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# Periurethral abscess etiology, risk factors, treatment options, and outcomes: A systematic review

**Arsalan Tariq**[a,b,*], **Adam G. Stewart**[a,c,d], **Devang J. Desai**[a,e], **Sumudu Britton**[a,c], **Nigel Dunglison**[a,b], **Rachel Esler**[a,b], **Matthew J. Roberts**[a,b,d]

[a]Faculty of Medicine, The University of Queensland, Brisbane, QLD, Australia; [b]Department of Urology, Royal Brisbane and Women's Hospital, Brisbane, QLD, Australia; [c]Department of Infectious Diseases, Royal Brisbane and Women's Hospital, Brisbane, QLD, Australia; [d]Centre for Clinical Research, The University of Queensland, Brisbane, QLD, Australia; [e]Department of Urology, Toowoomba Base Hospital, Toowoomba, QLD, Australia

## Abstract

**Objectives:** This study aimed to describe patterns of presentation, etiology, risk factors, management, and treatment outcomes of periurethral abscesses using a systematic review framework.

**Materials and methods:** After prospective registration on the PROSPERO database (CRD42020193063), a systematic review of Web of Science, Embase, PubMed, and Cochrane scientific databases was performed. Articles published between 1900 and 2021 were considered. Extracted data included symptoms, etiology, medical history, investigations, treatment, and outcomes. Collated data were analyzed using univariate methods.

**Results:** Sixty articles met the inclusion criteria reporting on 270 patients (211 male, 59 female) with periurethral abscess. The most common clinical features were pain (41.5%), pyuria (41.5%), dysuria (38.5%), urinary frequency (32.3%), fever (25%), and a palpable mass (23%). Predisposing risk factors included the presence of a sexually transmitted infection or urinary tract infection (55.0%), urethral strictures (39.6%), and recent urethral instrumentation (18.7%). Management approaches included open incision and drainage (64.3%), conservative management with antibiotics (29.8%), and minimally invasive techniques (needle aspiration, endoscopic drainage). Time trend analysis of etiology revealed a decreased incidence of infection (sexually transmitted infection/urinary tract infection, human immunodeficiency virus) and higher incidence of diabetes mellitus and periurethral bulking injections in recent years.

**Conclusions:** Periurethral abscesses may display a wide range of clinical features. Presentation, risk factors and underlying etiology vary with sex. The optimal management technique is guided by abscess size. Open incision and drainage combined with antibiotics continues to be the mainstay of management. However, minimally invasive techniques are gaining favor. To the authors' knowledge, this is the first systematic appraisal and management algorithm for periurethral abscess.

**Keywords:** Periurethral abscess; Sexually transmitted infection; Urethritis; Urinary tract infection

## 1. Introduction

Periurethral abscess is a rare entity in contemporary urological practice with the potential for significant morbidity and mortality. Abscess formation occurs within paraurethral tissues, most commonly related to the paraurethral glands (Littre's, Skene's, and Cowper's). The first published case was documented in 1901 of a 19-year-old man with underlying gonococcal urethritis.[1] The abscess was successfully treated with open incision and drainage (I&D) along with injection of tricresol (a mixture of 3 isometric methyl phenols) into the abscess cavity.[1] Given the rarity of this pathology, descriptions regarding microbiology, risk factors, investigations, and outcomes are sparse, with little consensus to guide contemporary management.

Periurethral abscesses may present in a similar fashion to other genitourinary pathology, including pain (scrotal, penile, pelvic, perineal, or suprapubic), fever, dysuria, pyuria, and acute urinary retention.[2,3] Accurate and timely diagnosis can be challenging, with many patients progressing to sepsis.[2] Delayed detection and treatment may lead to complications such as urethral fistula, stricture, and, rarely, extensive cellulitis, or necrotizing fasciitis.[4–6] Historical mortality rates have been as high as 47% to 50% in the context of delayed presentations and consequent phlegmon formation.[7] It has been proposed that abscess formation is preceded by urethritis and associated with etiological factors such as urinary obstruction, trauma (including surgery and/or instrumentation), urethral diverticula, and urethral carcinoma.[4,5] Reported management techniques include conservative therapy (ie, antibiotics),[8] needle aspiration,[9] and open I&D.[10]

Despite being described intermittently in the literature for more than 120 years, the microbiology, demographics, risk factors, clinical manifestations, optimal treatment, and outcomes for periurethral abscesses remain poorly defined and are likely to have changed over time. Thus, the aim of this study was to systematically review the available literature concerning periurethral abscesses and describe their etiology, risk factors, symptoms, investigations, management techniques, and outcomes, including temporal considerations.

*Corresponding Author: Dr Arsalan Tariq, Faculty of Medicine, The University of Queensland, Herston, QLD 4029, Australia. E-mail address: a.tariq@uq.edu.au (A. Tariq).

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## 2. Materials and methods

A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[11] The published study protocol was registered in the PROSPERO database (CRD42020193063).

### 2.1. Data sources

The EMBASE, Web of Science, and Cochrane databases were queried in October 2021 for studies published in English, including case reports and case series, from 1900 to 2021. All published literature was reviewed for eligibility. Of note, abscess reports related to the prostate and prostatic urethra were considered a separate pathology and thus excluded from this review.[12] The medical subject heading search terms "urethral," "urethra," "periurethral," "suburethral," "paraurethral," "Skene," "Cowper," and "Littre's" along with text-search terms "abscess" or "abscesses" were used to extract relevant articles. Reference lists of key articles were also examined for additional relevant articles. Conference abstracts and other unpublished accounts were excluded from this review because of insufficient detail to allow for appropriate assessment.

### 2.2. Quality assessment

Quality assessment of included studies (Supplementary Tables 1 and 2, http://links.lww.com/CURRUROL/A28 and http://links.lww.com/CURRUROL/A29) was performed using the 8-item Joanna Briggs Institute checklist,[13–15] as recommended by the Cochrane Collaboration guidelines.[16]

### 2.3. Outcome measures and data management

After screening of abstracts, full-text publications were assessed for inclusion by 2 reviewers (A.T. and A.G.S.). Extracted data included patient demographics (age, sex, ethnicity), symptoms, medical history, and, in particular, risk factors and precipitants, diagnostic imaging, laboratory findings, management techniques, and follow-up information, if available.

### 2.4. Statistical methods

Descriptive statistical analysis was performed for continuous (mean, median, standard deviation, and interquartile ranges) and categorical variables (frequencies, percentage distribution). Hypothesis testing was conducted using 2-tailed *t* test and Fisher exact test using GraphPad QuickCalcs. A $p$ value of <0.05 was designated as indicating statistical significance. Data tables, graphs, and figures were generated using Microsoft Excel.

## 3. Results

Database searches identified a total of 1665 entries, of which 1585 were excluded based on title and abstract review (Fig. 1). Full-text articles ($n$ = 80) were assessed for eligibility, of which 20 were excluded, resulting in 60 full-text articles with a total of 270 patients being included for analysis. Most studies originated in North America (48.5%), Asia (36.3%), and Africa (7.7%). A majority of patients were male (78.1%; Table 1). The median age was 49.0 years (range, 10 months–78 years), and 6 patients (2%) were children.

### 3.1. Clinical features

The most common clinical features included pain (43.3%; including penile, scrotal, perineal, and suprapubic), pyuria (41.5%), dysuria (38.5%), frequency (32.3%), fever (>38°C; 25%), and a palpable mass (23%; Table 1). Mean duration of symptoms before presentation was 30.6 days (standard deviation, 71.2 days; $n$ = 270). Delayed presentation to care was more common among female (28.2 ± 171.0 days, $n$ = 59) than male patients (16.4 ± 9.9 days, $n$ = 211; $p \le 0.01$). Female patients were more likely to present with a palpable mass than male patients (73% vs. 18%, $p \le 0.01$), and less likely to have a fever (7% vs. 30%, $p = 0.01$). Abscess location in male patients included the penile (78%) and bulbar (22%) urethra, whereas the distribution among female patients was highest in the distal (62%), followed by middle (21%) and proximal urethra (17%). Urinary retention was more common in patients with concurrent urethral abnormality (eg, diverticulum, stricture/stenosis, or previous instrumentation/injury) compared with those with no abnormality (59.8% vs. 0%, $p \le 0.01$; Table 2).

### 3.2. Imaging

Among 115 patients for whom imaging was reported, 124 imaging investigations comprised cystourethrography (61, 49.2%), magnetic resonance imaging (MRI; 31 [25.1%]), ultrasonography (USS; 19 [15.3%]), and computed tomography (CT; 13 [10.5%]; Table 1). Nine patients underwent investigation with multiple imaging modalities (CT and MRI, $n$ = 4; CT and USS, $n$ = 3; urethrography and CT or US, $n$ = 2). The abscess was successfully identified in all patients undergoing USS and CT and 93% of those who underwent cystourethrography ($p = 0.25$). MRI was less successful in identifying abscesses in comparison to CT and USS (71% vs. 93%, 91%; $p \le 0.01$). However, these findings predominantly came from 1 study, and the role of MRI in diagnosis of urethral pathology is considered in the discussion hereinafter.

### 3.3. Etiology

A total of 102 (37.8%) patients had a predisposing factor for abscess (diverticulum, strictures/stenosis, history of urolithiasis, or previous instrumentation/surgery; Table 1). Urethral stricture/stenosis (39.6%), previous instrumentation (18.7%), previous urethral injury (16.4%), and urethral diverticuli (11.9%) were the most common etiological factors. Evidence of an underlying diverticulum (60% vs. 9.2%, $p = 0.01$) or recent instrumentation (i.e., cystoscopic injection of bulking agents) was more common in female patients (60% vs. 8.3% $p \le 0.01$), whereas urethral strictures (48.6% vs. 0%, $p \le 0.01$) were the most common predisposing factor in male patients (Table 1). Previous urethral injury or surgery predisposed male patients to penile abscesses (43.8%) (Supplementary Table 3, http://links.lww.com/CURRUROL/A30).

### 3.4. Risk factors

Risk factors were reported for 200 patients (74%), including a history of a sexually transmitted infection (STI) or urinary tract infection (UTI) (55%), diabetes mellitus (6.6%), previous abscess (6.6%), human immunodeficiency virus (5.4%), and urethral carcinoma (1.6%) (Table 1). The rate of previous infection (STI/UTI) was higher in male than female patients (58.3% vs. 11.1%, $p \le 0.01$). The incidence of diabetes mellitus was higher in female than male patients (33.3% vs. 4.6%, $p \le 0.01$; Supplementary Table 3, http://links.lww.com/CURRUROL/A30).

### 3.5. Microbiology

There were 59 suspected pathogens isolated by urine culture and 205 suspected pathogens cultured directly from abscess fluid or tissue (Table 1). Anaerobic organisms accounted for 96.6% of urine and 51.7% of abscess culture results. The most commonly identified anaerobic organisms included *Escherichia coli*, *Enterococcus*, and *Staphylococcus* and *Streptococcus* species. Common aerobic

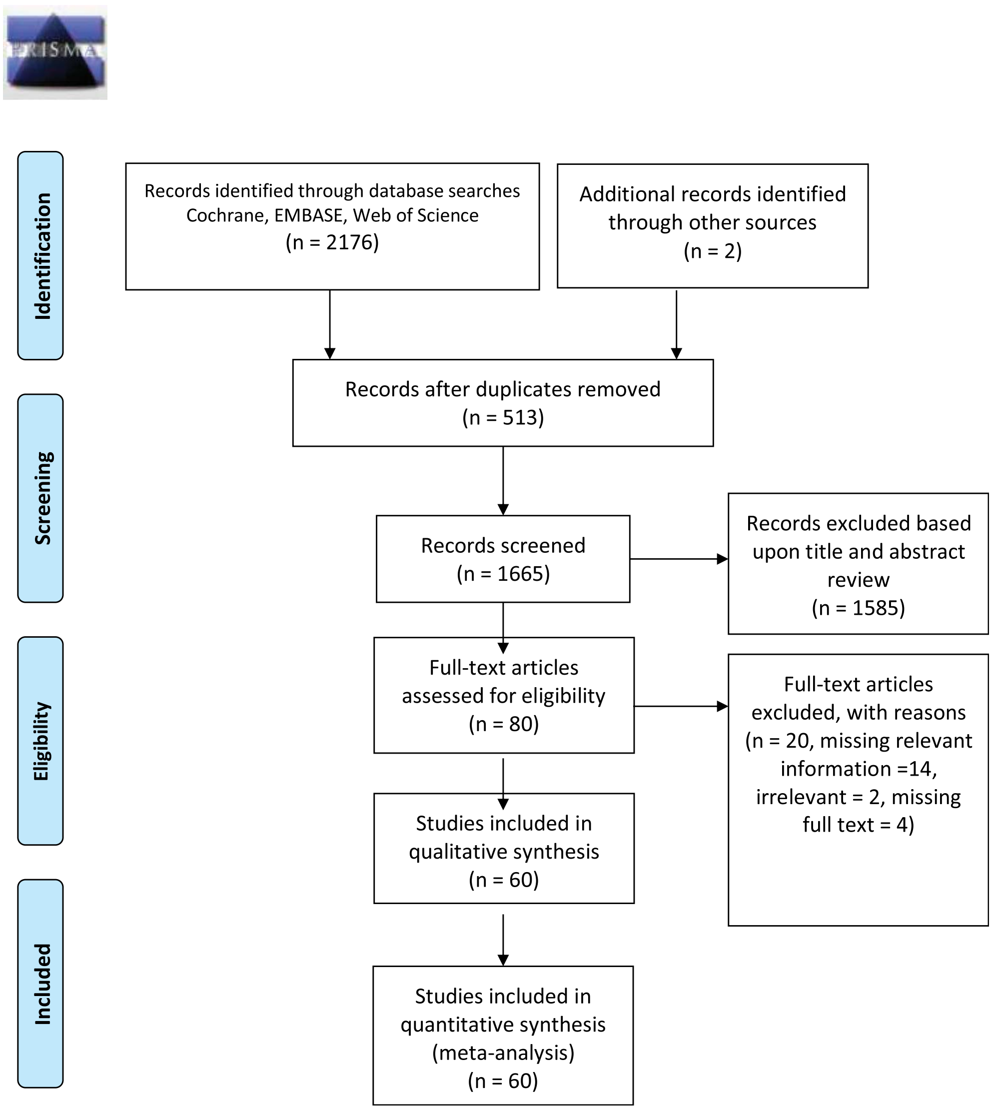


**Figure 1.** PRISMA flowchart: data collection and selection of studies.

pathogens included *Neisseria gonorrhoeae* and *Corynebacterium* species. Anaerobic (100% vs. 50.3%, $p = 0.03$) and gram-positive bacteria (100% vs. 23.6%, $p \leq 0.01$) were more commonly identified in samples from female than male patients. In male patients, a high proportion of anaerobic organisms were present across all locations (penile, 58.3%; bulbar, 91.7%; Supplementary Table 3, http://links.lww.com/CURRUROL/A30). However, aerobic organisms were more commonly found in penile (41.7%) as compared with bulbar abscesses (8.3%, $p = 0.02$). The distribution of pathogens based on Gram stain results stratified by abscess location in male patients were 60% gram positive and 40% gram negative in penile abscesses versus 36.4% gram positive and 63.6% gram negative in bulbar abscesses (Supplementary Table 3, http://links.lww.com/CURRUROL/A30).

### *3.6. Management*

Initial management included urinary diversion via suprapubic catheter placement in 65 of 270 patients (24.1%) (Table 1). Definitive management included open I&D in 166 patients (64.3%; 91.6% successful), needle aspiration in 29 patients (11.2%; 89.7% successful), and endoscopic transurethral drainage in 8 patients (3.1%; 62.5% successful; Table 1). Across all patients, no statistically significant difference in treatment success was found between open I&D and needle aspiration; however, transurethral/endoscopic drainage was less likely to be successful (91.2% vs. 62.5%; $p = 0.03$). Transurethral/endoscopic methods were more commonly successful in male than female patients (100% vs. 0%, $p = 0.01$), whereas the success of needle aspiration was equivalent irrespective of sex. Treatment success was not affected by underlying pathology or location.

### *3.7. Complications*

Complications (eg, incomplete abscess resolution, secondary pathology) were reported in 22 patients. Inadequate source control requiring further surgery was reported for 12 (7.2%), 2 (25%), and 1 (3.4%) patients who underwent I&D, endoscopic treatment, and needle aspiration, respectively. Urethrocutaneous fistula (1 I&D patient) and urethral stricture (1 I&D, 1 endoscopic treatment patient) were uncommon. Abscess recurrence occurred in 1 patient each among the I&D and needle aspiration cohorts, and prolonged antibiotics were required in 1 patient after needle aspiration (Table 1).

**Table 1**

**Patient clinical features, male versus female.**

| | Total | | Male | | Female | | p |
|---|---|---|---|---|---|---|---|
| No. patients, n (%) | 270 (100) | | 211 (78.1) | | 59 (21.9) | | |
| Age, median (IQR), yr | 49 (35.8–62.3) | | 48 (34.8–63.5) | | 43.75 (38.0–59.0)* | | **0.01** |
| Presenting symptoms, n (%) | | | | | | | |
| Acute urinary retention | 26 (9.6) | | 21 (10.0) | | 5 (8.5) | | 1 |
| Pain (penile, scrotal, perineal, suprapubic) | 117 (43.3) | | 108 (51.2) | | 27 (45.8) | | 0.55 |
| Difficulty voiding | 13 (4.8) | | 8 (3.8) | | 5 (8.5) | | 0.17 |
| Dysuria | 104 (38.5) | | 85 (40.3) | | 19 (32.2) | | 0.29 |
| Hematuria | 4 (1.5) | | 2 (0.9) | | 2 (3.4) | | 0.21 |
| Pyuria | 112 (41.5) | | 104 (49.3) | | 27 (45.8) | | 0.66 |
| Frequency | 87 (32.2) | | 69 (32.7) | | 14 (23.7) | | 0.21 |
| Other LUTS | 17 (6.3) | | 8 (3.8) | | 13 (22.0)* | | **≤0.01** |
| Mean symptom duration before presentation, d | 30.6 | | 16.4 | | 28.2* | | **≤0.01** |
| Physical examination, n (%) | | | | | | | |
| Palpable mass | 62 (23.0) | | 37 (17.5) | | 43 (72.9)* | | **≤0.01** |
| Fever | 67 (24.8) | | 63 (29.9)* | | 4 (6.8) | | **≤0.01** |
| Systemically unwell | 18 (6.7) | | 14 (6.6) | | 4 (76.8) | | 1 |
| Urethrocutaneous fistula | 8 (3.0) | | 8 (3.8) | | 0 (0) | | 0.26 |
| Imaging study, n (%) | 124 | | 84 | | 40 | | |
| Cystourethrography | 61 (49.2) | | 59 (70.2)* | | 2 (5.0) | | **≤0.01** |
| US | 19 (15.3) | | 10 (11.9) | | 9 (22.5)* | | **≤0.01** |
| CT | 13 (10.5) | | 11 (13.1) | | 2 (5.0) | | 0.74 |
| MRI | 31 (25.0) | | 4 (4.7) | | 27 (67.5)* | | **≤0.01** |
| Etiology, n (%) | 134 | | 109 | | 25 | | |
| History of urolithiasis (any) | 6 (4.5) | | 5 (4.6) | | 1 (4.0) | | 1 |
| Postprocedural/postinstrumentation | 25 (18.7) | | 10 (9.2) | | 15 (60.0)* | | **≤0.01** |
| Diverticulum | 16 (11.9) | | 9 (8.3) | | 7 (28.0)* | | **≤0.01** |
| Urethral stenosis/stricture | 53 (39.6) | | 53 (48.6)* | | 0 (0) | | **≤0.01** |
| Previous urethral injury/surgery? | 22 (16.4) | | 20 (18.3) | | 2 (8.0) | | 0.37 |
| No lower urinary tract disease | 32 (23.9) | | 31 (28.4)† | | 1 (4.0) | | **0.02** |
| RF, n (%) | 258 | | 240 | | 18 | | |
| T2DM | 17 (6.6) | | 11 (4.6) | | 6 (33.3)* | | **≤0.01** |
| HIV | 14 (5.4) | | 14 (5.8) | | 0 (0.0) | | 0.61 |
| STI/UTI | 142 (55.0) | | 140 (58.3)* | | 2 (11.1) | | **≤0.01** |
| Other RF | 6 (2.3) | | 5 (2.1) | | 1 (5.6) | | 1 |
| Previous abscess | 17 (6.6) | | 16 (6.7) | | 1 (5.6) | | 0.36 |
| Urethral carcinoma | 4 (1.6) | | 3 (1.3) | | 1 (5.6) | | 0.25 |
| No RF | 58 (22.5) | | 51 (21.3) | | 7 (36.9) | | 0.14 |
| Urinary pathogens, n (%) | 59 | | 36 | | 23 | | |
| Aerobic | 2 (3.4) | | 5 (13.9) | | 0 (0) | | 0.15 |
| Anaerobic | 57 (96.6) | | 31 (86.1) | | 23 (100.0) | | 0.15 |
| Gram positive | 19 (32.2) | | 9 (25.0) | | 9 (39.1) | | 0.27 |
| Gram negative | 40 (67.8) | | 27 (75.0) | | 14 (60.9) | | 0.27 |
| Abscess pathogens, n (%) | 205 | | 199 | | 6 | | |
| Aerobic | 99 (48.3) | | 99 (49.7) | | 0 (0) | | **0.03** |
| Anaerobic | 106 (51.7) | | 100 (50.3) | | 6 (100) | | **0.03** |
| Gram positive | 53 (25.9) | | 47 (23.6) | | 6 (100)* | | **≤0.01** |
| Gram negative | 152 (74.1) | | 152 (76.4)* | | 0 (0.0) | | **≤0.01** |
| Urinary diversion, n (%) | 65 (24.1) | | 63 (23.3) | | 2 (0.7) | | **≤0.01** |
| Definitive management, n (%) | Attempt | Successful | Attempt | Successful | Attempt | Successful | |
| Open I&D | 166 (64.3) | 152 (91.6) | 114 (47.5) | 108 (94.7) | 52 (83.4) | 42 (81) | 0.12 |
| Needle aspiration | 29 (11.2) | 26 (89.7) | 25 (10.4) | 22 (88.0) | 4 (6.5) | 4 (100) | 0.61 |
| Transurethral/endoscopic | 8 (3.1) | 5 (62.5) | 5 (2.1) | 5 (100) | 3 (4.8) | 0 (0) | 0.11 |
| Conservative | 77 (29.8) | 75 (97.4) | 74 (30.8) | 72 (97.3) | 3 (4.8) | 3 (100) | **≤0.01** |

Bold are the statistically significant *p* values.

CT = computed tomography; HIV = human immunodeficiency virus; I&D = incision & drainage; IQR = interquartile range; LUTS = lower urinary tract symptoms; MRI = magnetic resonance imaging; RF = risk factors; STI = sexually transmitted infection; surgery? = previous lower urinary tract surgery; T2DM = type 2 diabetes mellitus; US = ultrasound; UTI = urinary tract infection.

*$p \leq 0.05$; *p* value assessed through 2-tailed *t* test (age and symptom duration before presentation only) and Fisher exact test (all other variables).

†*p* value comparing male versus female cohorts.

### *3.8. Time-trend analysis*

Patients were stratified according to 2 time periods, 1900–2000 (112 patients) and 2000–present (158 patients; Table 3). Patients from reports published from 2000 to the present were generally older than those from 1900 to 2000 (50.3 vs. 43.2 years, $p \leq 0.01$). Urinary retention (16.1% vs. 5.1%, $p \leq 0.01$) and pain (69.6% vs. 24.7%, $p \leq 0.01$)

**Table 2**

**Patient clinical features by presence versus absence of urethral abnormality.**

| | **Any urethral abnormality** | | | **No urethral abnormality** | | ***p*** |
|---|---|---|---|---|---|---|
| No. patients, n (%) | 102 (85) | | | 18 (15) | | |
| Age, median (IQR), yr | 56.7 (30.0–56.7) | | | 38 (24.88–59.3) | | **≤0.01** |
| Presenting symptoms, n (%) | | | | | | |
| Acute urinary retention | 61 (59.8) | | | 0 (0) | | **≤0.01** |
| Pain (penile, scrotal, perineal, suprapubic) | 85 (83.3) | | | 13 (72) | | 0.32 |
| Difficulty voiding | 11 (10.8) | | | 2 (11.0) | | 1 |
| Dysuria | 21 (20.6) | | | 6 (33.0) | | 0.23 |
| Hematuria | 3 (2.9) | | | 1 (6.0) | | 0.48 |
| Pyuria | 30 (29.4) | | | 8 (44.0) | | 0.27 |
| Frequency | 9 (8.9) | | | 0 (0) | | 0.35 |
| Other LUTS | 9 (8.8) | | | 2.0 (11) | | |
| Mean symptom duration before presentation, d | 35 | | | 9 | | 0.19 |
| Physical examination, n (%) | | | | | | |
| Palpable mass | 46 (45.1) | | | 13 (72) | | 0.041 |
| Fever | 57 (55.9) | | | 0.798 | | 0.42 |
| Systemically unwell | 11 (10.8) | | | 0.021 | | 0.53 |
| Urethrocutaneous fistula | 4 (3.9) | | | 1 | | 0.18 |
| Imaging study, n (%) | | | | | | |
| Cystourethrography | 59 (57.8) | | | 1 (6) | | **≤0.01** |
| US | 13 (12.7) | | | 6 (33) | | **0.04** |
| CT | 9 (8.8) | | | 4 (22) | | 0.1 |
| MRI | 9 (8.8) | | | 2 (11.1) | | 0.67 |
| Etiology, n (%) | 102 | | | | | |
| History of urolithiasis (any) | 6 (5.9) | | | - | - | - |
| Diverticulum | 16 (15.7) | | | - | - | - |
| Urethral stenosis/stricture | 53 (52.0) | | | - | - | - |
| Previous urethral injury/surgery? | 22 (21.6) | | | - | - | |
| Other | 5 (4.9) | | | - | - | - |
| RF, n (%) | | | | | | |
| T2DM | 11 (10.8) | | | 2 (11.1) | | 1 |
| HIV | 0 (0) | | | 1 (5.6) | | 1 |
| STI/UTI | 40 (39.2) | | | 5 (27.8) | | 0.79 |
| Other RF | 3 (2.9) | | | 3 (16.7) | | 0.04 |
| Prior abscess | 21 (20.6) | | | 1 (5.6) | | 0.19 |
| Urethral carcinoma | 4 (3.9) | | | 0 (0) | | 1 |
| No RF | 55 (53.9) | | | 9 (50) | | 0.8 |
| Definitive management, n (%) | Attempts | Successes | | Attempts | Successes | |
| Open I&D | 102 (83.6) | 92 (90.2) | 1 | 9 (42.9) | 8 (88.9) | **0.01** |
| Needle aspiration | 4 (3.3) | 4 (100) | 1 | 5 (23.8) | 5 (100) | **≤0.01** |
| Transurethral/Endoscopic | 5 (4.1) | 3 (60.0) | 1 | 2 (9.5) | 1 (50) | 0.29 |
| Conservative | 11 (9.0) | 8 (72.3) | 1 | 5 (23.8) | 4 (80) | 0.07 |

Bold are the statistically significant *p* values.

CT = computed tomography; HIV = human immunodeficiency virus; I&D = incision & drainage; IQR = interquartile range; LUTS = lower urinary tract symptoms; MRI = magnetic resonance imaging; RF = risk factors; STI = sexually transmitted infection; surgery? = previous lower urinary tract surgery; T2DM = type 2 diabetes mellitus; US = ultrasound; UTI = urinary tract infection.

$p < 0.05$; *p* value assessed through 2-tailed *t* test (age and symptom duration before presentation only) and Fisher exact test (all other variables).

were reported more often among patients from 1900 to 2000. Dysuria (57.6% vs. 11.6%, $p \leq 0.01$), pyuria (52.5% vs. 25.9%, $p \leq 0.01$), and frequency (53.8% vs. 1.8%, $p \leq 0.01$) were more commonly reported in publications from 2000 to the present.

Urethral stricture/stenosis was less common (9.5% vs. 53.3%, $p \leq 0.01$), whereas a history of urolithiasis was more common (14.3% vs. 0%, $p \leq 0.01$) in reports from 2000 to the present than before 2000, respectively. A higher incidence of human immunodeficiency virus was reported before than after 2000 (10.6% vs. 0.7%, $p = 0.01$), whereas STI/UTI incidence remained high across both time periods (43.1% vs. 65.9%). Open I&D was more commonly attempted as primary treatment modality before 2000 (69.1% vs. 48.8%; $p = 0.01$), whereas needle aspiration was used more frequently from 2000 to the present than before 2000 (27.6% vs. 17.1%, $p = 0.01$).

## 4. Discussion

Diagnosis and management of periurethral abscess continue to be a challenging aspect of urological practice. Patients often have vague presentations and broad symptoms.[5] In addition, pathophysiology can be multifactorial and inadequate treatment can cause significant morbidity.[17] Given the scarcity of the literature on this topic, we sought to provide an evidence base to guide clinicians. This systematic review highlights that periurethral abscess continues to be a rare pathology and is often accompanied by concurrent urethral pathology.[10,18] We also demonstrate that differences in clinical presentation, etiology, risk factors, and microbiology exist between sexes. Furthermore, successful management is underpinned by surgical source control and antimicrobial therapy.[4]

### 4.1. Sex and urethral pathology

The presence of underlying urethral pathology in periurethral abscess patients was common, particularly among those with a previous abscess and/or those presenting with acute urinary retention (Table 2). In the latter cohort, it is important for clinicians to suspect the possibility of concurrent urethral pathology (eg, diverticulum, stricture/stenosis, or previous urethral injury), which could make urethral catheterization difficult and require suprapubic catheter placement.[4] The incidence of periurethral abscess is higher in men (Table 1), potentially because of a longer, more tortuous urethra, along with higher rates of stricture/stenosis, which may cause higher intraurethral pressure and subsequent epithelial disruption allowing progression of infection into the periurethral glands.[6] In women, an emerging trend of "sterile abscess" formation after transurethral injections of bulking agents for stress urinary incontinence represents a contemporary risk factor.[19] It is likely that correct injection technique is of paramount importance in reducing the potential for such presentations.[20] In addition, urethral diverticuli were often present in female patients in this review, with subsequent urinary stasis predisposing these women to infection and calculus formation.[21] Therefore, careful physical examination is important to assess for urethral abnormalities (eg, diverticuli) in people presenting with suspected periurethral abscess. In particular for female patients, a palpable diverticulum or sterile abscess may be targeted for transvaginal needle aspiration as a minimally invasive management option.[22]

### 4.2. Infectious and diagnostic issues

Male patients presenting with periurethral abscess more commonly develop serious infections (ie, febrile illness; Table 1), with

**Table 3**

**Patient clinical features, by time period (1900–2000 vs. 2000–present).**

| | Total | | 1900–2000 | | 2000–2021 | | *p* |
|---|---|---|---|---|---|---|---|
| No. patients, n (%) | 270 (100) | | 112 (41.5) | | 158 (58.5) | | |
| Age, median (IQR), yr | 49 (35.8–62.3) | | 43.2 (36.1–56.7) | | 50.29 (38.4–49.3)* | | **≤0.01** |
| Presenting symptoms, n (%) | | | | | | | |
| Acute urinary retention | 26 (9.6) | | 18 (16.1)* | | 8 (5.1) | | **≤0.01** |
| Pain (penile, scrotal, perineal, suprapubic) | 117 (43.3) | | 78 (69.6)* | | 39 (24.7) | | **≤0.01** |
| Dysuria | 104 (38.5) | | 13 (11.6) | | 91 (57.6)* | | **≤0.01** |
| Pyuria | 112 (41.5) | | 29 (25.9) | | 83 (52.5)* | | **≤0.01** |
| Frequency | 87 (32.2) | | 2 (1.8) | | 85 (53.8)* | | **≤0.01** |
| Other LUTS | 17 (6.3) | | 3 (2.7) | | 14 (8.9) | | **0.04** |
| Mean symptom duration before presentation, d | 30.6 | | 18.3 | | 15.3* | | 0.33 |
| Physical examination, n (%) | | | | | | | |
| Palpable mass | 62 (23.0) | | 25 (22.3) | | 37 (23.4) | | 0.88 |
| Fever | 67 (24.8) | | 51 (45.5)* | | 16 (10.1) | | **≤0.01** |
| Systemically unwell | 18 (6.7) | | 7 (6.3) | | 11 (7.0) | | 1 |
| Urethrocutaneous fistula | 8 (3.0) | | 6 (5.4) | | 2 (1.3) | | 0.07 |
| Imaging study, n (%) | 124 | | 61 | | 63 | | |
| Cystourethrography | 61 (49.2) | | 55 (90.2)* | | 6 (9.5) | | **≤0.01** |
| US | 19 (15.3) | | 3 (4.9) | | 16 (25.4) | | 0.74 |
| CT | 13 (10.5) | | 2 (3.3) | | 11 (17.4) | | 0.08 |
| MRI | 31 (25.0) | | 1 (1.6) | | 30 (47.6)* | | **≤0.01** |
| Etiology, n (%) | 134 | | 92 | | 25 | | |
| History of urolithiasis (any) | 6 (4.5) | | 0 (0) | | 6 (14.3)* | | **≤0.01** |
| Postprocedural/postinstrumentation? | 25 (18.7) | | 19 (20.7) | | 6 (14.3) | | 0.48 |
| Diverticulum | 16 (11.9) | | 9 (9.8) | | 7 (16.7) | | 0.26 |
| Urethral stenosis/stricture | 53 (39.6) | | 49 (53.3)* | | 4 (9.5) | | **≤0.01** |
| Previous urethral injury/surgery? | 22 (16.4) | | 14 (15.2) | | 8 (19.0) | | 0.62 |
| No lower urinary tract disease | 32 (23.9) | | 21 (22.8) | | 11 (26.2) | | 0.69 |
| RF, n (%) | 258 | | 123 | | 135 | | |
| T2DM | 17 (6.6) | | 8 (6.5) | | 5 (3.7) | | 0.40 |
| HIV | 14 (5.4) | | 13 (10.6)* | | 1 (0.7) | | **≤0.01** |
| STI/UTI | 142 (55.0) | | 53 (43.1) | | 89 (65.9)* | | **0.001** |
| Other RF | 6 (2.3) | | 6 (4.9)* | | 0 (0) | | **0.01** |
| Prior abscess | 17 (6.6) | | 0 (0) | | 17.0 (12.6)* | | **≤0.01** |
| Urethral carcinoma | 4 (1.6) | | 1 (0.8) | | 3 (2.2) | | 0.62 |
| No RF | 58 (22.5) | | 38 (30.9)* | | 20 (14.8) | | **≤0.01** |
| Management, n (%) | Attempts | Successes | Attempts | Successes | Attempts | Successes | |
| Open I&D | 166 (59.3) | 152 (91.6) | 85 (72.6)* | 78 (91.8) | 81 (49.7) | 69 (85) | **0.01** |
| Needle aspiration | 29 (10.4) | 26 (89.7) | 21 (17.9) | 17 (81.0) | 8 (4.91)* | 8 (100) | **≤0.01** |
| Transurethral/endoscopic | 8 (2.9) | 5 (62.5) | 4 (3.4) | 2 (50.0) | 4 (2.4) | 3 (75) | 0.72 |
| Conservative | 77 (27.5) | 75 (97.4) | 7 (6.1) | 5 (71.4) | 70 (42.9)* | 69 (99) | **≤0.01** |

Bold are the statistically significant *p* values.

CT = computed tomography; HIV = human immunodeficiency virus; I&D = incision & drainage; IQR = interquartile range; instrumentation? = urethral catheterization; LUTS = lower urinary tract symptoms; MRI = magnetic resonance imaging; RF = risk factors; STI = sexually transmitted infection; surgery? = previous lower urinary tract surgery; T2DM = type 2 diabetes mellitus; US = ultrasound; UTI = urinary tract infection.

*$p < 0.05$; *p* value assessed through 2-tailed *t* test (age and symptom duration before presentation only) and Fisher exact test (all other variables).

a higher risk for phlegmon formation and sepsis.[7] Fortunately, however, male patients seem to present for care earlier (Table 1), allowing for prompt assessment and investigation. Imaging modalities (CT, USS, and cystourethrography) can accurately confirm a clinical diagnosis of periurethral abscess.[2,3,18] Therefore, in current practice, early utilization of CT or USS is prudent to ensure timely treatment. The sensitivity of MRI to identify a periurethral abscess was inferior to CT/USS in this review; however, these results were attributable largely to 1 study.[23] This finding seems counterintuitive because MRI is generally well suited to identification of soft tissue pathology and has been used in urethral imaging[24] along with imaging of prostatic abscesses,[25] highlighting that there may still be a role for MRI in periurethral abscess characterization.

Men with periurethral abscesses demonstrated higher rates of previous STI and penile urethral abscess, consistent with the natural progression of gonoccocal urethritis and associated higher rates of STIs.[18,26] Targeted antimicrobial therapy in men requires consideration of abscess location. For penile urethral abscesses, antibiotics with gram-positive and aerobic organism coverage should be selected, whereas anaerobic coverage is required for bulbar abscesses (Supplementary Table 3, http://links.lww.com/CURRUROL/A30). All pathogens reported in the microbiology testing of female patients were anaerobic organisms (Table 1), highlighting the likely role of local flora in abscess formation and the need to consider appropriate antibiotic coverage for *Bacteroides* species, *Gardnerella vaginalis*, *Ureaplasma* species, and *Streptococcus* species.[27] The reported UTI and STI rates in periurethral abscess patients were higher in reports from 2000 to the present than those before 2000 (Table 3) despite advances in antibiotics, potentially reflecting the greater prevalence of multiresistant organisms.[28] Nonetheless, detailed microbiological data were scarce in the studies included in this review. Among patients who had cultures performed, many either demonstrated no growth or only described pathogens at the genus level. A majority of pathogens were identified from direct cultures of the abscess fluid. Given these findings, importance should be placed on obtaining a sample of abscess fluid early and before commencement of antimicrobials for therapeutic and diagnostic purposes in patients without features of systemic illness. In addition to abscess drainage, this strategy will maximize the chance of clinical cure by facilitating the choice of antimicrobial therapy with optimal coverage.

### 4.3. Management considerations

Open I&D continues to the most commonly used method of surgical source control of periurethral abscess and is effective (91.6% success rate in this study) in patients with primary and recurrent disease. However, needle aspiration or conservative management (targeted antimicrobials and supportive care) can also be considered as an initial treatment option in appropriate patients (97.4% success rate). In the 21st century, treatment with needle aspiration has increasingly been reported, presumably because of wider adoption by clinicians and greater availability of imaging guidance (ie, USS, CT, or MRI). Interestingly, similar trends have also been reported in the contemporary treatment of prostatic abscesses.[29,30] Furthermore, the available literature demonstrates that long-term complications of periurethral abscess are relatively uncommon. Nonetheless, follow-up after treatment is prudent because failure of appropriate healing after surgical treatment may precipitate urethrocutaneous fistulae or strictures requiring intervention.[22,31,32] Failure of healing

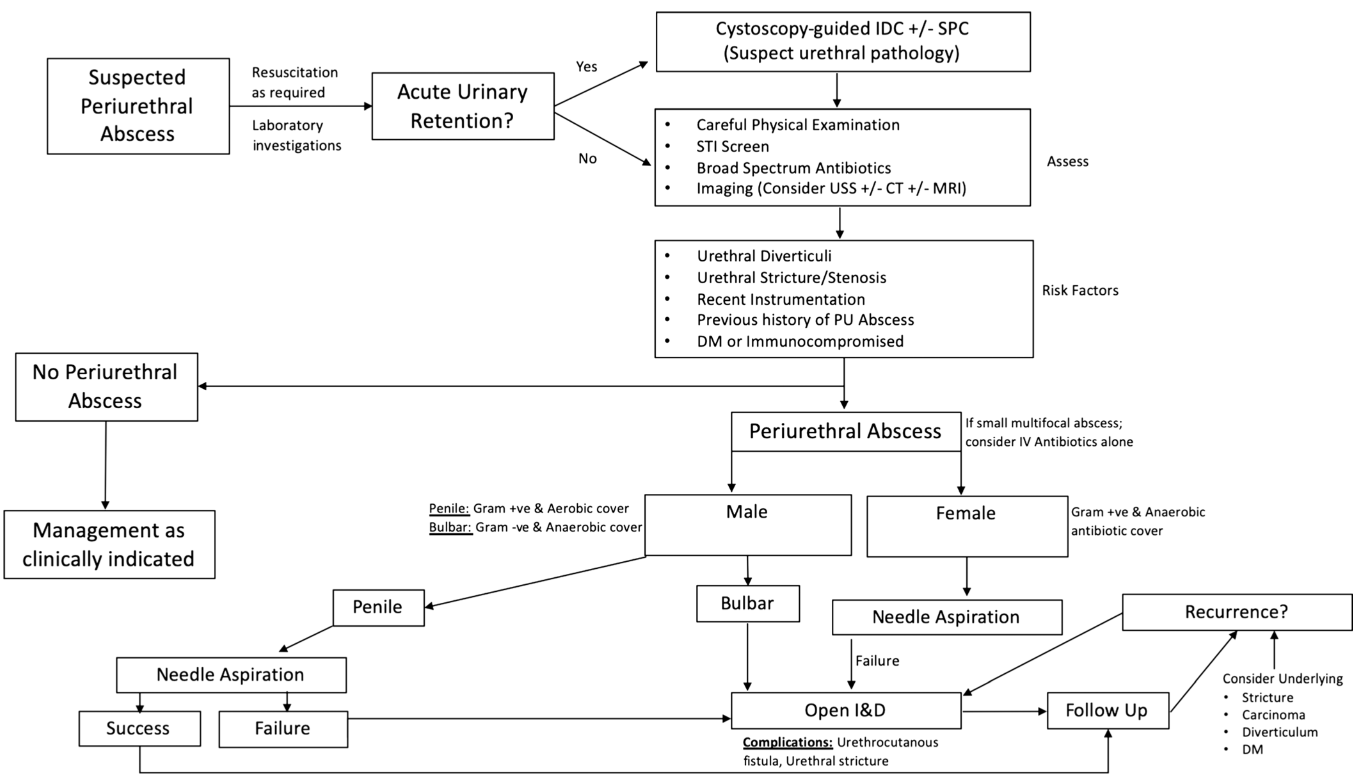


**Figure 2.** Periurethral abscess management algorithm. CT = computed tomography; DM = diabetes mellitus; Gram +ve = gram positive; Gram -ve = gram negative; IDC = indwelling urinary catheter; IV = intravenous; I&D = incision and drainage; MRI = magnetic resonance imaging; PU = periurethral; SPC = suprapubic catheter; STI = sexually transmitted infection; USS = ultrasonography.

may also be a harbinger for underlying urethral carcinoma as a precipitant for recurrent and/or prolonged abscess occurrence.[18,33–35] To aid clinicians in navigating the assessment and management of this rare but serious pathology, we present a novel management algorithm for periurethral abscess in Figure 2.

### *4.4. Limitations and future directions*

Given the sparsity of available information on this topic and hence the rationale for this review, our data analysis and interpretation were limited by the fact that the identified articles included in this review were case reports and series, and findings and conclusions were limited by the quality and detail of data reported. In particular, limited data precluded further antibiotic and microbiological analysis. In addition, interpretation of data from case reports and series must take into consideration potential publication bias because such publications often report extreme or interesting cases (ie, interesting management strategies or pathology). Improvements in available data may come in the form of larger, well-designed studies, such as review of national registry data, for a more thorough and contemporary analysis of underlying etiologies, risk factors, and treatment strategies.

## 5. Conclusions

To our knowledge, this represents the first systematic review of periurethral abscesses. Overall, symptoms continue to be broad; however, presentations, risk factors, and underlying etiologies vary by sex. Accurate diagnosis requires that clinicians maintain an index of suspicion among patients presenting with penile and perineal masses and conduct imaging studies early (USS, CT, MRI, or cystourethrography) for abscess localization. Initial treatment requires appropriate urinary drainage, source control, and treatment of systemic illness. Open I&D in conjunction with antibiotic therapy continues to be the mainstay of management; however, endoscopic approaches and needle aspiration are gaining favor. In instances of recurrence, it is important to consider urethral strictures, diverticuli, carcinoma, and diabetes as precipitating factors.

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## Statement of ethics

Not applicable.

## Conflicts of interest statement

No conflict of interest has been declared by the authors.

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## Author contributions

AT, AGS: Research design, data collections, analysis and writing of the manuscript;
DJD, SB, ND, RE: Writing and drafting of the manuscript;
MJR: Data analysis, writing and drafting of the manuscript, expert statistical analysis opinion, and overall project supervision.

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