

Anorectal Manometry: Current Techniques and Indications.

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Abstract: Anorectal manometry measures the pressures of the anal sphincter muscles, sensation in rectum, and the neural reflexes that are needed for normal bowel movements. This test is mainly performed to evaluate patients with constipation or fecal incontinence but is also useful for pre/post surgical evaluation of anal sphincter tone, functional anorectal pain, pelvic floor dyssynergia and diagnosis of Hirschsprung's Disease. Anorectal manometry is criticized on certain grounds. The equipment is costly and facility is limited to specialist centers. The procedure has poor sensitivity and specificity in anorectal disorders. At times abnormal measurements do not correlate with disease entities or explain the symptoms. Normal range of various parameters measured is highly variable and poorly reproducible. Clinical outcome after intervention does not correlate with alteration in the measurements obtained. However, anorectal manometry provides many useful data regarding anorectal function. Anorectal manometry indicates the prognosis of treatment, particularly in the management of sphincter injuries and may be used in biofeedback treatment of anismus and solitary rectal ulcer syndrome. Appropriate interpretation and clinical correlation of these tests is of paramount importance.

INTRODUCTION

The anorectum plays an important role in regulation of defecation and in maintenance of continence¹. The most widely used test for anorectal function is anorectal manometry. Anorectal manometry measures pressures of the anal sphincter muscles, sensation in the rectum, and neural reflexes that are needed for normal bowel movements. This test is mainly performed to evaluate patients with constipation or fecal incontinence but is also useful for pre/post surgical evaluation of anal sphincter tone, functional anorectal pain, pelvic floor dyssynergia and diagnosis of Hirschsprung's Disease². After establishing a diagnosis, anorectal manometry can also be used therapeutically³. Anorectal manometry is often used in conjunction with other assessment tools like defecography, pudendal nerve studies, anal sphincter electromyography (EMG) and endoanal ultrasonography. A comprehensive assessment of anorectal function during anorectal manometry consists of measuring at a minimum each of the following parameters: (1) anal sphincter function, (2) rectoanal reflex activity, (3) rectal sensation, (4) changes in anal and rectal pressures during attempted defecation, (5) rectal compliance and (6) performance of a balloon expulsion test⁴.

ANAL SPHINCTER FUNCTION

Anal sphincter function is assessed by measurement of resting sphincter pressure, squeeze sphincter pressure, and the functional length of the anal canal. Normal resting pressure is 40-80mmHg, contributed 85% by internal anal sphincter (IAS) and 15% by external anal sphincter (EAS). Squeeze pressure is normally 80-160mmHg and 100% due to the external anal sphincter. The anorectal manometry test measures pressure gradients all along the anal canal both *radially* and *longitudinally*. Thus, maximum resting anal canal pressure predominantly reflects IAS function, while voluntary anal squeeze pressure reflects EAS function. Functional anal canal length is defined as the length of the anal canal over which resting pressure exceeds that of the rectum by greater than 5 mmHg or, alternatively, as the length of the anal canal over which pressures are greater than half of the maximal pressure at rest. Maximal resting anal pressure is defined as the difference between intrarectal pressure and the highest recorded anal sphincter pressure at rest, and is generally recorded 1-2 cm from the anal verge. Maximum squeeze pressure is defined as the difference between the intrarectal pressure and the highest pressure that is recorded at any level within the anal canal during the squeeze maneuver.

RECTOANAL REFLEX ACTIVITY

Rapid distention of the rectum induces a transient increase in rectal pressure,

followed by a transient increase in anal pressure associated with EAS contraction (the rectoanal contractile reflex), and in turn, a more prolonged reduction in anal pressure due to relaxation of the IAS (the rectoanal inhibitory reflex). The rectoanal contractile reflex is a compensatory guarding mechanism that allows a positive anorectal pressure gradient to be maintained during transient increases in intra-abdominal pressure (such as coughing), which is essential for preserving continence. In fecal incontinence patients, anal sphincter pressure is not increased over the intra-abdominal pressure during coughing. The presence of rectoanal inhibitory reflex is recorded when the balloon is distended with a 50 mL volume of air.

RECTAL SENSATION

The lowest volume of air that evokes sensation and a desire to defecate, and the maximum tolerable volume are recorded. Minimum sensory volume for rectum is usually 10-15mL. Assessment of rectal sensation is useful in patients with fecal incontinence or rectal hyposensitivity. Neuromuscular conditioning using biofeedback techniques can be effective in improving impaired rectal sensation.

CHANGES IN ANAL AND RECTAL PRESSURES DURING ATTEMPTED DEFECAATION

When an individual is asked to 'bear down,' as if attempting to defecate, the normal response consists of an increase in rectal pressure that is coordinated with a relaxation of the EAS. Inability to perform this coordinated maneuver suggests a diagnosis of dyssynergic or obstructive defecation, a common cause of constipation. This response can be quantified using the defecation index = maximum rectal pressure during attempted defecation/minimum anal residual pressure during attempted defecation. A normal defecation index is 1.5. Three types of dyssynergic defecation are recognized. Most patients show paradoxical increase in anal sphincter pressure during attempted defecation with normal adequate pushing force (type 1). Some patients are unable to generate an adequate pushing force, and exhibit a paradoxical anal contraction (type 2). In type 3, the patient can generate an adequate pushing force, but has absent or incomplete (20%) sphincter relaxation.

RECTAL COMPLIANCE

Rectal compliance reflects the capacity and distensibility of the rectum. Rectal compliance is calculated by plotting the relationship between balloon volume (dV) and steady state intrarectal pressure (dP). Higher compliance indicates lower resistance to distention and vice versa.

BALLOON EXPULSION TEST

The balloon expulsion test is used to assess rectoanal co-ordination during defecatory maneuvers⁵. The test evaluates a patient's ability to expel a filled balloon from the rectum, providing a simple and more physiologic assessment of defecation dynamics. Most normal subjects can expel the balloon within one minute⁶. If the patient is unable to expel the balloon within 3 minutes, dyssynergic defecation should be suspected.

PROCEDURE

Preparation for anorectal manometry is simple usually limited to administration of rectal enema 2 hour before the procedure. The test takes approximately 30 minutes. After informed consent the patient is made to lie on left side. The small, flexible catheter, about the size of a thermometer, with a balloon at the end is inserted into the rectum. The catheter is connected to a machine that measures the pressure. Then the patient is asked to squeeze, relax, and push at various times. A perfused-tube catheter is pulled through the anal sphincter in 1 cm increments. The anal sphincter muscle pressures are measured during each of these maneuvers at various locations. To squeeze, the patient tightens the sphincter muscles as if trying to prevent anything from coming out. To push or bear down, the patient strains down as if trying to have a bowel movement. After the examination, patient might resume normal activities⁷.

During the conventional water perfusion manometry, patients are expected to be in their lateral decubitus position, which interferes with an optimal abdominal contraction and anal relaxation during simulated defecation. However, in case of high resolution anorectal manometry (HR-ARM), patients can take sitting position in commode, which is more physiological since patients can feel more comfortable and they can generate enough movement of rectum for defecation and adequate anal relaxation.

ANORECTAL MANOMETRY IN VARIOUS DISORDERS

Constipation: Anorectal manometry can identify the cause of constipation in patients with suspected nonmechanical obstructive defecation⁸. However, the physiology of defecation and the correlation between manometric findings and other objective measures of anorectal function are not completely understood⁹. Furthermore, psychologic factors may influence test results in the laboratory setting.

Pelvic floor dyssynergia: Patients with pelvic floor dyssynergia or obstructive defecation do not straighten the anorectal angle during defecation as a result of failed relaxation of the puborectalis muscle and the external anal sphincter¹⁰. The diagnosis is suggested during anorectal manometry by inappropriate contraction of the external anal sphincter while the patient is attempting to stimulate defecation. However, a similar pattern can be seen in as many as 20 percent of healthy controls. The etiology of dyssynergia is not completely understood, but it may arise as a learned behavior to avoid the discomfort associated with defecating large, hard stool. The balloon expulsion test may also be useful for diagnosing this disorder¹¹.

Reduced rectal sensation: Reduced rectal sensation during balloon distention can be associated with increased rectal compliance or megarectum, which is often seen in children and elderly persons with fecal impaction.

Hirschsprung's disease: Children and young adults with severe constipation from birth should be assessed for Hirschsprung's disease (congenital megacolon), a disorder associated with absence of intramural ganglion cells of the submucosal and myenteric plexuses as a result of arrest of neural crest cell migration during embryonic development. The presence of IAS relaxation on anorectal manometry excludes the diagnosis, while failure of the IAS to relax during rectal distention is suggestive

of the disorder^{12,13}.

Fecal incontinence: In women, the pudendal nerve or anal sphincter may be injured during childbirth, which may contribute to weakening of continence mechanisms. In such cases, the diagnosis can be established by combining anorectal manometry and anal endosonography. In one series that evaluated this approach, the combination of these two tests correctly identified 90 percent of known anal sphincter injuries¹⁴.

Anismus- In patients with anismus the obstruction to defaecation is because of failure of normal relaxation of puborectalis and the external sphincter during straining. This condition is recognised by physiological measurements which show increased activity in the external sphincter on straining. A paradoxical decrease in the anorectal angle is seen on evacuation proctography, which is an independent, but less sensitive way to make this diagnosis.

COMPLICATIONS

Anorectal manometry is a safe, low risk procedure and is unlikely to cause any pain. Complications are rare: it is possible that a perforation (tearing) or bleeding of the rectum could occur. In patients allergic to latex, a latex free balloon should be used.

DISCUSSION

Anorectal manometry is criticized on certain grounds. The equipment is costly and facility is limited to specialist centers. The procedure has poor sensitivity and specificity in anorectal disorders. At times abnormal measurements do not correlate with disease entities or explain the symptoms. Normal range of various parameters measured is highly variable and poorly reproducible. Clinical outcome after intervention does not correlate with alteration in the measurements obtained.¹⁵ However, anorectal manometry provides many useful data regarding anorectal function. It does provide information that assists in the management of conditions such as constipation, anismus, Hirschsprung's disease, and faecal incontinence. Anorectal manometry indicates the prognosis of treatment, particularly in the management of sphincter injuries and may be used in biofeedback treatment of anismus and solitary rectal ulcer syndrome. Appropriate interpretation and clinical correlation of these tests is of paramount importance.

REFERENCES

1. Wald A. Colonic and anorectal motility testing in clinical practice. *Am J Gastroenterol* 1994;89:2109.
2. Rao SS, Patel RS. How useful are manometric tests of anorectal function in the management of defecation disorders? *Am J Gastroenterol* 1997;92:469.
3. Glia A, Gyllin M, Akerlund JE et al. Biofeedback training in patients with fecal incontinence. *Dis Colon Rectum* 1998;41:359.
4. Barnett JL, Hasler WL, Camilleri M. American Gastroenterological Association medical position statement on anorectal testing techniques. *American Gastroenterological Association. Gastroenterology* 1999;116:732.
5. Madoff RD, Williams JG, Caushaj PF. Fecal incontinence. *N Engl J Med* 1992;326:1002.
6. Minguez M, Herreros B, Sanchez V, et al. Predictive value of the balloon expulsion test for excluding the diagnosis of pelvic floor dyssynergia in constipation. *Gastroenterology* 2004;126:57.
7. Diamant NE, Kamm MA, Wald A, Whitehead WE. AGA technical review on anorectal testing techniques. *Gastroenterology* 1999;116:735.
8. Locke GR 3rd, Pemberton JH, Phillips SF. American Gastroenterological Association Medical Position Statement: guidelines on constipation. *Gastroenterology* 2000;119:1761.
9. Heymen S, Jones KR, Scarlett Y, Whitehead WE. Biofeedback treatment of constipation: a critical review. *Dis Colon Rectum* 2003;46:1208.
10. Papachrysostomou M, Smith AN. Effects of biofeedback on obstructive defecation—reconditioning of the defecation reflex? *Gut* 1994;35:252.
11. Rao SS, Welcher KD, Pelsang RE. Effects of biofeedback therapy on anorectal function in obstructive defecation. *Dig Dis Sci* 1997;42:2197.
12. Osatakul S, Patrapinyokul S, Osatakul N. The diagnostic value of anorectal manometry as a screening test for Hirschsprung's disease. *J Med Assoc Thai* 1999;82:1100.
13. De Lorijn F, Reisma JB, Voskuil WP, et al. Diagnosis of Hirschsprung's disease: a prospective, comparative accuracy study of common tests. *J Pediatr* 2005;146:787.
14. Mirani C, Chun A, Desautels S, Wald A. Anorectal manometric characteristics in men and women with idiopathic fecal incontinence. *J Clin Gastroenterol* 1998;26:175.
15. Raza N, Bielefeldt K. Discriminative value of anorectal manometry in clinical practice. *Dig Dis Sci* 2009;54:2503-11.