Paradoxical Puborectalis Contraction and Increased Perineal Descent

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ABSTRACT

Paradoxical puborectalis contraction and increased perineal descent are two forms of functional constipation presenting as challenging diagnostic and treatment dilemmas to the clinician. In the evaluation of these disorders, the clinician should take special care to exclude anatomic disorders leading to constipation. Physical examination is supplemented by additional diagnostic modalities such as cinedefecography, electromyography, manometry, and pudendal nerve tefninal motor latency. Generally, these investigations should be used in combination with the two playing the more relied upon techniques. Treatment is typically conservative with biofeedback playing a principal role with favorable results when patient compliance is emphasized. When considering paradoxical puborectalis contraction, failure of biofeedback is usually augmented with botulinum toxin injection. Increased perineal descent is generally treated with biofeedback and perineal support maneuvers. Surgery has little or no role in these conditions. The patient who insists on surgical intervention for either of these two conditions should be offered a stoma.

KEYWORDS: Constipation, paradoxical puborectalis contraction, increased perineal descent, botox, biofeedback, colectomy, stoma

Objectives: On completion of this article, the reader should be able to summarize the management of paradoxical puborectalis contraction and increased perineal descent.

Functional constipation presents a challenging dilemma to the practicing physician and surgeon. Constipation may be attributed to multiple causes, which generally can be classified into congenital, acquired behavioral, infectious, or anatomic and physiological abnormalities.

In this article, we focus on two particular causes of constipation that are categorized into the functional abnormality group – paradoxical puborectalis contraction and increased perineal descent. There may be coexistent mechanical components and presentation may be associated with other functional, anatomic, or acquired

causes of constipation.¹ Occasionally symptoms of one disorder may mimic another and careful evaluation and diagnostic modalities must be utilized to prescribe the appropriate treatment.

PARADOXICAL PUBORECTALIS CONTRACTION

Paradoxical puborectalis contraction is associated with a cluster of symptoms including prolonged repeated straining with bowel movements, incomplete evacuatory sensations, pain, and the need for digital manipulation.

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Appreciation of the syndrome of nonrelaxing puborectalis can be best reconciled as an anal outlet obstruction. Under normal circumstances, the anorectal angle is straightened due to relaxation of the puborectalis and external anal sphincter during the act of defecation. However, failure of puborectalis relaxation, or paradoxical contraction, results in the continued maintenance of this angle and failed elimination due to pelvic outlet obstruction.^{1,2}

History and Physical Examination

The syndrome of paradoxical puborectalis contraction is diagnosed during a careful assessment of the pelvic floor musculature by both physical examination and anorectal physiologic testing. During physical examination, special attention is made to note increases in the anal canal tone and the mobility of the posterior loop of the puborectalis during squeezing. While the patient is asked to strain, the examiner should maintain a digit in the rectum. Squeezing or intermittent contractions rather than the typical Valsalva maneuver suggests paradoxical puborectalis syndrome.² The diagnosis is then confirmed by defecography, manometry, electromyography (EMG), or dynamic pelvic magnetic resonance imaging (DPMRI).

A clinician should also exclude the paradoxical puborectalis syndrome when a patient presents with signs and symptoms of an anterior rectocele. The former can instigate the latter in up to 45% of cases.^{2,3}

In the evaluation of patients with these findings, care must be taken to determine if this isolated paradoxical contraction is a manifestation of coping from sexual assault⁴ or abuse.⁵ This learned response can also be a manifestation of a history of passage of large painful bowel movements during childhood.¹

Diagnostic Evaluation

Accurate diagnosis of this syndrome and differentiation from other etiologies of outlet obstruction and constipation is paramount to effective treatment. Although one can easily appreciate this paradoxical contraction during a Valsalva maneuver in the clinic setting, cine-defecography and EMG provide more accurate assessments in this diagnosis.

Defecography plays a significant role in diagnosing paradoxical contraction of the puborectalis during evaluation for functional disorders of constipation. The syndrome of paradoxical puborectalis contraction is a constellation of findings including a persistent posterior indentation of the puborectalis muscle, lack of perineal descent, a lack of straightening of the anorectal angle, and poor opening of the anal canal.^{6,7} Care must be taken during the evaluation because different variables may lead to inconclusive or wrong results. During and upon review of the defecography, there will be prolonged

and frequent periods of straining with little to no evacuation of contrast material. If permitted to go on for extended periods of time, this can enlarge an anterior rectocele or cause posterior rectal bowing.^{2,6}

Electromyography (both surface and needle) can be utilized to diagnose puborectalis dysfunction as registered by a maintained or increased activity.^{8,9} A false-positive result on EMG may be caused by pain from needle placement leading to nonrelaxation of pelvic musculature. Anxiety and inhibition during cine-defecography may also lead to similar nonrelaxation. Both EMG and cine-defecography have similar sensitivities and positive predictive values of 67–70% with specificities hovering around 81%.^{1,6}

The senior author has previously published results of both modalities in 112 constipated patients. Approximately one third of these patients had findings consistent with paradoxical puborectalis syndrome based on these examinations. Unfortunately, correlation between the two modalities was poor, being discordant in 67–70%.⁶

Although both defecography and electromyography have been utilized in the diagnosis of paradoxical puborectalis contraction, neither study has exceptional sensitivity or specificity and therefore, a combination of the two tests is advocated to correctly diagnose this syndrome and to help differentiate it from other functional disorders of constipation.^{6,10–13}

Treatment

Treatment for this problem is highly variable and has yielded mixed results at best. These therapies range from biofeedback, to botulinum toxin, to division of the puborectalis muscle, to colectomy, to end ileostomy or colostomy (Fig. 1).

The primary modality for treatment of paradoxical puborectalis contraction is biofeedback, with bowel management reported to have success rates ranging from 40–90% (Table 1).^{3,14–22}

Failure of biofeedback is principally due to patient noncompliance. Wexner et al reported on a series of 18 patients with paradoxical puborectalis contraction and constipation—all of whom had no unassisted bowel movements. A significant majority of these patients (14) were laxative-dependent and just over half were enema-dependent. The 18 patients had a median of nine EMG-based biofeedback sessions; with a mean follow-up of 9.1 months, they reported a mean of 7.3 unassisted bowel movements per week ($P < 0.0001$). Laxative use was also reduced to only 2 patients, and generally ≤ 1 dose per week ($P < 0.001$). Similarly, enema use was also reported in only 3 patients ($P < 0.002$). There were no complications from treatment. The overall success rate with EMG-based biofeedback was reported as 89%.¹⁴

Figure 1 Algorithm for the diagnosis and management of paradoxical puborectalis contraction and increased perineal descent.

Several years later, similar findings were reported by Lau et al.³ The aim of their study, however, was to determine what affect any concomitant condition such as rectocele, intussusception, sigmoidocele, or increased perineal descent has on the success of biofeedback in the treatment of constipation due to paradoxical contraction of the puborectalis. Data were available for 173 patients; however, only 62% of patients completed the prescribed course of biofeedback. There was a 55% overall success rate and there was no statistical difference in the success of biofeedback seen between groups of patients with paradoxical puborectalis contraction alone and those with one, two, and three additional findings on initial defecography. The authors concluded by recommending biofeedback to all patients with paradoxical puborectalis contraction with or without coexistent findings and

attributed success more to compliance with the entire biofeedback regimen.³

Failure of treatment with biofeedback necessitates a more invasive modality. Given the modest success rates of only 40–90%, some groups have emphasized to patients that this success is determined primarily by their willingness to complete the course of therapy and that the only recourse would involve continued laxative and cathartic use or more invasive techniques.^{14,16,17}

Patients who fail or refuse biofeedback are generally then offered botulinum toxin, isolated from the *Clostridium botulinum* bacteria, injections into the puborectalis muscle. This method was first described in North America by Joo et al in 1996.²³ In this study, botulinum toxin type A was utilized to treat patients with paradoxical puborectalis contraction that had failed

Table 1 Results of Biofeedback for Treatment of Constipation due to Paradoxical Puborectalis Contraction

Authors, Year	Patients		Final Response	Follow-Up
	N	Immediate Response	N (%)	(Months)
Karlbom et al, 1997 ¹⁸	28	19	12 (43%)	14 (12–34)
Glia et al, 1997 ¹⁷	26	18	15 (58%)	6
Ko et al, 1997 ¹⁹	32		26 (80%)	7
Gilliland et al, 1997 ²⁰	194		Overall, 68 (35%) Completed treatment – 63%	72
Hull et al, 1995 ²¹	12	9		8 (1–15)
Wexner et al, 1992 ¹⁴	18		16 (89%)	9 (0.5–12)
Lau et al, 2000 ³			96 (55%)	
Dailianas et al, 2000 ²²	11		7 (63%)	6

biofeedback (partial or full course). Under electromyographic guidance, 6 to 15 units were injected bilaterally. Two additional sessions were provided as necessary. Although only 4 patients were enrolled in the study, all patients improved within the first 3 months and half had sustained success (discontinuation of evacuatory assistance with laxatives, enemas, or suppositories) at one year with no morbidity.²³

These preliminary data led to a study by Maria et al²⁴ into the use of botulinum toxin type A to treat biofeedback-refractory paradoxical puborectalis syndrome. In their study, there were 50 patients accrued and 30 units of the toxin were injected under ultrasonographic guidance. Bowel movements increased from 0 to 6 per week and laxatives were only utilized by one patient. There was a significant decrease in manometric puborectalis tone during straining and defecography likewise showed an increase in the anorectal angle upon defecation with evacuation of barium paste ($P=0.003$ and 0.01 , respectively). Only one patient reported a symptomatic recurrence that successfully remitted after two additional treatments with increased dosage.²⁴ This study has laid the groundwork for the increasingly accepted and widespread use of botulinum toxin for patients who fail conservative treatment with biofeedback (Table 2).²³⁻²⁷

Yoshioka and Keighley²⁸ reported their results on colectomy for 40 patients with severe constipation. Of these, 19 patients had EMG evidence for paradoxical puborectalis contraction. Their preference for preoperative diagnostic modalities now, however, is defecography primarily, with EMG and balloon expulsion unnecessary procedures. Initial resections included subtotal colectomy with ileorectal ($n=34$), cecorectal ($n=5$), or ileosigmoid anastomosis ($n=1$). Patients who were unsuccessfully treated were offered secondary procedures including restorative proctocolectomy with ileal pouch-anal anastomosis ($n=6$), or end ileostomy ($n=5$). Their overall results were generally poor. Only 23 of 40 patients were satisfied with outcomes after surgery and 82% of patients continued with complaints of abdominal distention despite a significant increase in median bowel frequency per week. Consequently, the group has altered their selection criteria in the management of these patients.

Surgical therapy is being reserved for those rare patients who are psychologically stable with identifiable anatomic abnormalities.²⁸ The authors' only surgical option for patients with paradoxical puborectalis contraction who have failed conservative therapy is a stoma.

Barnes et al²⁹ reported their experience with posterior division of the puborectalis muscle in 9 female patients with chronic constipation. Preoperative EMG and defecographic measurement of the anorectal angle at rest and during straining suggested paradoxical puborectalis contraction. Two patients reported improvement after surgery and had normal balloon expulsion postoperatively. Unfortunately, 7 patients reported no benefit from surgery and tests of defecatory function and anorectal angle did not show any improvement. Furthermore, although incontinence of solid stool was not reported in this cohort following puborectalis muscle division, over half (5 patients) reported incontinence of gas, liquid, and mucus.²⁹

These studies support the practice of patients being offered conservative management with biofeedback followed by botulinum toxin injection before a surgical alternative is entertained.

Multiple Sclerosis and Paradoxical Puborectalis Contraction

An association of paradoxical puborectalis contraction in patients with multiple sclerosis (MS) complicated with constipation has been suggested. Special circumstances exist in patients with MS with 50 to 70% of patients reporting constipation and/or incontinence.³⁰ Chia and the group at Central Middlesex Hospital³¹ reported their findings of complete and near-complete failure of puborectalis relaxation in 8 of 10 patients with MS and constipation. None of the 10 patients demonstrated evidence of lower motor neuron involvement of pelvic floor musculature. The paradoxical contraction may be attributed to the disturbed voluntary sphincter control mechanism in patients with this neurological disorder, analogous to detrusor sphincter dyssnergia in the bladder.³¹

Following a standard diagnostic and treatment algorithm, these patients are generally prescribed a bowel

Table 2 Results of Botulinum Toxin Type A in the Treatment of Paradoxical Puborectalis Contraction

Authors, Year	Patients		Final Response	Follow-Up	
	N	Immediate Response		(Months)	Complications
Joo et al, 1996 ²³	4	4/4	2/4	3	None
Shafik & El Sibai, 1998 ²⁵	15	13/15	0/15	4-6	None
Maria et al, 2000 ²⁴	4	3/4	2/4	16-28	None
Ron et al, 2001 ²⁶	24	9/24	18/24	6	Rectal pain (3/24)
Maria et al, 2006 ²⁷	24	16/24	11/24	4	Incontinence to flatus, mild (2/24)

regimen of high fiber with supplementation, laxatives, and enemas. Should this fail, defecographic evidence of nonrelaxation of the puborectalis and resulting outlet obstruction should be elicited.³² Biofeedback is then instituted with beneficial effect reported in one study with 5 of 13 patients reporting lack of constipation. Success of this treatment modality was predicted in patients with limited disability and a nonprogressive disease course.³³

INCREASED PERINEAL DESCENT

Perineal descent may be a manifestation of weakness of the pelvic floor support structures. The etiology for this is itself multifaceted. Descending perineum syndrome,¹ as it can also be termed, has been attributed to injury of the sacral or pudendal nerves, damage to the intrinsic musculature from childbirth, or chronic straining during defecation. Due to this latter cause, some authors have classified increased perineal descent (IPD) as a secondary manifestation of constipation and not a principal instigator of constipation. Obstruction to defecation can be due to weakening of the perineal body, an increased (obtuse) anorectal angle, and a more vertical orientation of the rectum—all manifestations of pelvic floor weakness.³⁴

History

Patients generally present with increased perianal and perineal descent upon straining. Over time, as the constipation worsens, the anterior rectal wall may prolapse through the anal canal and cause bleeding and irritation. This problem can be attributed to the soilage, mucus secretion, and subsequent pruritis. Patients will frequently relay a feeling of incomplete evacuation followed by obstruction due to the prolapsing anterior rectal wall mucosa. Some patients will admit to digitation and manual reduction to allay the obstruction and permit complete defecation.¹

Furthermore, patients presenting with IPD may also have other associated symptoms and findings such as prolapse, obstructed evacuation, solitary rectal ulcer syndrome, rectal pain, or various stages of incontinence. These may be also associated with surgically correctable disorders such as significant rectocele, enterocele, or sigmoidocele.²

Pathophysiology

Porter³⁵ most recently best described the evolution of the perineal descent syndrome. Exemplified as a vicious cycle, patients with excessive and repeated straining would then force protrusion of their anterior rectal wall into the anal canal leading to a sensation of incomplete evacuation and weakness of the pelvic floor

musculature. This pathology would then feedback to increased straining and progressive pelvic floor weakness and associated manifestation of, and worsening perineal descent.³⁵

Prevalence

Increased perineal descent plays a less dominant role as compared to paradoxical puborectalis contraction as a cause of constipation. In a prospective consecutive study in a rectal clinic, Ambrose and Keighly reported IPD in only 18 of 158 patients presenting with constipation.³⁶

Berkelmans et al³⁷ reported their findings on the relationship of increased perineal descent with straining and anal incontinence. A case-controlled study of 46 women with constipation and no incontinence and 46 women with idiopathic fecal incontinence was undertaken using defecography and manometry measurements. No differences were noted in all tests (resting perineal floor position, straining, and during maximal contraction of the sphincter, resting pressure in the upper part of the anal canal, maximal amplitude and duration of the voluntary contraction). Future incontinence was associated with lower maximal amplitude of voluntary contraction, greater perineal descent at rest, and less elevation of the pelvic floor during maximal contraction of the anal sphincter ($P < 0.05$). The group concluded by summarizing the findings that women with chronic straining during evacuation have perineal descent at rest and during straining similar to that of incontinent women. Women with chronic straining are also prone to develop future anal incontinence, suggesting that perineal descent at defecography in women with straining at stool may predict future anal incontinence.³⁷

Physical Examination

Although patients and clinicians may have their preferences in positioning, either the left lateral decubitus or prone jackknife position may be used to adequately examine patients. As an example, with the patient in left lateral decubitus, a perineometer may be placed on the patient's ischial tuberosities and used to determine and measure IPD during a Valsalva maneuver. However, simple observational physical examination is not ideal as it only simulates defecation in a nonphysiologic position.^{2,38,39}

Diagnostic Evaluation

The current standard for the diagnosis of increased perineal descent is based upon cinedefecography. Pudendal nerve motor terminal latency (PNMTL) can be used as an adjunct in further specifying the cause and

etiology of constipation when cinedefecography reveals an equivocal finding.

Perineal descent is one of several discrete parameters that can be measured during defecography. It can be defined as the vertical movement of the anorectal junction from its position at rest.² Although most clinicians use the ischial tuberosities as landmarks,⁴⁰ others have utilized the line drawn from the pubis to the tip of the coccyx (pubococcygeal line).⁴¹ A 2-cm pelvic floor descent can be noted in up to 84% of patients and is considered normal.^{42,43}

Cinedefecography revealing perineal descent of > 3 cm on straining, as measured from resting, is highly suggestive of a weakened perineum. This descent can be termed increased dynamic perineal descent, which can be compared to increased fixed perineal descent when there is a 4-cm descent at rest.^{2,44} When coupled with prolonged latency of a stimulated pudendal nerve, a more definitive diagnosis is made.

Ambrose and Keighley³⁶ sought to categorize and classify 18 patients with increased perineal descent at rest and during straining using noninvasive methods. Half of these patients had resting descent of their perineums below the ischial tuberosities, whereas the other half had abnormal descent of > 2.5 cm with straining. Sixteen of the 18 patients with abnormal descent at rest or on straining were women and in 10 (56%) a diagnosis of hemorrhoids was made at the initial clinic attendance. Additional correlation with parity (> 3) was noted with increased perineal descent upon straining ($P < 0.05$).³⁶

Although the focus of the study was on puborectalis denervation in fecal incontinence, Bartolo et al⁴⁵ showed that constipated patients with IPD showed partial denervation of the external sphincter and puborectalis; however, the degree of abnormality in puborectalis was less than that in incontinent patients. Furthermore, patients with constipation showed neurogenic abnormalities in the external anal sphincter, but not in the puborectalis. The findings suggest that partial denervation of the external sphincter and puborectalis are independent events and that if significant changes are present in both muscles, incontinence will likely ensue.⁴⁵

Several years later, this same group⁴⁶ sought to specifically determine the relationship between IPD and puborectalis muscle neuropathy. Twenty-seven patients with IPD presenting with obstructed defecation were examined using cinedefecography and PNTML/EMG. All patients had abnormal descent of the anorectal angle upon straining. Female patients demonstrated a significant degree of puborectalis denervation compared to men and controls (both, $P < 0.001$). The conclusion was that external sphincter denervation was associated with perineal descent in both sexes whereas other causes, of which obstetric trauma is a possibility,

must be implicated in the puborectalis neuropathy of females.⁴⁶

Jorge et al⁴⁴ reported their results of a prospective study evaluating pudendal neuropathy and its correlation with IPD in 213 patients (165 women and 48 men). Presenting symptoms included constipation (115), idiopathic fecal incontinence (58), or rectal pain/anismus (40). All patients underwent cinedefecography and bilateral PNTML as part of their workup. Measurement of perineal descent > 3.0 cm was considered abnormal. PNTML measurements of > 2.2 milliseconds were also considered abnormal. Of the 65 patients with increased perineal descent, only a quarter of these (16) had evidence of neuropathy. Neuropathy was found in an equivalent proportion of patients without IPD and furthermore, only a quarter of the 58 patients who had neuropathy had IPD, yet IPD was present in nearly a third of 155 patients without pudendal neuropathy. Attempts at correlation of pudendal neuropathy based on degree of perineal descent were unsuccessful and the authors concluded that increased perineal descent and prolonged PNTML were likely independent findings in patients presenting with disordered defecations.⁴⁴

Choi et al¹¹ reported their findings in the diagnostic evaluation of increased perineal descent using cinedefecography. The aim of their study was to assess the reproducibility of measuring anorectal angle and perineal descent by two different methods according to intraobserver and interobserver measurement and to evaluate which method yields more consistent results. Both methods were reliable and consistent for measurement of anorectal angle and perineal descent, with a concordancy of 0.60.¹¹

Finally, based on Berkelmans' group data as presented above, patients presenting with functional constipation and increased perineal descent with straining have an increased likelihood of developing fecal incontinence when associated with denervation of the external anal sphincter and puborectals or with impaired anal sensation.^{2,37}

Treatment

Increased perineal descent as the sole or primary cause of constipation is rare and when seen is generally treated by urologists and gynecologists. Generally, these patients also present with posterior compartment defects and vaginal vault prolapse.

Cundiff et al⁴⁷ reported their results of a modified abdominal sacral colpopexy in 19 patients. In this procedure, the rectovaginal space is dissected to the superior aspect of the posterior vaginal fascia still contiguous with the perineal body. A piece of mesh is then sutured to this fascia and along the entire posterior vaginal wall. With a mean follow-up of 11 weeks, 8 of 11 patients reported significant improvement in bowel symptoms.

Postoperatively, none of the patients had a stage III prolapse and all were found to have a decrease in genital hiatus measurement of 3.13. The group concluded that when associated with vaginal vault prolapse and posterior vaginal defects, IPD may be treated with abdominal sacral colpoperineopexy.⁴⁷ Interestingly, however, rectoceles and enteroceles were also corrected on postoperative defecography—leading one to propose that the perineal descent was not the primary cause of the constipation, but simply a manifestation of significant other anatomic disorders of constipation.

As an evolution of this technique, Link et al reported on the successful technique of laparoscopic sacral colpoperineopexy for increased perineal descent.⁴⁸ However, it is ours' preference not to offer surgery, but to rely upon perineal support maneuvers and biofeedback therapy to treat this condition. The only operation which we would offer is a stoma.

CONCLUSION

Paradoxical puborectalis contraction and increased perineal descent are two distinct etiologies for functional constipation. In the evaluation of these disorders, the clinician should take special care to exclude anatomic disorders leading to constipation. Physical examination is supplemented by additional diagnostic modalities such as cinedefecography, electromyography, manometry, and pudendal nerve terminal motor latency. Generally these investigations should be used in combination with the first two playing the more relied upon techniques. Treatment is generally conservative with biofeedback playing a principal role with favorable results when patient compliance is emphasized. When considering paradoxical puborectalis contraction, failure of biofeedback is usually augmented with botulinum toxin injection. Increased perineal descent is generally treated with biofeedback and perineal support maneuvers. Surgery has little or no role in these conditions. The patient who insists on surgical intervention should be offered a stoma.

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