

Augmented-pressure colostogram in imperforate anus with fistula

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Abstract. Most newborns with imperforate anus, except for those with very low varieties, undergo a diverting colostomy performed in the postnatal period, with definitive surgical repair at a later age. Accurate demonstration of the anatomy of any associated fistula between the rectum and urogenital tract is essential for optimal surgical management. An augmented-pressure distal segment colostogram is recommended prior to definitive repair, both to confirm the level of rectal atresia and to define any associated fistulous communication. We report a case of high imperforate anus with rectourethral fistula in which the fistulous tract was not identified on the conventional contrast colostogram but was readily delineated when an augmented-pressure modification of the technique was utilized. The technical aspects of augmented-pressure colostography are presented.

Most cases of imperforate anus have an accompanying fistulous communication between the rectum and urogenital tract or perineum [1]. Except for low malformations, a diverting colostomy is performed in the early postnatal period. A contrast colostogram should be obtained prior to definitive repair of the anorectal malformation, in order to accurately determine both the level of rectal termination and the presence and anatomy of any associated fistulous communication. To emphasize the importance of utilizing augmented-pressure when performing the colostogram, we present a case in which a conventional technique distal segment colostogram failed to define a rectourethral fistula, which was subsequently identified in its entirety with a repeat study utilizing Foley balloon occlusion of the stoma and augmented-pressure hand injection of contrast. This technique has received scant mention in the radiologic literature [1].

Case report

DS was born at term with normal male external genitalia but no visible anal opening. Abdominal distention was present. On voiding, meconium appeared in the urine, indicating the presence of a recto-urinary

fistula. Postnatal renal sonography demonstrated mild bilateral hydronephrosis and a voiding cystourethrogram identified a short fistula between the prostatic urethra and atretic rectal segment.

At day one of age, a divided sigmoid colostomy was performed. The patient's subsequent growth and development were normal.

At 13 months of age, prior to definitive repair of the anorectal malformation by posterior sagittal anorectoplasty, a water-soluble distal segment colostogram was performed to document the lowermost extent of the colon and demonstrate the level of the recto-urethral fistula.

Contrast injected into the distal segment of colon through a large-caliber red rubber catheter entering via the stoma outlined the entire distal segment but did not identify the recto-urethral fistula (Fig. 1). The red rubber catheter was replaced by a Foley catheter



Fig. 1. Lateral spot radiograph of the contrast-filled rectum and distal sigmoid segment. Distal segment colostography was without augmented-pressure. Distension of rectum and distal sigmoid is incomplete and the recto-urinary fistula is not demonstrated

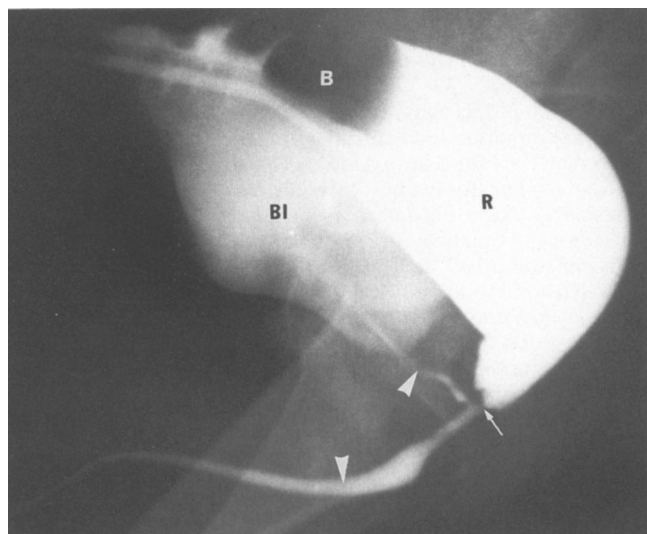


Fig. 2. Lateral spot radiograph with augmented-pressure colostography. Inflated Foley balloon (*B*) occludes the lower sigmoid segment. Distention of rectum (*R*) is significantly improved. Contrast now outlines the short recto-urethral fistula (*arrow*), the entire urethra (*arrowheads*) and the urinary bladder (*BI*)

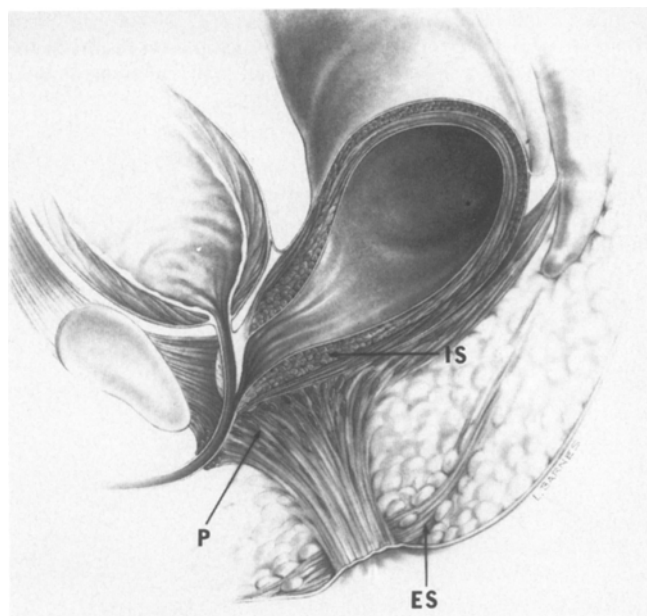


Fig. 3. Detailed anatomy of the rectourethral fistula, as seen in the sagittal view. Note how the rectum passes through the funnel-like voluntary striated muscle structure termed the internal sphincter. The usual contracted state will compress the rectal lumen and may preclude contrast entering a fistula unless augmented-pressure injection of water soluble contrast is employed. *IS* = internal sphincter, *P* = puborectalis muscle, *ES* = external sphincter. (Reprinted with permission of Springer-Verlag)

whose 5 cubic centimeter balloon was inflated inside the distal colon segment. Subsequently, contrast was injected under mild pressure and with gentle traction on the Foley catheter so as to draw the balloon firmly against the inside of the stoma and achieve an adequate seal against contrast leakage at the stoma. This permitted improved distention of the distal colon segment as well as definition of the entire recto-urethral fistula (Fig. 2).

Discussion

Imperforate anus (anorectal anomaly) has a reported incidence of 1 in 5000 live births [2–4]. Males are affected slightly more frequently than females [3, 4]. Anorectal malformations are related to abnormal separation of the genitourinary system and structures of the hindgut early in embryological development [2–4].

Fistulous tracts can extend from the atretic rectum to the bladder neck, prostatic or bulbar urethra or perineum in males; and to a urogenital sinus, upper or lower vagina, vestibule, or perineum in females [4–6]. Imperforate anus without fistula is reported to occur in approximately 5% of all cases of anorectal malformation [7, 8]. However, we suspect that the actual incidence of imperforate anus without fistula is even lower than reported due to improperly performed colostograms.

Accurate postnatal categorization is essential in determining the subsequent approach to surgical management. Low lesions are treated definitively with perineal surgery shortly following birth. For higher lesions, a diverting colostomy is performed initially, with the subsequent performance of a pullthrough procedure [2–4, 6].

In all patients undergoing a pullthrough operation, it is important for the surgeon to know the precise location of the rectal pouch and any associated urinary fistula [3, 8]. Approximately 10% of cases have a true supra-levator malformation with a recto-bladder neck fistula. In those cases, the rectum cannot be reached via the posterior sagittal approach alone, and a laparotomy is also required [8]. Unnecessary searching for a very high rectum at operation exposes the male child to potential injury to the posterior urethra, vas deferens, and seminal vesicles [8].

A distal segment contrast colostogram is recommended prior to the pullthrough procedure. Gravity infusion or hand injection of water-soluble contrast material via a straight catheter may not accurately define the level of rectal termination or any associated fistula, as illustrated by our patient [4, 9]. Contrast injection under augmented pressure, with the colostomy stoma occluded by traction placed on an internally inflated Foley balloon, increases the accuracy of the study.

Anatomic considerations upon which the rationale behind the augmented-pressure colostogram is based are depicted in Fig. 3. The rectum passes through a funnel-like muscular structure which is usually contracted, resulting in compression of the rectal lumen [8, 10]. Instillation of contrast material without sufficient hydrostatic pressure may fail to fully distend and define the distal most rectal segment and any associated recto-urinary fistula [8]. In order to overcome resting pelvic floor muscle tone, it may be necessary to exert increased hydrostatic pressure [8]. Fluoroscopic observation during augmented-pressure colostography will permit dynamic visualization of muscular contraction and relaxation [8]. The distal colostogram is the most accurate study available to define the level of rectal termination and the presence and extent of any associated urinary fistula [8].

The augmented-pressure colostography technique is relatively simple and easily performed. Required mate-

rials are a Foley catheter with a 5 cc inflatable balloon, a 50–60 cc catheter tip syringe, and water soluble contrast such as Renografin-60. Following insertion of the Foley catheter into the distal colon segment stoma and inflation of the balloon, continuous gentle traction is applied to the catheter in order to obtain a seal at the stoma and prevent contrast leakage. Water-soluble contrast (not barium) is then injected under gentle but increasing pressure until the distal rectal segment and associated fistula are identified. Fluoroscopy with spot filming in the lateral projection is performed. It is important to include the sacrum, perineum, and urinary bladder on the radiographs, and the anal dimple must be defined with a radiopaque marker [11]. Caution must be used to avoid excessive pressure that might result in rupture of the colon [1].

When performing the augmented-pressure colostogram and demonstrating an associated recto-vesical fistula, we recommend continuing contrast injection so as to fill the urinary bladder and provoke an episode of voiding, thereby permitting definition of urethral anatomy. The need to catheterize the bladder, which can be quite difficult in these patients due to a tendency for the catheter to persistently pass into the rectum or be hindered by an acute urethral angle at the fistula site, may thereby be avoided [8].

This simple modification of colostography in children has received scant mention in the radiological literature, probably due to its infrequency of use and the unfamiliarity of many radiologists with the importance of defining any fistula associated with imperforate anus. We recommend use of this technique in any patient undergoing colostography prior to definitive surgical repair of imperforate anus.

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