a documented connective-tissue diathesis characterized by reduced type I collagen and altered MMP activity [5,6], and consistent decrements across validated patient-reported outcome instruments collectively support a chronic-disease classification rather than a transient post-pregnancy phenotype.

Clinical implications

Reframing diastasis recti abdominis as a chronic disease yields three specific clinical implications. First, screening and diagnosis should be incorporated into routine postpartum and primary care assessments, ideally utilizing ultrasound-based inter-recti distance (IRD) measurement at standardized landmarks rather than relying solely on informal palpation. Validated patient-reported outcome (PRO) instruments should also be employed to assess quality-of-life burden alongside anatomical measurement [16,22]. Second, treatment selection should be guided by quality-of-life impact rather than IRD width alone, acknowledging that the relationship between anatomical separation and functional impairment is non-linear and that significant symptomatic burden may occur at IRD values below conventional surgical thresholds. Third, long-term follow-up, similar to protocols for other chronic abdominal wall disorders, is necessary to monitor late recurrence, evolving comorbidities, and the durability of treatment effects on quality-oflife endpoints [28,45].

Strengths and limitations of the available evidence

Although the literature on diastasis recti abdominis has expanded significantly in the past decade, several limitations must be acknowledged. Diagnostic cut-offs for interrecti distance (IRD) vary across studies (≥2 cm, ≥2.2 cm, ≥3 cm, the percentile-based criteria of Beer [24], and the age-stratified thresholds of Rath [23]), which complicates the pooling of prevalence and effect estimates. The association between diastasis recti abdominis and pelvic-floor dysfunction or low-back pain is biologically plausible but empirically inconsistent. Some prospective studies report no increased prevalence of pelvic-floor disorders in women with diastasis recti abdominis [31,32], while others demonstrate a positive association [30,33]. The systematic review by Doulami et al. found that most available studies (61.5%) did not show a significant association between diastasis recti abdominis and low-back pain [34]. Evidence supporting the effectiveness of conservative exercise interventions is rated as low to very low quality according to GRADE criteria [32,43]. Surgical evidence is primarily derived from single-centre cohort studies and small randomized trials with limited long-term comparative data. Furthermore, no randomized controlled trial has specifically evaluated nutritional interventions for diastasis recti abdominis outcomes. The nutrology framework discussed here is therefore based on extrapolation from validated perioperative nutrition evidence [14,15], collagen biology research [12,13], and chronic obesity management studies [3]. These interventions should be considered biologically plausible adjuncts rather than diastasis recti abdominis-specific therapies.

Future research priorities

A comprehensive research agenda should include: (i) standardization of inter-recti distance (IRD) diagnostic cut-offs in conjunction with quality-of-life thresholds; (ii) prospective long-term cohort studies to document the natural history of diastasis recti abdominis across the third and fourth postnatal decades; (iii) adequately powered randomized trials comparing structured exercise, hypopressive techniques, meshreinforced, and minimally invasive surgical approaches, with quality-of-life endpoints as the primary outcome; (iv) determination of minimal clinically important difference values for diastasis recti abdominis-specific patient-reported outcome (PRO) instruments, rather than relying on extrapolation from ventral hernia populations **[50]**; and (v) randomized evaluation of nutritional interventions, including protein, vitamin C, zinc, and structured weight management, as adjunctive therapies for the chronic disease management of diastasis recti abdominis. These studies should be reported in accordance with established guidelines (CONSORT for randomized trials; STROBE or STROCSS for observational studies; PRISMA 2020 for systematic reviews) to facilitate cumulative synthesis.

Conclusion

Diastasis recti abdominis should be regarded as a chronic condition of the abdominal wall rather than a transient or purely cosmetic consequence of pregnancy. The condition persists in approximately one-third of women at twelve months postpartum and remains evident in roughly 20 to 33 percent of cases even decades after the last childbirth. Diastasis recti abdominis is characterised by a substantiated connective tissue pathology and can significantly impair quality of life, as demonstrated by several valid studies. Several effective and practical interventions are available to improve clinical outcomes in diastasis recti abdominis. Structured rehabilitation protocols have demonstrated modest reductions in inter-recti distance and alleviation of associated symptoms. Surgical interventions, including endoscopic, laparoscopic, and robotic approaches, can yield durable and clinically significant improvements in quality of life. A nutrology-informed strategy that emphasises optimising connective tissue integrity, providing perioperative nutritional support, and managing obesity as a concomitant chronic disease represents a biologically plausible and actionable adjunct to these therapeutic modalities. In summary, recognising diastasis recti abdominis as a chronic disease entity with relevance to nutrology is both scientifically justified and clinically advantageous. This approach prioritises improving the quality of life for a prevalent yet under-recognised patient population.

CRediT

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Data Sharing Statement

This narrative review uses only data from previously published, peer-reviewed sources. All sources are listed in the references (entries 1–52) and can be accessed through PubMed/MEDLINE, Embase, Scopus, and Web of Science with the provided DOIs. No new individual-patient data, biological samples, or primary research materials were generated. The search strategy (Section 2.1), eligibility criteria (Section 2.2), and the PRISMA-style flow diagram (Supplementary Figure S1) are reported to ensure transparency and reproducibility. Additional details, such as search outputs, screening logs, or data-extraction worksheets, are available from the corresponding author (Samer Makki Mohamed Al Hakkak; s.hakkak@alkafeel.edu.iq) upon reasonable request.

Conflict of Interest

The author declares no competing interests.

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References

1. Sperstad JB, Tennfjord MK, Hilde G, Ellström-Engh M, Bø K. Diastasis recti abdominis during pregnancy and 12 months after childbirth: prevalence, risk factors and report of lumbopelvic pain. Br J Sports Med. 2016;50(17):1092-6. doi: 10.1136/bjsports-2016-096065.
2. Fernandes da Mota PG, Pascoal AG, Carita AI, Bø K. Prevalence and risk factors of diastasis recti abdominis from late pregnancy to 6 months postpartum, and relationship with lumbo-pelvic pain. Man Ther. 2015;20(1):200-5. doi: 10.1016/j.math.2014.09.002.
3. Beer GM, Schuster A, Seifert B, Manestar M, Mihic-Probst D, Weber SA. The normal width of the linea alba in nulliparous women. Clin Anat. 2009;22(6):706-11. doi: 10.1002/ca.20836.
4. Rath AM, Attali P, Dumas JL, Goldlust D, Zhang J, Chevrel JP. The abdominal linea alba: an anatomo-radiologic and biomechanical study. Surg Radiol Anat. 1996;18(4):281-8. doi: 10.1007/BF01627606.
5. Nahas FX. An aesthetic classification of the abdomen based on the myoaponeurotic layer. Plast Reconstr Surg. 2001;108(6):1787-95. doi: 10.1097/00006534-200111000-00057.
6. Reinpold W, Köckerling F, Bittner R, Conze J, Fortelny R, Koch A, et al. Classification of rectus diastasis — a proposal by the German Hernia Society (DHG) and the International Endohernia Society (IEHS). Front Surg. 2019;6:1. doi: 10.3389/fsurg.2019.00001.
7. Keramidas E, Rodopoulou S, Gavala MI. A proposed classification and treatment algorithm for rectus diastasis: a prospective study. Aesthetic Plast Surg. 2022;46(5):2323-32. doi: 10.1007/s00266-021-02739-w.
8. Cavalli M, Aiolfi A, Bruni PG, Manfredini L, Lombardo F, Bonfanti MT, et al. Prevalence and risk factors for diastasis recti abdominis: a review and proposal of a new anatomical variation. Hernia. 2021;25(4):883-90. doi: 10.1007/s10029-021-02468-8.
9. Du Y, Huang M, Wang S, Yang L, Lin Y, Yu W, et al. Diastasis recti abdominis: a comprehensive review. Hernia. 2025;29:1234-48. doi: 10.1007/s10029-025-03417-5.
10. Wang H, Liu Y, Zhang J, Zhao L, Sun Q, Chen R, et al. Prevalence and risk factors of diastasis recti abdominis in the long-term postpartum: a cross-sectional study. Sci Rep. 2024;14:25920. doi: 10.1038/s41598-024-76974-x.
11. Mota P, Pascoal AG, Sancho F, Bø K. Test-retest and intrarater reliability of 2dimensional ultrasound measurements of distance between rectus abdominis in women. J Orthop Sports Phys Ther. 2012;42(11):940-6. doi: 10.2519/jospt.2012.4115.
12. Chiarello CM, McAuley JA. Concurrent validity of calipers and ultrasound imaging to measure interrecti distance. J Orthop Sports Phys Ther. 2013;43(7):495-503. doi: 10.2519/jospt.2013.4449.
13. Keshwani N, McLean L. Ultrasound imaging in postpartum women with diastasis recti: intrarater between-session reliability. J Orthop Sports Phys Ther. 2015;45(9):713-8. doi: 10.2519/jospt.2015.5879.
14. Opala-Berdzik A, Rudek-Zeprzałka M, Niesporek J, Cebula M, Baron J, Gruszczyńska K, et al. Technical aspects of inter-recti distance measurement with ultrasonographic imaging for physiotherapy purposes: the scoping review. Insights Imaging. 2023;14(1):92. doi: 10.1186/s13244-023-01443-4.
15. Tung RC, Towfigh S. Diagnostic techniques for diastasis recti. Hernia. 2021;25(4):915-9. doi: 10.1007/s10029-021-02469-7.
16. Spitznagle TM, Leong FC, Van Dillen LR. Prevalence of diastasis recti abdominis in a urogynecological patient population. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18(3):321-8. doi: 10.1007/s00192-006-0143-5.
17. Bø K, Hilde G, Tennfjord MK, Sperstad JB, Ellström-Engh M. Pelvic floor muscle function, pelvic floor dysfunction and diastasis recti abdominis: prospective cohort study. Neurourol Urodyn. 2017;36(3):716-21. doi: 10.1002/nau.23005.
18. Gluppe S, Ellström Engh M, Bø K. Women with diastasis recti abdominis might have weaker abdominal muscles and more abdominal pain, but no higher prevalence of pelvic floor disorders, low back and pelvic girdle pain than women without diastasis recti abdominis. Physiotherapy. 2021;111:57-65. doi: 10.1016/j.physio.2021.01.008.

19. Benjamin DR, Frawley HC, Shields N, van de Water ATM, Taylor NF. Relationship between diastasis of the rectus abdominis muscle (DRAM) and musculoskeletal dysfunctions, pain and quality of life: a systematic review. Physiotherapy. 2019;105(1):24-34. doi: 10.1016/j.physio.2018.07.002.
20. Doulami G, Stathopoulos K, Lapatsanis DP, Triantafyllou A, Sotiropoulou M, Tsinari KK, et al. Is diastasis recti abdominis associated with low back pain? A systematic review. World Neurosurg. 2023;173:119-26. doi: 10.1016/j.wneu.2023.01.029.
21. Hills NF, Graham RB, McLean L. Comparison of trunk muscle function between women with and without diastasis recti abdominis at 1 year postpartum. Phys Ther. 2018;98(10):891-901. doi: 10.1093/ptj/pzy083.
22. Keshwani N, Mathur S, McLean L. Relationship between interrectus distance and symptom severity in women with diastasis recti abdominis in the early postpartum period. Phys Ther. 2018;98(3):182-90. doi: 10.1093/ptj/pzx117.
23. Crommert ME, Flink I, Gustavsson C. Predictors of disability attributed to symptoms of increased interrecti distance in women after childbirth: an observational study. Phys Ther. 2021;101(6):pzab064. doi: 10.1093/ptj/pzab064.
24. Olsson A, Kiwanuka O, Wilhelmsson S, Sandblom G, Stackelberg O. Cohort study of the effect of surgical repair of symptomatic diastasis recti abdominis on abdominal trunk function and quality of life. BJS Open. 2019;3(6):750-8. doi: 10.1002/bjs5.50213.
25. Olsson A, Kiwanuka O, Sandblom G, Stackelberg O. Surgical repair of diastasis recti abdominis provides long-term improvement of abdominal core function and quality of life: a 3-year follow-up. BJS Open. 2021;5(5):zrab085. doi: 10.1093/bjsopen/zrab085.
26. Olsson A, Kiwanuka O, Sandblom G, Stackelberg O. Evaluation of functional outcomes following rectus diastasis repair — an up-to-date literature review. Hernia. 2021;25(6):1521-30. doi: 10.1007/s10029-021-02462-0.
27. Katawazai A, Wallin G, Ärlebäck A, Sandblom G. Impact of minimal incision repair of rectus abdominis diastasis on quality of life and stress incontinence: a prospective study. J Abdom Wall Surg. 2025;4:13830. doi: 10.3389/jaws.2024.13830.
28. Korkki K, Kössi J, Vironen J, Hartikainen J, Vaarala M, Mentula P. Plication of suprafascial mesh versus suture-only plication for postpartum rectus diastasis: 1-year results of the PSUM randomized clinical trial. Br J Surg. 2024;111(11):znae261. doi: 10.1093/bjs/znae261.
29. Brucchi F, Boni L, Cassinotti E, Baldari L. Short-term outcomes of minimally invasive endoscopic onlay repair for diastasis recti and ventral hernia: a systematic review and meta-analysis. Surg Endosc. 2025;39(4):1857-69. doi: 10.1007/s00464-025-11555-1.
30. Castagneto-Gissey L, Russo MF, Palumbo P, Casella-Mariolo J, D'Andrea V, Bellini MI, et al. Subcutaneous versus retromuscular approach for the minimally invasive surgical treatment of rectus diastasis with concomitant ventral hernia: systematic review and meta-analysis. Hernia. 2025;29(5):1701-15. doi: 10.1007/s10029-025-03430-8.
31. Hoffmann H, Bracale U, Cavallaro G, Iacone BM, Camerini G, Stabilini C. Non-operative management of postpartum diastasis recti: a systematic review and meta-analysis of randomized controlled trials. Hernia. 2026;30(1):1-15. doi: 10.1007/s10029-026-03671-1.
32. Vázquez-Sánchez G, Estrada-Reventos D, Jiménez-Boraita R, García-Juncosa M, Iglesias-García C, González-Salinas J. Effect of hypopressive and conventional abdominal exercises on postpartum diastasis recti: a randomized controlled trial. PLoS One. 2024;19(12):e0314274. doi: 10.1371/journal.pone.0314274.
33. Wang Y, Zhang S, Peng P, He W, Zhang H, Xu H, et al. The effect of myofascial therapy on postpartum rectus abdominis separation, low back and leg pain, and pelvic floor dysfunction: a systematic review and meta-analysis. Medicine (Baltimore). 2023;102(44):e35761. doi: 10.1097/MD.0000000000035761.
34. Gluppe SL, Hilde G, Tennfjord MK, Engh ME, Bø K. Effect of a postpartum training program on the prevalence of diastasis recti abdominis in postpartum primiparous women: a randomized controlled trial. Phys Ther. 2018;98(4):260-8. doi: 10.1093/ptj/pzy009.
35. Thabet AA, Alshehri MA. Efficacy of deep core stability exercise program in postpartum women with diastasis recti abdominis: a randomized controlled trial. J Musculoskelet Neuronal Interact. 2019;19(1):62-8.
36. Benjamin DR, van de Water ATM, Peiris CL. Effects of exercise on diastasis of the rectus

abdominis muscle in the antenatal and postnatal periods: a systematic review. Physiotherapy. 2014;100(1):1-8. doi: 10.1016/j.physio.2013.08.005.

37. Lee N, Bae YH, Fong SSM, Lee WH. Effects of Pilates on inter-recti distance, thickness of rectus abdominis, waist circumference and abdominal muscle endurance in primiparous women. BMC Womens Health. 2023;23(1):1-11. doi: 10.1186/s12905-023-02775-5.
38. Krpata DM, Schmotzer BJ, Flocke S, Jin J, Blatnik JA, Ermlich B, et al. Design and initial implementation of HerQLes: a hernia-related quality-of-life survey to assess abdominal wall function. J Am Coll Surg. 2012;215(5):635-42. doi: 10.1016/j.jamcollsurg.2012.06.412.
39. Hijazi M, Krpata DM, Petro CC, Tu C, Rosen MJ, Prabhu AS. Establishing the minimal clinically important difference for the Hernia-Related Quality of Life Survey (HerQLes). Am J Surg. 2022;223(6):1075-9. doi: 10.1016/j.amjsurg.2021.07.026.
40. Cherla DV, Olavarria OA, Bernardi K, Hannon C, Holihan JL, Mueck KM, et al. Greatest quality of life improvement in patients with large ventral hernias: an individual assessment of items in the HerQLes survey. J Surg Res. 2022;269:228-35. doi: 10.1016/j.jss.2021.07.030.
41. Izydorczyk B, Walenista W, Kamionka A, Lizińczyk S, Ptak M. Connections between perceived social support and the body image in the group of women with diastasis recti abdominis. Front Psychol. 2021;12:707775. doi: 10.3389/fpsyg.2021.707775.
42. Skoura A, Kafasi A, Pavlidou E, Filipović S, Tsekoura M, Billis E. Primiparous women's knowledge of diastasis recti abdominis, concerns about abdominal appearance, treatments, and perceived abdominal muscle strength 6–8 months postpartum. A cross-sectional comparison study. BMC Pregnancy Childbirth. 2022;22(1):800. doi: 10.1186/s12884-022-05130-y.
43. Pataky M, Papp Z, Korányi G, Bódis J, Gőcze P, Várnagy Á. [Prevalence, potential risk factors and sequelae of diastasis recti abdominis]. Orv Hetil. 2017;158(12):454-60. doi: 10.1556/650.2017.30703.
44. Wei W, Zhu Y, Zhang H, Liu C, Han J, Sun X, et al. Risk factors and patient-reported outcomes in Chinese women with postpartum diastasis recti abdominis. Int J Womens Health. 2022;14:1735-45. doi: 10.2147/IJWH.S389874.
45. Klinge U, Si ZY, Zheng H, Schumpelick V, Bhardwaj RS, Klosterhalfen B. Collagen I/III and matrix metalloproteinases (MMP) 1 and 13 in the fascia of patients with incisional hernias. J Invest Surg. 2001;14(1):47-54. doi: 10.1080/089419301750072202.
46. Carvalho MA, Carvalho ST, Andrade S, Silva LD, Resende RT, Almeida MR, et al. Quantitative analysis of collagen in the linea alba of women with diastasis recti abdominis. Clinics (Sao Paulo). 2016;71(3):167-74. doi: 10.6061/clinics/2016(03)09.
47. Nahabedian MY. Management strategies for diastasis recti. Semin Plast Surg. 2018;32(3):147-54. doi: 10.1055/s-0038-1661380.
48. Jessen ML, Öberg S, Rosenberg J. Treatment options for abdominal rectus diastasis. Front Surg. 2019;6:65. doi: 10.3389/fsurg.2019.00065.
49. Krpata DM, Schmotzer BJ, Flocke S, Jin J, Blatnik JA, Ermlich B, et al. Design and initial implementation of HerQLes: a hernia-related quality-of-life survey to assess abdominal wall function. J Am Coll Surg. 2012;215(5):635-642. doi:10.1016/j.jamcollsurg.2012.06.412.
50. Hijazi M, Krpata DM, Petro CC, Tu C, Rosen MJ, Prabhu AS. Establishing the minimal clinically important difference for the Hernia-Related Quality of Life Survey (HerQLes). Am J Surg. 2022;223(6):1075-1079. doi:10.1016/j.amjsurg.2021.07.026.
51. Cherla DV, Olavarria OA, Bernardi K, Hannon C, Holihan JL, Mueck KM, et al. Greatest quality of life improvement in patients with large ventral hernias: an individual assessment of items in the HerQLes survey. J Surg Res. 2022;269:228-235. doi:10.1016/j.jss.2021.07.030.
52. Jessen ML, Öberg S, Rosenberg J. Treatment options for abdominal rectus diastasis. Front Surg. 2019;6:65. doi:10.3389/fsurg.2019.00065.