Urologia Internationalis

Review Article

Urol Int 2022;106:1091–1094
DOI: 10.1159/000526762

Received: March 27, 2022
Accepted: May 16, 2022
Published online: October 11, 2022

Assessment of the Anastomosis after Radical Prostatectomy: A Review of Available Diagnostic Methods

Christoph Würnschimmel Vera Panagl Agostino Mattei
Christian Daniel Fankhauser

Klinik für Urologie, Luzerner Kantonsspital, Luzern, Switzerland

Keywords
Cystography · Anastomosis · Leakage · Radical prostatectomy

Abstract
Introduction: After radical prostatectomy, many institutions perform cystography to exclude vesicourethral anastomotic leakage before removing a urethral catheter. We reviewed diagnostic methods to exclude leakage compared to the reference standard cystography. ***Methods:*** We performed systematic literature review to summarize the published options and outcomes for assessment of vesicourethral anastomotic leakage after radical prostatectomy. ***Results:*** Of 2,137 publications, 45 full-text manuscripts underwent full-text screening, of which 9 studies contributing 919 patients were included. Seven studies described ultrasound-guided assessment (four transrectal, two transabdominal, one transperineal). Two further studies described the use of computerized tomography. Ultrasound-guided assessment of the anastomosis after radical prostatectomy shows promising agreement with cystography. Computerized tomography-aided assessment of vesicourethral anastomosis detects more leakages; however, clinical consequences are not defined. ***Conclusion:*** Further studies are warranted to (1) identify men at risk of anastomotic leakage who should undergo assessment before trial without a catheter and (2) provide prospective comparisons of different ultrasound-guided approaches.

Introduction

Every year, around 100,000 men with prostate cancer undergo radical prostatectomy, and leakage of the vesicourethral anastomosis occurs in as many as 15% of cases [1]. Early detection of leakage can be managed by prolonged catheter use. In men with undetected leakage, catheter removal leads to severe discomfort, including abdominal pain, readmission, and the need to reinsert the catheter with the risk of injuring the anastomosis or inducing additional drainage, which is associated with potential complications, including injury to the intra-abdominal organs and infections. Therefore, an accurate assessment of the anastomosis before catheter removal is important.

Christoph Würnschimmel and Vera Panagl shared first authorship.

Karger@karger.com
www.karger.com/uin

Correspondence to:
Christoph Würnschimmel, christoph.wuernschimmel@luks.ch

Karger

Table 1. Overview of nine included studies investigating alternative methods to X-ray-based cystography for anastomotic leakage assessment after radical prostatectomy

Novel assessment method	Author, year [ref.]	Sample size	POD	CEUS applied	Leakage according to cystography, *n* (%)	Leakage according to novel assessment method, *n* (%)
Transrectal ultrasound	De Stefani et al., 2005 [2]	$n = 30$	6	Yes	3 (10)	3 (10)
	Eggert et al., 2007 [3]	$n = 100$	6	No	21 (21)	23 (23)
	Cantiello et al., 2013 [4]	$n = 80$	5–7	Yes	26 (33)	24–25 (30/31*)
	Schenck/Schneider 2011 [5]	$n = 250$	4–8	No	(a)	(a)
Transabdominal ultrasound	Lepor et al., 2008 [6]	$n = 75$	8	No	17 (23)	(b)
	Schoeppler et al., 2010 [7]	$n = 43$	8	Yes	22 (51)	11 (26)
Transperineal ultrasound	Telegrafi et al., 2010 [8]	$n = 175$	8 and 10	Yes	33 (19)	33 (19)
CT	Lee et al., 2008 [9]	$n = 46$	10	N/A	25 (54)	37 (80)
	Han et al., 2011 [10]	$n = 120$	7	N/A	14 (12)	40 (33)

POD, postoperative day on which tests were performed; CEUS, contrast-agent-enhanced ultrasound. (a) A correlation coefficient was provided instead of absolute leakage rates ($r = 0.99$, $p < 0.05$). (b) At an extravasation volume of 20 mL or above, any transabdominal ultrasound detected 100% of cystography-proven leakages.
* Proportions provided are without and with contrast-enhanced ultrasound, respectively.

To prevent such complications, most surgeons test for leakage during surgery by retrograde filling of the bladder. Additionally, prior to catheter removal, many centres perform cystography to exclude anastomotic leakage a few days after the operation. The most-used technique for assessing the anastomosis is cystography [1], during which the bladder is filled using a radiopaque contrast agent and sequential antero-posterior and oblique X-ray images are taken. Typically, anastomotic leakage is either detected by a clear contrast extravasation from the site of anastomosis or, in cases of smaller leakages, due to findings of residual contrast agent residing in the area of the anastomosis after emptying the bladder. In the future, the risk of anastomotic leakage might increase because many centres have shortened or plan to shorten the time from surgery to catheter removal to decrease the length of stay and the risk of catheter-associated infections. Therefore, accurate but less invasive and cheaper diagnostic methods to test for anastomotic leakage are of interest to most surgeons and are the aim of this review.

Methods

We performed a literature review on July 29, 2021, to summarize the published options and outcomes. The search strategy excluding non-English literature can be found in the online supplementary File 1 (see www.karger.com/doi/10.1159/000526762 for all online suppl. material). Of 2,137 publications, 45 full-text manuscripts underwent full-text screening, of which 9 studies contributing 919 patients were included (online suppl. Fig. 1).

Results

Seven articles compared cystography using pelvic X-rays versus ultrasound-guided assessment, and two compared cystography with computerized tomography (CT; Table 1). For ultrasound-guided assessments, three transducer locations, including transrectal (n = 4, [2–5]), transabdominal (n = 2, [6, 7]), and transperineal (n = 1, [8]) positions were used, and saline was applied through the transurethral catheter with or without an ultrasound contrast agent.

The first description of ultrasound-guided assessment of the anastomosis was provided by De Stefani et al. [2], who used a transrectal transducer location and ultrasound contrast agent for assessment of the anastomosis and reported a 100% agreement in leakage detection (3 out of 30 men), compared to cystography. In another study without an ultrasound contrast agent, Eggert et al.

[3] also reported good agreement between the transrectal ultrasound and cystography in a cohort of 100 men (21 leakages detected using cystography and 23 leakages detected using the transrectal ultrasound). Further, Cantiello et al. [4] used an ultrasound contrast agent and reported detection rates very similar to cystography rates for anastomotic leakage using transrectal ultrasound. In this study of 80 men, 26 anastomotic leaks were detected by cystography, of which 24 were detected by transrectal ultrasound without contrast and 25 by transrectal ultrasound using a contrast.

Finally, in a larger cohort of 250 men, with leakage proportions of 46% 1 week postoperatively and 18% 2 weeks postoperatively, Schenck and Schneider [5] also reported good agreement rates between the transrectal ultrasound (without a contrast agent) and cystography. Due to the nearly 100% correlation in the first 250 men, Schenck and Schneider abandoned cystography, and a further 500 men were evaluated relying only on the transrectal ultrasound [5].

Besides the transrectal probe, some studies have reported the experience with transabdominal or transperineal probe positions. In a cohort of 17 out of 75 men with leakage, Lepor et al. [6] demonstrated that 100% of moderate-to-large leakages ($n = 8$), defined as an extravasate volume of 20 mL or higher, were also detected using a transabdominal ultrasound. However, small leakages (<20 mL, $n = 9$) were not reliably detected using the transabdominal ultrasound, missing around 30%. In a study of 43 men, cystography identified 22 men with anastomotic leakage, whereas the transabdominal ultrasound with a contrast agent for retrograde filling correctly identified 16 men with leakage [7]. Finally, in a cohort of 175 men, all 33 men with anastomotic leakages according to cystography were successfully identified using a transperineal ultrasound position combined with a contrast agent [8].

Apart from ultrasound-guided alternatives, two studies described CT-assisted cystography. Lee et al. [9], who compared CT-assisted cystography with conventional X-ray cystography, reported of CT-detected anastomotic leakage in 37 out of 46 men and X-ray-detected anastomotic leakage in 25 out of 46 men. In another cohort, Han et al. [10] reported that CT-assisted cystography described an anastomotic leakage in 40 out of 120 men. In contrast, X-ray-based cystography only described leakage in 14 men [10], suggesting that CT discovers as much as three times more leakages compared to X-ray-based cystography. These findings raise two questions: first whether the standard of care as cystography is a suitable gold standard in all mentioned comparisons (ultrasound vs. X-ray-based cystography) and, second, whether all anastomotic leakages detected by CT are of clinical relevance.

Discussion/Conclusion

Our review revealed that ultrasound-guided assessments exhibit encouraging results compared to the reference standard cystography. The advantage of ultrasound-guided assessments is the reduction of radiation exposure for patients and personnel, lower costs, and the possibility of bedside testing.

Before ultrasound-guided assessment can replace cystography-based assessment, we propose two areas for further research. First, studies should assess the pretest probability of anastomotic leakage. For example, patient factors, including prostate size, surgical techniques, and surgical experience, could guide institutions to identify which men require a leakage test before trial without a catheter. Second, prospective studies should evaluate the diagnostic accuracy of the ultrasound-guided approaches in different institutions and implement standardized teaching.

Statement of Ethics

An ethics statement is not applicable because this study is based exclusively on published literature.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

This manuscript did not receive any funding.

Author Contributions

Christoph Würnschimmel, Vera Panagl …: literature search and drafting of manuscript. Agostino Mattei, Christian Daniel Fankhauser …: literature search, supervision, and revision of manuscript.

Data Availability Statement

All data generated or analysed during this study are included in this article and its online supplementary material. Further enquiries can be directed to the corresponding author.

References

1 Tyritzis SI, Katafigiotis I, Constantinides CA. All you need to know about urethrovesical anastomotic urinary leakage following radical prostatectomy. J Urol. 2012;188(2):369–76.
2 De Stefani S, Sighinolfi MC, Mofferdin A, Paterlini M, Micali S, Celia A, et al. Transrectal contrast-enhanced (Levovist) ultrasonography in evaluation of urinary leakage after radical prostatectomy: a preliminary report. Urology. 2005;66(4):871–3.
3 Eggert T, Palisaar J, Metz P, Noldus J. Assessing the vesico-urethral anastomosis after radical retropubic prostatectomy: transrectal ultrasonography can replace cystography. BJU Int. 2007;100(6):1268–71.
4 Cantiello F, Cicione A, Autorino R, De Nunzio C, Tubaro A, Damiano R. Transrectal contrast-enhanced ultrasonography, transrectal ultrasonography and retrograde cystography for the detection of vesicourethral anastomosis leakage after radical retropubic prostatectomy: a prospective comparative evaluation. Urol Int. 2013;90(3):316–20.
5 Schenck M, Schneider T. New standardization of checking the vesicourethral anastomosis for tightness following radical prostatectomy with dynamic transrectal ultrasound: can this new technique replace the traditional postoperative cystogram? World J Urol. 2011;29:651–5.
6 Lepor H, Kozirovsky M, Laze J, Telegrafi S. Transabdominal sonocystography: a novel technique to assess vesicourethral extravasation following radical prostatectomy. J Urol. 2008;180(6):2459–62.
7 Schoeppler GM, Buchner A, Zaak D, Khoder W, Staehler M, Stief CG, et al. Detection of urinary leakage after radical retropubic prostatectomy by contrast enhanced ultrasound - do we still need conventional retrograde cystography? BJU Int. 2010;106(11):1632–7.
8 Telegrafi S, Ito T, Kozirovsky M, Laze J, Lepor H. Transperineal sonocystography: new standard for assessing anastomotic leaks after radical prostatectomy. J Ultrasound Med. 2010;29(1):71–7.
9 Lee HJ, Shin C-I, Hwang SI, Jung SI, Kim SH, Lee SE, et al. MDCT cystography for detection of vesicourethral leak after prostatectomy. Am J Roentgenol. 2008;191(6):1847–51.
10 Han KS, Choi HJ, Jung DC, Park S, Cho KS, Joung JY, et al. A prospective evaluation of conventional cystography for detection of urine leakage at the vesicourethral anastomosis site after radical prostatectomy based on computed tomography. Clin Radiol. 2011;66(3):251–6.