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RESEARCH ARTICLE

Pathogenetic Mechanisms Of Rectocele Combined With Cystourethrocele And The Concept Of Multilevel Pelvic Floor Failure

Navruzov B.S.
Professor, DSc, Tashkent State Medical University, Tashkent, Uzbekistan

Yusupov Sh.B.
Tashkent State Medical University, Tashkent, Uzbekistan

Rakhimov O.U.
Tashkent State Medical University, Tashkent, Uzbekistan

Sabirmatov A.A.
Tashkent State Medical University, Tashkent, Uzbekistan

Yusupov A.Sh.
Tashkent State Medical University, Tashkent, Uzbekistan

Abstract: Rectocele combined with cystourethrocele represents a frequent and clinically complex manifestation of pelvic floor dysfunction. Traditionally, these entities have been interpreted as isolated compartmental defects requiring local anatomical correction. However, accumulating anatomical, functional, and radiological evidence suggests that combined rectocele and cystourethrocele reflect a multilevel failure of the pelvic floor support system rather than a single-site structural abnormality.

This narrative review analyzes contemporary literature addressing anatomical interactions between anterior and posterior compartments, the biomechanical role of the rectovaginal septum and pubocervical fascia, levator ani dysfunction, and functional alterations detected by defecography, high-resolution anorectal manometry, and dynamic magnetic resonance imaging. The reviewed data demonstrate that symptom severity frequently does not correlate with the morphological extent of rectocele. Functional disturbances, including impaired anal relaxation, altered pressure gradients, and disrupted load redistribution within the pelvic floor, appear to play a decisive role in clinical presentation.

The concept of multilevel pelvic floor failure provides a more coherent framework for understanding the coexistence of rectocele and cystourethrocele. Damage to muscular and fascial structures, age-related connective tissue changes, chronic increases in intra-abdominal pressure, and obstetric trauma interact in a cumulative manner, leading to progressive destabilization of pelvic support. This systemic perspective explains the limited durability of isolated defect correction and underscores the importance of functional assessment in clinical decision-making.

Recognition of rectocele combined with cystourethrocele as a manifestation of integrated pelvic floor failure may refine pathogenetic interpretation and serve as a conceptual basis for further development of reconstructive strategies aimed at restoring biomechanical balance rather than correcting isolated anatomical deformities.

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Key words: Rectocele; cystourethrocele; pelvic floor dysfunction; multilevel pelvic failure; levator ani; rectovaginal septum; anorectal manometry; magnetic resonance defecography; obstructed defecation syndrome.

INTRODUCTION

Pelvic floor disorders encompass a wide spectrum of anatomical displacement and functional impairment involving pelvic organ support. Rectocele and cystourethrocele are among the most common manifestations and are frequently identified together in women presenting with obstructed defecation, voiding symptoms, or mixed pelvic floor complaints. In contemporary multidisciplinary concepts, rectocele is increasingly viewed as a clinically meaningful element of pelvic floor dysfunction rather than a purely incidental morphological finding. This shift has influenced both diagnostic reasoning and interpretation of symptom heterogeneity in affected patients [1]. Broader management frameworks that address pelvic organ prolapse and rectal prolapse also emphasize the need to consider multicomponent involvement and inter-compartment interactions in routine practice [2].

The classical compartmental approach attributes posterior compartment failure mainly to attenuation of the rectovaginal septum, while anterior compartment failure is linked to insufficiency of anterior vaginal wall support structures. Anatomical synthesis of these relationships requires careful understanding of mid-vaginal support and its role as a shared interface for load transmission between compartments, particularly when multiple defects coexist [3]. A parallel conceptual development has been recognition that pelvic stability depends not only on fascial continuity but also on the integrity and coordination of the levator ani complex. Levator and puborectalis disruption can compromise dynamic support and create conditions for multilevel descent that extends beyond a single localized defect [4].

Functional studies support this systemic view. High-resolution anorectal manometry demonstrates that impaired anal relaxation dynamics and altered resting pressure profiles can substantially contribute to obstructed defecation in women with rectocele, and these functional disturbances may be disproportionate to static measurements of prolapse [5]. Structural–functional characterization of obstructed defecation further indicates that symptoms emerge from a combined pattern of morphological deformation and functional dyscoordination rather than from anatomy alone [6].

Taken together, these observations challenge the reductionist interpretation of rectocele combined with cystourethrocele as two independent defects and support a framework of multilevel pelvic floor failure. Within this paradigm, cumulative muscular injury, connective tissue remodeling, and altered biomechanical load distribution gradually destabilize coordinated pelvic support and shape variable clinical phenotypes. The present review synthesizes current anatomical and functional evidence to clarify the pathogenetic mechanisms underlying rectocele associated with cystourethrocele within the concept of multilevel pelvic floor failure.

METHODS

This review was conducted as a narrative analytical study aimed at synthesizing contemporary evidence on anatomical and functional mechanisms underlying rectocele combined with cystourethrocele. The methodological framework was structured to ensure transparency of source selection and thematic consistency with the objective of conceptualizing multilevel pelvic floor failure.

A targeted literature search was performed in international biomedical databases including PubMed, Scopus, and Web of Science. The search strategy incorporated combinations of the following keywords and Medical Subject Headings terms: rectocele, cystourethrocele,

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pelvic floor dysfunction, levator ani, rectovaginal septum, anorectal manometry, magnetic resonance defecography, obstructed defecation syndrome, and pelvic organ prolapse recurrence. Boolean operators AND and OR were used to refine search combinations.

The time frame for analysis primarily covered publications from 2021 to 2025 in order to reflect contemporary concepts and technological advances in pelvic floor diagnostics and management. Earlier foundational studies were not included unless directly relevant to current pathogenetic interpretation. Only peer-reviewed articles published in English were considered.

Inclusion criteria comprised original clinical investigations, prospective cohort studies, randomized controlled trials, imaging-based analyses, and structured clinical reviews that addressed structural interactions between pelvic compartments, functional assessment of anorectal dynamics, levator ani integrity, or recurrence predictors in pelvic organ prolapse. Case reports without broader analytical relevance, purely technical surgical descriptions without functional evaluation, and studies limited to isolated anterior or posterior compartment pathology without discussion of interdependence were excluded.

A total of 18 publications meeting thematic and methodological relevance criteria were selected for detailed analysis. Data extraction focused on three principal domains:

- structural anatomy and compartmental interactions, including rectovaginal septum integrity and mid-vaginal support;
- functional assessment of pelvic floor mechanics, including anorectal manometry and dynamic imaging modalities;
- predictors of recurrence and indicators of multilevel pelvic support instability.

Selected studies were analyzed qualitatively, with emphasis on identifying convergent patterns linking anatomical disruption and functional impairment. Rather than performing statistical pooling, the review aimed to integrate structural and physiological findings into a coherent pathogenetic model consistent with the concept of multilevel pelvic floor failure.

RESULTS

Analysis of the selected studies revealed consistent evidence supporting the interdependence of structural and functional components of the pelvic floor in patients with rectocele combined with cystourethrocele. The findings were grouped into three principal domains: anatomical interactions between compartments, functional disturbances influencing symptom formation, and predictors of multilevel instability and recurrence.

Structural Interactions Between Anterior and Posterior Compartments

Anatomical investigations confirm that the rectovaginal septum and mid-vaginal support structures serve as integral load-transmitting interfaces rather than isolated partitions. Clinical assessment of posterior compartment repair demonstrates that plication of the rectovaginal fascia can restore local morphology; however, durability depends on the integrity of surrounding support systems [7].

Physiological modeling of rectocele formation suggests that deformation of posterior vaginal support structures alters intra-pelvic pressure vectors and contributes to progressive anterior displacement when anterior support is simultaneously weakened [8]. Radiological comparison between defecographic and clinical findings indicates that anatomical measurements do not always correspond to symptom severity, underscoring the importance of dynamic assessment [9].

Magnetic resonance defecography further demonstrates that pelvic floor descent often involves coordinated movement of multiple compartments, even when one defect appears dominant on static examination [11]. Quantitative MRI analysis shows that pelvic organ repositioning after reconstructive procedures does not fully normalize dynamic relationships between compartments, suggesting persistent biomechanical vulnerability [16].

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Functional Disturbances and Dynamic Imbalance

Functional assessment studies highlight the role of anorectal coordination in symptom generation. Gastrointestinal transit scintigraphy reveals that delayed or segmental evacuation patterns may coexist with structural rectocele, indicating that mechanical protrusion alone does not account for obstructed defecation [10].

High-resolution anorectal manometry demonstrates that impaired relaxation rate and elevated maximum anal resting pressure are strongly associated with severe rectocele and age-related deterioration of coordinated pelvic floor function [5]. These findings support the concept that functional dyssynergia amplifies structural deformities and may precede or accompany multilevel descent.

Comparative imaging studies confirm that pelvic floor motion differs substantially under dynamic load conditions compared with supine static evaluation, reinforcing the importance of physiological context in interpreting anatomical defects [12]. Analysis of patients undergoing mesh-augmented fixation procedures shows that reinforcement of one support level may alter functional balance and influence symptoms in adjacent compartments, further demonstrating interdependence of pelvic support systems [13].

Predictors of Recurrence and Multilevel Instability

Prospective cohort data identify multilevel involvement and baseline support weakness as significant predictors of recurrence following vaginal prolapse surgery [14]. Morphological indicators such as increased genital hiatus dimensions are associated with higher rates of postoperative failure, suggesting that global pelvic floor laxity contributes to recurrence risk beyond the site of primary repair [15].

Preoperative predictors of surgical success in rectocele repair demonstrate that functional parameters and symptom patterns often outweigh isolated anatomical measurements in determining long-term outcome [18]. Additional case-based analyses illustrate that disruption of one pelvic compartment may predispose to instability in adjacent structures, particularly when underlying connective tissue integrity is compromised [17].

Collectively, these findings converge toward a model in which rectocele combined with cystourethrocele represents a manifestation of coordinated multilevel failure. Structural defects, muscular dysfunction, altered pressure transmission, and connective tissue vulnerability interact in a cumulative manner, producing a clinical phenotype that cannot be adequately explained by isolated compartmental pathology.

DISCUSSION

The synthesis of anatomical, functional, and imaging data supports a conceptual transition from compartment-based interpretation toward a systemic model of pelvic floor destabilization. Traditional descriptions of rectocele and cystourethrocele emphasize discrete structural defects; however, contemporary evidence indicates that these conditions frequently emerge within a shared biomechanical environment characterized by progressive weakening of support mechanisms. Rectocele is increasingly regarded not as an isolated protrusion, but as part of a broader spectrum of pelvic floor dysfunction requiring integrated assessment [1,2].

Anatomical analysis demonstrates that the mid-vaginal support complex serves as a central interface linking anterior and posterior compartments. Disruption of this structural continuity affects load transmission and pressure distribution across the pelvic cavity [3]. At the same time, integrity of the levator ani complex appears essential for maintaining coordinated support. Levator disruption alters dynamic stability and predisposes to descent across multiple levels, providing a plausible explanation for the frequent coexistence of rectocele and cystourethrocele [4].

Functional data reinforce this interpretation. High-resolution anorectal manometry reveals that abnormal anal relaxation dynamics significantly influence symptom severity in women with rectocele, independent of

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morphological size [5]. Structural–functional analyses of obstructed defecation further demonstrate that anatomical deformation interacts with neuromuscular dyscoordination, shaping heterogeneous clinical presentations [6]. These findings suggest that morphological correction alone may not fully restore coordinated pelvic mechanics.

Radiological investigations contribute additional insight into the dynamic nature of pelvic floor interactions. Magnetic resonance defecography confirms that descent patterns often involve simultaneous displacement of multiple compartments, even when one defect appears dominant clinically [11,12]. Persistent alterations in pelvic organ relationships after reconstructive procedures indicate that anatomical repositioning does not necessarily normalize biomechanical balance [16]. Such observations may explain why symptom persistence or transformation occurs despite technically adequate repair.

The recurrence literature further highlights the importance of multilevel assessment. Prospective cohort analyses demonstrate that baseline weakness of support structures and combined compartment involvement increase the likelihood of postoperative failure [14]. Morphological predictors such as enlarged genital hiatus dimensions reflect global laxity rather than localized defects and correlate with higher recurrence risk [15]. Moreover, preoperative symptom configuration and functional parameters have been shown to influence surgical outcome more strongly than isolated anatomical measurements [18].

Taken together, the evidence converges toward a pathogenetic model of multilevel pelvic floor failure. In this framework, cumulative muscular injury, connective tissue remodeling, and chronic mechanical load gradually destabilize coordinated support. Rectocele and cystourethrocele represent different expressions of this shared process rather than independent pathologies. The systemic perspective helps reconcile discrepancies between anatomical severity and clinical manifestation and provides a rationale for integrated diagnostic strategies.

Understanding rectocele combined with cystourethrocele as a manifestation of coordinated pelvic floor failure may also refine future reconstructive approaches. While the present review does not propose a specific operative technique, the findings underscore the importance of addressing functional balance and load redistribution alongside structural correction. Recognition of multilevel involvement may therefore represent a critical step toward improving long-term stability and reducing recurrence.

CONCLUSION

Rectocele combined with cystourethrocele should be interpreted within the paradigm of multilevel pelvic floor failure rather than as two isolated compartmental defects. Anatomical disruption of fascial and muscular support structures interacts with functional dyssynergia and altered pressure transmission, producing a heterogeneous clinical phenotype that cannot be fully explained by static morphology alone.

Dynamic imaging, functional anorectal assessment, and evaluation of global pelvic support integrity are essential for understanding symptom formation and predicting clinical outcomes. Evidence from recurrence studies and functional investigations indicates that long-term stability depends on the overall biomechanical integrity of the pelvic floor rather than isolated defect correction.

Recognition of this systemic pathogenetic framework provides a coherent basis for future refinement of reconstructive strategies aimed at restoring coordinated pelvic support and biomechanical equilibrium.

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Conflict of Interest

The authors declare that there are no conflicts of interest related to the content of this article.

Ethical Approval

This study is a narrative review of previously published literature and does not involve human participants, patient data, or experimental interventions. Therefore, ethical committee approval was not required.

Author Contributions

Navruzov B.S. conceptualized the study design and supervised the development of the manuscript. Yusupov Sh.B. contributed to literature selection and methodological structuring. Rakhimov O.U. participated in data synthesis and drafting of analytical sections. Sabirmatov A.A. assisted in data interpretation and manuscript editing. Yusupov A.Sh. contributed to final revision and preparation of the manuscript for submission. All authors approved the final version of the manuscript.

Data Availability

All data analyzed in this review are derived from publicly available published studies cited in the reference list.

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