

Revolutionizing Colovesical Fistula Diagnosis: A Novel Technique

Sabharwal, Sahil, MD¹, Young, Brandyn, BS², Sabharwal Sarat, MD³, Brandon Kristen, MD¹ and Assem Sarah, MD¹

¹University of Arkansas for Medical Sciences, Northwest

²University of Arkansas for Medical Sciences, College of Medicine

³University of Kentucky College of Medicine, Hazard

*Corresponding author:

Sabharwal, Sahil, MD,
University of Arkansas for Medical Sciences, Northwest

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1. Abstract

Colovesical fistulas (CVFs) are significant complications arising from diverticulitis and colorectal cancer. These fistulas create abnormal connections between the colon and bladder, leading to symptoms like pneumaturia and fecaluria. Given the variability in symptoms, a robust and accurate diagnostic approach is essential, combining clinical expertise with advanced imaging techniques. Traditional diagnostic methods, such as transabdominal ultrasound, have limitations due to operator dependency and patient-specific factors. Retrograde guidewires show promise in accurately localizing CVFs by creating a wire loop through the fistula for precise identification and resection. Magnetic Resonance Imaging (MRI) has become a leading diagnostic modality, offering high-resolution, detailed anatomical images without ionizing radiation. Combining CT scans and colonoscopy as first-line investigations provides a comprehensive evaluation, ruling out malignancies and other severe conditions. When the former methods fail, colonic insufflation during simultaneous cystoscopy and colonoscopy allows for direct visualization of the fistula and successful surgical intervention through a robotic-assisted laparoscopic sigmoid colectomy.

2. Introduction

Colovesical fistulas (CVFs) are a rare, but significant complication from diverticulitis, colorectal cancer, among other inflammatory diseases. These fistulas, forming abnormal connections between the colon and bladder, lead to symptoms such as pneumaturia and fecaluria, which severely impacts the patient's quality of life. The

variability of these symptoms necessitates a robust and accurate diagnostic approach, combining clinical acumen with advanced imaging techniques. Historically, diagnostic modalities such as transabdominal ultrasound have been used to visualize fistulous tracts by identifying ureteric orifices and associated urinary jets, but their effectiveness is often limited by operator dependence and patient-specific adjustments [1]. Innovative techniques, such as the retrograde guidewire used during simultaneous cystoscopy and colonoscopy, have shown promise in localizing CVFs. This technique facilitated the creation of a wire loop through the fistula, aiding in precise identification and resection [2]. However, further validation in larger patient cohorts is needed. Magnetic Resonance Imaging (MRI) has been increasingly recognized for its superior capability in delineating anatomical details of CVFs, proving highly accurate in identifying both the presence of a fistula and its underlying etiology [3]. MRI's comprehensive visualization capabilities significantly impact clinical outcomes by allowing for precise surgical planning and treatment. A combined approach, including computed tomography (CT) scans and colonoscopy, had been advocated as first-line investigations of CVFs to emphasizing the importance of ruling out malignancy and other serious etiologies [4]. This integrated approach reflects a shift towards more comprehensive diagnostic strategies. This report documents a new approach in identifying a colovesical fistula. It employs multiple diagnostic modalities. The patient presented with gross hematuria, pneumaturia, and fecaluria. Despite an extensive workup, the exact point of the fistula could not be identified.

During simultaneous cystoscopy and colonoscopy, insufflation of the colon revealed the CVF and enabled further management. This case illustrates the importance of flexible and innovative diagnostic strategies in the management of complex colovesical fistulas. These novel techniques may improve the accuracy of fistula localization, and, thereby, improve the patient outcomes.

3. Case Description

The patient is a 66-year-old Caucasian male with a BMI of 36 who presented to Urology for gross hematuria for a month and a half, in addition to brownish-red penile discharge. The patient also admits to passing gas of the penis and brown colored semen. The patient denies any dysuria, fever, chills, or flank pain. The patient's medical history is significant for non-enhancing cystic masses in the pancreas and hepatic cysts, for which the patient follows Gastroenterology. The patient does not smoke, does not have diabetes mellitus, and was not on any blood thinners. Labs were significant for 11-20 RBCs in the urine, pneumaturia, in addition to an elevated PSA of 1.6 with free PSA of 33. Pelvic MRI revealed severe sigmoid diverticulosis, in addition to an enhancing nodule in the anterior peripheral zone of the prostate, cholelithiasis, and a tiny renal cyst. Physical exam revealed

hepatosplenomegaly and testicular pain on palpation. The patient was scheduled for a fusion biopsy of the prostate, which was later revealed to be benign. As the patient has never had a colonoscopy, he was scheduled for a simultaneous colonoscopy and cystoscopy as a potential colovesical fistula was suspected secondary to the patient's fecaluria and pneumaturia. After the etiology of the colovesical fistula was obtained, the patient was underwent a sigmoid colectomy. During the simultaneous colonoscopy and cystoscopy, the patient was placed in the left lateral decubitus position and both the cystoscope and colonoscope were advanced at the same time. There appeared to be bulging of the mucosa close to the base of the bladder. However, even with saline injection, the exact point of the fistula could not be determined. Therefore, the Surgical and Urology teams decided to insufflate the colon. The point of the fistula appeared to enlarge as air was being insufflated into the colon (Figure 1). However, no active air bubbles were seen. These findings are consistent with colovesical fistula. The etiology of the fistula appears to be significant CAD diverticulitis secondary to pan-diverticulosis most severe in the sigmoid colon. The patient subsequently underwent robotic-assisted laparoscopic sigmoid colectomy with diverting loop ileostomy.



Figure 1: View of bladder wall from cystoscope during insufflation of the colon during simultaneous colonoscopy and cystoscopy showing the exact point of the fistula in the bladder.

4. Discussion

The complexity of CVFs makes it a challenge to establish a pattern for diagnosis and a consistent therapeutic approach. CVFs are complex due to their pathophysiology and their variability in clinical presentation. This case demonstrates the new diagnostic method: simultaneous colonoscopy and cystoscopy with colonic insufflation. Such a method allows for clear visualization of the fistula's tract, which allows for precise surgical interventions.

4.1. Diagnostic Challenges and Modalities

The diagnosis of CVFs often involves a combination of clinical

evaluation and imaging techniques. The classic symptoms of pneumaturia and fecaluria are pathognomonic but may not always be present. This patient's case was also complicated by gross hematuria. Classic diagnostic modalities, including transabdominal ultrasound, have proved helpful in some instances, as ultrasound can identify ureteric orifices and associated urinary jets, providing indirect evidence of a fistula. However, the technique's effectiveness is highly dependent on the operator's skill and the patient's specific anatomical conditions [1]. Innovations in diagnostic approaches, such as the retrograde guide-wire technique described by Aurello et al. [2], have shown promise. This method involves establishing a wire

loop through the fistula tract during cystoscopy and colonoscopy, which can then be used to guide surgical resection. This innovative approach further clinical trials to ensure safety and efficacy for more diverse populations [2]. MRI has emerged as the leading diagnostic modality for CVF, offering high resolution, detailed anatomical images without exposure to ionizing radiation. MRI is instrumental in accurately identifying the presence and etiology of the CVF, which is essential for planning minimally invasive surgeries. Its ability to detail soft tissues enables precise localization of the fistula and assessment of surrounding tissues [3].

4.2. Combined Diagnostic Approach

Najjar et al. [4] highlighted the importance of an integrated, multimodal diagnostic approach for CVFs, which includes cystoscopy and colonoscopy as first line investigations. CT imaging also plays a significant role in localizing the fistula and detailing its anatomic extent. Colonoscopy excludes malignancies and other severe conditions. This multimodal diagnostic approach ensures a more thorough and comprehensive evaluation by addressing the limitations in individual diagnostic modalities [4]. In our case, though the initial MRI showed marked sigmoid diverticulosis and an enhancing nodule in the prostate, which was ultimately shown to be benign. The actual site of the fistula could not be localized. The combined colonoscopy and cystoscopy, aided with colon insufflation, allowed for direct visualization of the fistula by a novel technique. This technique enabled the identification of mucosal bulging at the base of the bladder on insufflation to locate and confirm the fistula.

4.3. Therapeutic Implications

Accurate localization of the CVF is crucial in surgical management. Traditional surgical approaches are now being replaced by minimally invasive techniques, which reduce morbidity and shorten postoperative recovery times. For instance, these new diagnostic methods facilitate the development of less-invasive procedures, such as robotic-assisted laparoscopic sigmoid colectomy. As the literature suggests, the patient's risk factors, in addition to the complexity of the fistula should dictate the choice of surgical intervention. Uncomplicated fistulas should be treated with primary resection and colonic anastomosis. 4 Staged procedures may be required in cases with significant inflammation or abscess formation. Robotic-assisted techniques enable precise dissection and repair of the fistula, which minimizes tissue trauma and accelerates recovery times.

5. Future Directions

The successful application of simultaneous colonoscopy and cystoscopy with colon insufflation in this case indicates a promising avenue for future diagnostic protocols for CVFs. Further research is warranted to validate this technique in larger cohorts and diverse clinical settings. Integrating advanced imaging technologies, such as MRI, with innovative endoscopic techniques may revolutionize the assessment and treatment of CVFs. Collaboration between gastroenterologists, urologists, surgeons, and radiologists will

optimize the diagnostic pathway and care of patients with CVFs.

6. Conclusion

This case report highlights this diagnosis and management pathway for colovesical fistulas, acknowledging the challenges in establishing effective treatment strategies. While traditional diagnostic methods, such as transabdominal ultrasound and MRI, are valuable, they have limitations. The use of simultaneous colonoscopy and cystoscopy with colon insufflation accurately localizes the fistula, facilitating precise surgical intervention. This approach, which allowed direct visualization of the fistula, led to a successful robotic-assisted laparoscopic sigmoid colectomy. Integrating multiple diagnostic modalities ensures comprehensive evaluation and accurate diagnosis, crucial for effective treatment planning [4]. Further research is needed to validate this technique across diverse patient populations. Standardizing multidisciplinary protocols that incorporate these novel techniques and advanced imaging modalities, such as MRI, could improve patient diagnosis and treatment. Further validation and standardization of this technique will benefit a broader patient population and set new standards in gastroenterology and urology.

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