

World Journal of *Clinical Cases*

World J Clin Cases 2023 January 26; 11(3): 487-718



MINIREVIEWS

- 487 Protective effects of combined treatment with ciprofol and mild therapeutic hypothermia during cerebral ischemia-reperfusion injury
Wang YC, Wu MJ, Zhou SL, Li ZH
- 493 Non-pulmonary involvement in COVID-19: A systemic disease rather than a pure respiratory infection
El-Kassas M, Alborai M, Elbadry M, El Sheemy R, Abdellah M, Afify S, Madkour A, Zaghloul M, Awad A, Wifi MN, Al Balakosy A, Eltabbakh M
- 506 Progress and expectation of stem cell therapy for diabetic wound healing
Xu ZH, Ma MH, Li YQ, Li LL, Liu GH
- 514 Prevention, diagnostic evaluation, management and prognostic implications of liver disease in critically ill patients with COVID-19
Valsamaki A, Xanthoudaki M, Oikonomou KG, Vlachostergios PJ, Papadogoulas A, Katsiafylloudis P, Voulgaridi I, Skoura AL, Komnos A, Papamichalis P
- 528 Exosomal miRNA in early-stage hepatocellular carcinoma
Wu ZQ, Zhu YX, Jin Y, Zhan YC
- 534 Impact of multidrug resistance on the management of bacterial infections in cirrhosis
Terra C, de Mattos ÁZ, Chagas MS, Torres A, Wiltgen D, Souza BM, Perez RM
- 545 Could there be an interplay between periodontal changes and pancreatic malignancies?
Ungureanu BS, Gheorghe DN, Nicolae FM, Râmboiu S, Radu PA, Șurlin VM, Strâmbu VDE, Gheonea DI, Roman A, Șurlin P

ORIGINAL ARTICLE**Retrospective Study**

- 556 Qixue Shuangbu decoction and acupuncture combined with Western medicine in acute severe stroke patients
Gou LK, Li C
- 566 Successful treatment of patients with refractory idiopathic membranous nephropathy with low-dose Rituximab: A single-center experience
Wang YW, Wang XH, Wang HX, Yu RH
- 576 Bowel inflammatory presentations on computed tomography in adult patients with severe aplastic anemia during flared inflammatory episodes
Zhao XC, Xue CJ, Song H, Gao BH, Han FS, Xiao SX

- 598 Clinical outcomes of AngioJet pharmacomechanical thrombectomy *versus* catheter-directed thrombolysis for the treatment of filter-related caval thrombosis

Li JY, Liu JL, Tian X, Jia W, Jiang P, Cheng ZY, Zhang YX, Liu X, Zhou M

Clinical Trials Study

- 610 Efficacy and safety of propofol target-controlled infusion combined with butorphanol for sedated colonoscopy

Guo F, Sun DF, Feng Y, Yang L, Li JL, Sun ZL

Observational Study

- 621 Application of a hospital–community–family trinity rehabilitation nursing model combined with motor imagery therapy in patients with cerebral infarction

Li WW, Li M, Guo XJ, Liu FD

CASE REPORT

- 629 Congenital biliary atresia caused by *GPC1* gene mutation in Chinese siblings: A case report

Kong YM, Yuan K, Wang CL

- 635 Rescuing “hopeless” avulsed teeth using autologous platelet-rich fibrin following delayed reimplantation: Two case reports

Yang Y, Liu YL, Jia LN, Wang JJ, Zhang M

- 645 Acute diffuse peritonitis secondary to a seminal vesicle abscess: A case report

Li K, Liu NB, Liu JX, Chen QN, Shi BM

- 655 Young thoracic vertebra diffuse idiopathic skeletal hyperostosis with Scheuermann disease: A case report

Liu WZ, Chang ZQ, Bao ZM

- 662 Relapsed primary extraskeletal osteosarcoma of liver: A case report and review of literature

Di QY, Long XD, Ning J, Chen ZH, Mao ZQ

- 669 Heterotopic pregnancy after assisted reproductive techniques with favorable outcome of the intrauterine pregnancy: A case report

Wang YN, Zheng LW, Fu LL, Xu Y, Zhang XY

- 677 Periprosthetic knee joint infection caused by *Brucella melitensis* which was first -osteoarticular brucellosis or osteoarthritis: A case report

Stumpner T, Kuhn R, Hochreiter J, Ortmaier R

- 684 Recurrent intramuscular lipoma at extensor pollicis brevis: A case report

Byeon JY, Hwang YS, Lee JH, Choi HJ

- 692 Imaging features of retinal hemangioblastoma: A case report

Tang X, Ji HM, Li WW, Ding ZX, Ye SL

- 700** Clinical and genetic diagnosis of autosomal dominant osteopetrosis type II in a Chinese family: A case report
Gong HP, Ren Y, Zha PP, Zhang WY, Zhang J, Zhang ZW, Wang C
- 709** Soft tissue tuberculosis detected by next-generation sequencing: A case report and review of literature
He YG, Huang YH, Yi XL, Qian KL, Wang Y, Cheng H, Hu J, Liu Y

ABOUT COVER

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WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

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Acute diffuse peritonitis secondary to a seminal vesicle abscess: A case report

Kun Li, Nan-Bin Liu, Jiang-Xi Liu, Quan-Ning Chen, Bao-Min Shi

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Abstract

BACKGROUND

Seminal vesicle abscess (SVA) is the manifestation of a relatively rare urinary system infection. In response to urinary system inflammation, an abscess forms in special locations. However, acute diffuse peritonitis (ADP) induced by SVA is unusual.

CASE SUMMARY

We report a case of a left SVA in a male patient complicated with pelvic abscess, ADP, multiple organ dysfunction syndrome, infectious shock, bacteremia, and acute appendiceal extraperitoneal suppurative inflammation as a result of a long-term indwelling urinary catheter. The patient received a course of morinidazole + cefminol antibiotics but showed no obvious relief, so the perineal SVA underwent puncture drainage and abdominal abscess drainage + appendectomy was performed. The operations were successful. After the operation, anti-infection, anti-shock, and nutritional support treatments were continued and various laboratory indicators were regularly reviewed. The patient was discharged from the hospital after recovery. This disease is a challenge for the clinician because of the unusual spreading path of the abscess. Moreover, appropriate intervention and adequate drainage of abdominal and pelvic lesions are necessary, especially when the primary focus cannot be determined.

CONCLUSION

The etiology of ADP varies, but acute peritonitis secondary to SVA is very rare. In this patient, the left SVA not only affected the adjacent prostate and bladder but also spread retrogradely through the vas deferens, forming a pelvic abscess in the loose tissues of the extraperitoneal fascia layer. Inflammation involving the peritoneal layer led to ascites and pus accumulation in the abdominal cavity, and

appendix involvement led to extraperitoneal suppurative inflammation. In clinical practice, surgeons need to consider the results of various laboratory tests and imaging examinations to make comprehensive judgments involving the diagnosis and treatment plan.

Key Words: Seminal vesicle abscess; Acute diffuse peritonitis; Acute appendicitis; Multiple organ dysfunction syndrome; Case report

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Core Tip: Seminal vesicle abscess (SVA) is a relatively rare urinary system infection, and acute diffuse peritonitis (ADP) induced by SVA is unusual. We report a male patient who had a left SVA induced by a long-term indwelling urinary catheter, and this condition was complicated with pelvic abscess, ADP, multiple organ dysfunction syndrome, infectious shock, bacteremia, and acute appendiceal extraperitoneal suppurative inflammation. With no obvious relief by conservative treatment, puncture drainage of the perineal SVA and abdominal abscess drainage + appendectomy was performed. In this case, the left SVA not only affected the adjacent prostate and bladder but also spread retrogradely through the vas deferens, forming a pelvic abscess in the loose tissues of the extraperitoneal fascia layer. Inflammation involving the peritoneal layer led to ascites and pus accumulation in the abdominal cavity, and appendix involvement led to extraperitoneal suppurative inflammation.

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INTRODUCTION

Acute diffuse peritonitis (ADP) is a common acute abdominal complication of general surgery. It has a high risk of mortality due to its rapid onset, rapid progression, and poor prognosis. The causes of ADP vary, but most cases are due to secondary infections. However, emergency surgery is needed regardless of the cause[1]. The main function of the seminal vesicles is to secrete nutrients and dilute the fluid in which the sperm resides. An infection of the seminal vesicle most commonly causes inflammation. Seminal vesicle abscess (SVA) is relatively rare, and diseases that develop from the "SVA-pelvic abscess-ADP" pathogenesis circuit, where the associated bacteria originate from the seminal vesicles and SVA, are even rarer. In 1978, Rajfer *et al*[2] reported the first case of SVA. According to Rajfer *et al* [2], less than 100 cases of SVA have been reported worldwide. Here, we report a male patient who developed a SVA due to a long-term indwelling catheter, analyze the basic condition and outcome, and provide the clinical diagnosis and treatment ideas.

CASE PRESENTATION

Chief complaints

An 86-year-old man was admitted to our hospital for lower abdominal distension and pain that lasted for 5 d. The patient had a sudden high fever of 39 °C.

History of present illness

Five days prior to hospital admission, the patient suffered from intermittent abdominal distension and pain. He did not visit his doctor, the symptoms of lower abdominal pain gradually worsened the night prior, and the symptoms were accompanied by frequent nausea, vomiting, and loose watery stools. After symptomatic treatment in a local hospital, there was no obvious remission, so he came to our hospital for emergency treatment. He had no jaundice or anorexia symptoms.

History of past illness

The patient underwent surgical treatment for benign prostatic hyperplasia 2 years prior and took finasteride + tamsulosin hydrochloride intermittently after the operation. Last year, he had difficulty urinating. Ultrasound examination showed that there was an increase in the residual urine volume and urinary retention. He had an indwelling catheter. The catheter was regularly removed and replaced in

the outpatient clinic, which led to dysuria recurrence. The patient also experienced hypertension for many years, which was partly controlled with medications.

Personal and family history

No relevant family history, travel history, or animal contact was reported.

Physical examination

The patient's initial vital signs at admission were as follows: Blood pressure 146/79 mmHg, pulse 62 bpm, respiratory rate 18 breaths/min, and body temperature 39 °C. He had an altered mental state, slight abdominal distension, slightly weak bowel sounds (3/min), obvious tenderness and rebound pain in the lower abdomen, slightly tense abdominal muscles, and percussive tympany abdominal sounds. He had an indwelling urinary catheter, drainage was unobstructed, urine was dark yellow, and flocculent was visible. Scrotal symmetry, bilateral testis, and epididymis tenderness were observed.

Laboratory examinations

The in-hospital laboratory examination showed the following: White blood cell (WBC) count: 12.61×10^9 /L (79.1% neutrophils and 11.7% lymphocytes); C-reactive protein: 82.6 mg/L. The routine urine examination showed red blood cells 85/UL and WBCs 291/UL, indicating hematuria and pyuria. However, the patient's liver and kidney function, electrolytes, myocardial enzymes, and coagulation at the first day of admission were normal.

Imaging examinations

Pelvic magnetic resonance imaging (MRI) was performed 2 d after admission, which showed a lumpy and patchy left lower abdomen, with a high possibility of inflammation, a thickened sigmoid wall, blurred fatty space surrounding the pelvic cavity, and a possible left SVA (Figure 1). Combined pelvic and abdominal computed tomography (CT) showed encapsulated effusion and gas accumulation in the left lower abdomen with peripheral exudative changes, suggesting the possibility of an abscess. The left seminal vesicle was unclear with corresponding cystic foci, suggesting the possibility of an abscess (Figure 2A and B). Chest CT revealed scattered chronic inflammation in both lungs.

FINAL DIAGNOSIS

The discharge diagnoses were: (1) Septic shock; (2) ADP and acute extraserosal suppurative appendicitis; (3) Left SVA; (4) Pelvic abscess; and (5) Hypertension grade 3 (high risk).

TREATMENT

After admission, the patient's condition gradually worsened. Morlinidazole + cefminol was administered as anti-infection agents, and fluid resuscitation, abrosia, nutritional support, and other treatments were administered. Four days after admission, puncture drainage of the perineal SVA was performed, and a small amount of purulent fluid (bacterial culture: *Klebsiella pneumoniae*) was drained. Infection with Gram-positive cocci and *Candida parapsilosis* was detected in urine smears. However, multiple cultures were negative, so the possibility of sample contamination was considered. Abdominal pain was not obviously relieved postoperatively, and on the 5th day, blood pressure decreased and septic shock symptoms, such as weak consciousness, liver and kidney insufficiency, and abnormal coagulation function, were observed (Table 1). His vital signs at that time were as follows: Blood pressure 76/40 mmHg, pulse 118 bpm, respiratory rate 22 breaths/min, and body temperature 39 °C. The Acute Physiology and Chronic Health Evaluation II score was 15, and the Sequential Organ Failure Assessment score was 7. Considering that the patient's vital signs were not stable and after communicating with his family, it was decided to perform emergency exploratory laparotomy for active fluid replacement, volume expansion, and vital sign monitoring to identify the focus of infection and to fully drain the abscess.

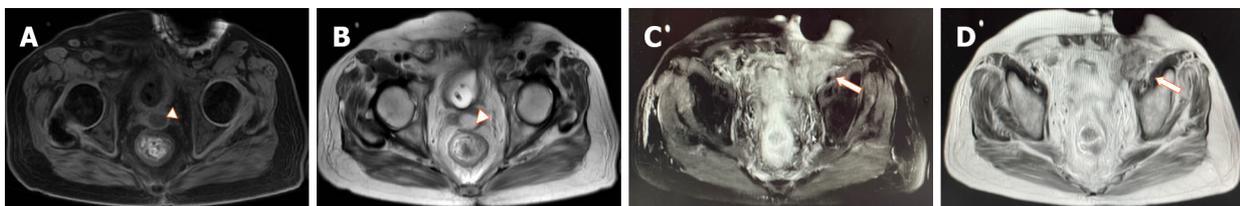
After preoperative preparation and general anesthesia, the patient underwent surgery in the supine position, and the surgery was performed by the attending physician, who had approximately 25 years of specialized training. During the operation, the intraperitoneal suppurative fluid volume was approximately 100 mL and was mainly found in the intestines and around the appendix. The head and body of the appendix were suppurated, and a large amount of pus was around the surface of the surrounding intestinal canal and sigmoid colon, without obvious intestinal perforation or tumor formation. Thus, abdominal abscess drainage + appendectomy was performed (Figure 3A-C).

After the operation, the patient was transferred to the intensive care unit due to his critical condition. He fasted and underwent electrocardiogram monitoring and continued anti-infection, anti-shock, and nutritional support treatments. The internal environment and water electrolyte balance was maintained.

Table 1 Change trend of the patient's laboratory indexes

Date	Leukocytes ($\times 10^9/L$)	Creatinine ($\mu\text{mol/L}$)	Albumin (g/L)	Prothrombin time (s)	C-reactive protein (mg/L)
DBO5	13	92	34.3	13.1	151.77
DBO4	11.62	81	31.5	15.7	157.74
DBO2	22.41	157	30.1	17.9	227.71
DBO1	34.67	153	18.2	18.6	239.87
OD	23.85	173	25.0	17.7	177.34
POD1	20.35	158	28.4	16.6	204.14
POD2	14.96	128	34.2	16.0	177.26
POD3	11.29	109	34.4	15.5	141.1
POD4	11.41	104	35.6	14.1	99.55
POD6	16.98	88	35.3	14.2	57.6
POD8	15.39	85	33.5	15.0	37.0
POD10	13.07	91	33.5	14.4	99.3
POD12	7.3	87	30.2	14.3	118.73
POD15	6.78	78	30.6	14.1	66.02

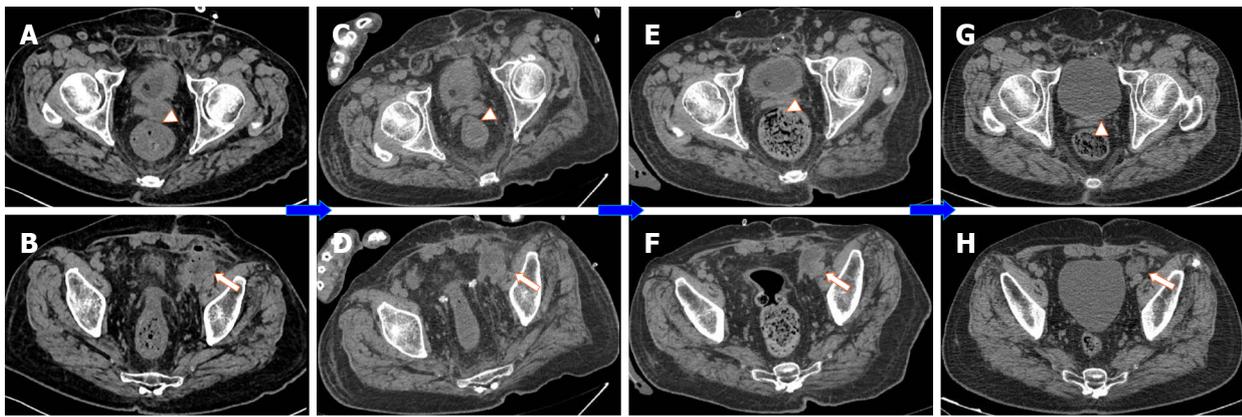
Leukocytes ($\times 10^9/L$); Creatinine ($\mu\text{mol/L}$); Albumin (g/L); Prothrombin time (s); C-reactive protein (mg/L). DBO: Days before operation, DBO5 refers to the day of admission; OD: Operation day, referring to the date of performing exploratory laparotomy; POD: Postoperative days, POD15 refers to discharge date.



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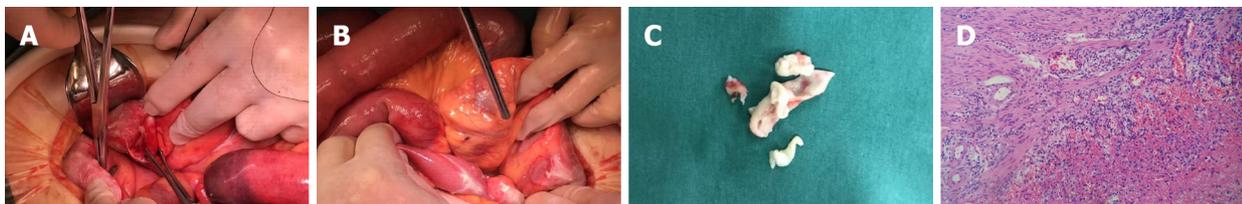
Figure 1 Magnetic resonance imaging results of the patient after admission. A and B: Pelvic magnetic resonance imaging (MRI) showed a rounded abnormal signal shadow in the left seminal vesicle, with low signal on T1-weighted imaging (T1WI) and high signal on T2-weighted imaging (T2WI) + lipid inhibition, and a size of approximately 2.3 cm \times 1.6 cm; C and D: Pelvic MRI showed a nodular mass in the left inguinal region, with low signal on T1WI and high signal on T2WI + lipid inhibition, and a size of approximately 5.0 cm \times 4.0 cm. The white arrowheads show the left seminal vesicle. The white arrows show the pelvic abscess (secondary focus).

The function of various organs was monitored. Plasma was infused to achieve coagulation, and wound dressings were changed regularly. Various laboratory indicators were routinely checked. On the 1st day after the operation, the patient had dyspnea and atrial fibrillation with a fast ventricular rate after taking off the line. He received high flow oxygen inhalation and his heart rate was regulated with amiodarone. Treatment to resolve abdominal distension and promote gastrointestinal motility was performed. The pus culture showed *Klebsiella pneumoniae* infection. A combination of meropenem and linezolid was administered, and the patient's symptoms and signs were gradually resolved. On the 3rd day after the operation, the patient's heart rate returned to normal, oxygen saturation was maintained with low-flow oxygen inhalation, the infection was eradicated, and abdominal distension was relieved. Later, the patient returned to general surgery ward for further treatment. On the 4th day after the operation, a liquid diet was initiated. The amount of intravenous fluid replacement was reduced and he was encouraged to get out of bed to prevent embolization. On the 7th day after the operation, abdominal distension recurred. He continued to fast, and the wound suture was removed. On the 10th day after the operation, the patient complained of hunger but abdominal distension was relieved. Abdominal CT showed less abdominal inflammation than before (Figure 2C and D). Three days later, the patient's diet was changed to a semiliquid diet. Two days later, the patient did not complain of any special discomfort, his body temperature returned to normal, and he was allowed to resume a normal diet. The other catheter was replaced, and the patient was discharged.



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Figure 2 Computed tomography results of the patient throughout the diagnosis and treatment processes. A-D: The results of pelvic computed tomography examinations on the 2nd day after admission, on the 10th day after surgery, at 1 mo after discharge, and at 3 mo after discharge; E-H: The primary focus of the left seminal vesicle abscess and the secondary focus of the extraperitoneal fascial abscess were gradually controlled and narrowed after treatment and outpatient and emergency follow-up. The white arrowheads show the left seminal vesicle. The white arrows show the pelvic abscess (secondary focus).



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Figure 3 The appendix. A and B: During the operation, the appendix was congested and edematous, with accumulation of the surrounding suppurative fluid, and the sigmoid colon was coated with a large amount of pus; C: A section of the appendix with a length of 3.5 cm and a diameter of 0.8-1.2 cm was cut; D: The suppurative inflammation of the appendix was confined outside the serosa (microscopy, × 100).

OUTCOME AND FOLLOW-UP

Postoperative pathology of the appendix showed extraserous suppurative inflammation, AB (+), and PAS (+) (Figure 3D). After discharge, the patient underwent a 1-year follow-up. The two inflammatory foci were managed and their size was gradually reduced after treatment and follow-up (Figure 2E-H).

DISCUSSION

The seminal vesicles are located at the bottom of the bladder and the outer side of the ampulla of the ureter. Together with the ampulla of the vas deferens and the ejaculatory duct, they form the distal structure of the seminal tract[3]. Seminal vesicle secretions account for approximately 60% of the total semen volume and include high concentrations of fructose, prostaglandin, and other substances[4]. SVA is very rare. In 2004, Sağlam *et al*[5] pointed out that a total of 26 related cases were reported in the literature. By searching PubMed, ScienceDirect, and other literature databases, as of August 2022, a total of 51 cases of SVA were identified worldwide. Table 2 shows the SVA cases reported since 2004. SVA can occur in all age groups and is more common unilaterally, and *Escherichia coli* is the main pathogenic bacteria. The etiology of SVA is unknown, but long-term indwelling catheters, diabetes, prostate puncture biopsy, and endoscopic operation are factors contributing to the susceptibility to this disease [6,7]. SVAs are mostly secondary to urinary tract infections such as prostatitis. Infections causing a SVA can also involve the blood, lymph, and other pathways[8]. In our case, the patient underwent surgical treatment of benign prostatic hyperplasia. He suffered difficulty urinating and had a long-term indwelling urinary catheter. We speculate that his previous medical history is an important risk factor for SVA.

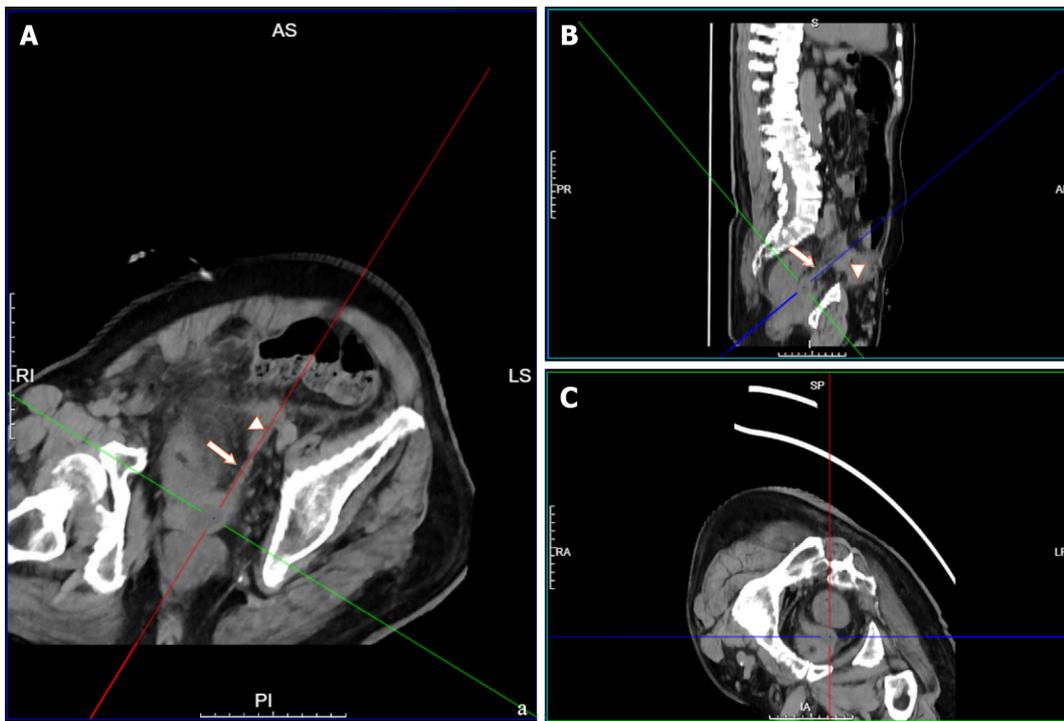
SVA lacks specific clinical symptoms. Because the vesicles are anatomically adjacent to the bladder and other tissues, dysuria, testicular and groin pain, tenesmus, *etc.* are common clinical manifestations. Pandey *et al*[9] reviewed reports on these clinical manifestations; 74% of patients had fever, 58% had dysuria, and 32% had mild prostatitis[9]. Swollen glands can be found on digital anal examination.

Table 2 Summary of literature on primary seminal vesicle abscess treated by surgery since 2004

Ref.	Year	No.	Age	Complaints	Imaging	Surgery	Pathogens	Location	Underlying causes
Dewani <i>et al</i> [15]	2006	1	35	Infertility, hemospemia	CUS, US	Abscess incision, catheterization	Acid-fast bacilli	Unilateral	N/A
Chong <i>et al</i> [16]	2014	1	38	Fever, lethargy, rigor, anorexia	N/A	Percutaneous drainage	<i>Burkholderia pseudomallei</i>	N/A	Melioidosis, diabetes
Bayne <i>et al</i> [11]	2013	1	67	Myalgias, chills	MRI, IVP	Percutaneous drainage	<i>Escherichia coli</i>	Left	Transrectal biopsy
Hammad[17]	2006	1	24	Urinary frequency, urgency, urge incontinence	CUS, CT, IVP	Perirectal incision and drainage	N/A	Left	N/A
Fujinaga <i>et al</i> [18]	2008	1	2 ms	Fever with leukocyturia	CUS, CT	Percutaneous transrectal aspiration	<i>Escherichia coli</i>	Left	Dysplastic left kidney
Wadei <i>et al</i> [19]	2008	1	29	Fever, dysuria, right-sided testicular pain	CT, MRI	Transrectal aspiration	<i>Staphylococcus</i> , <i>Proteus mirabilis</i> , <i>Clostridium</i> species	Right	Donor kidney transplant
Talwar <i>et al</i> [20]	2021	1	20	Fever, oliguria and uremic symptoms	MRI	Transrectal aspiration	<i>Escherichia coli</i>	Left	Zinner syndrome
Monzó <i>et al</i> [21]	2005	1	38	Dysuria, frequent urination and fever	US	Transrectal puncture drainage	<i>Escherichia coli</i>	Left	Bilateral orchiopexy
Machida <i>et al</i> [22]	2008	1	81	Swelling and left inguinal pain	CT	Inguinal canal ligation and percutaneous suprapubic vesical catheterization	<i>Escherichia coli</i>	Left	Diabetes
Bradley and Scoular[23]	2021	1	42	Subjective fevers and worsening fatigue	CT	Transurethral resection of the prostate	<i>Candida parapsilosis</i> , <i>Candida glabrata</i> , <i>Bacteroides fragilis</i>	Left	Diabetes
Sağlam <i>et al</i> [5]	2004	6	18-47	Rectal discomfort, left inguinal tender-swelling	N/A	Transrectal (2)/Transperineal (4) puncture and aspiration	<i>Escherichia coli</i>	Bilateral (4)/Unilateral (2)	2 with rectal cancer
Sihra <i>et al</i> [12]	2018	1	29	Right hemiscrotal pain, swelling, and pyrexia	US, CUS	Incision, drainage, transvesical deroofting of abscess	<i>Staphylococcus aureus</i>	Right	Elective vasectomy
Saha <i>et al</i> [7]	2009	1	49	Gradually enlarging, exquisitely tender groin mass	CT, MRI, CUS, IVP	Laparoscopic drainage of the abscess	<i>Escherichia coli</i>	Left	Drainage of perianal abscess
Imperatore <i>et al</i> [24]	2017	1	58	Dysuria and fever	CT	Open abdominal pus drainage	N/A	Bilateral	N/A
Zheng <i>et al</i> [25]	2015	1	42	Severe dysuria abdominal pain	US, MRI	Percutaneously drainage	<i>Staphylococcus aureus</i> and <i>Candida albicans</i>	Left	Diabetes
Cui <i>et al</i> [26]	2014	3	31-58	N/A	US, CT	F4 single "J" catheterization	N/A	N/A	N/A
Kuribayashi <i>et al</i> [27]	2017	1	26	Fever and right seminal vesicle swelling	US, CT	Transperineal needle aspiration	<i>Staphylococcus aureus</i>	Right	Zinner syndrome
Somiya <i>et al</i> [28]	2018	1	89	Left lower quadrant bulge	CT, CUS	Transperineal needle aspiration	<i>Streptococcus viridans</i>	Right	Transurethral prostate resection

US: Ultrasound; CT: Computed tomography; MRI: Magnetic resonance imaging; IVP: Intravenous pyelography; CUS: Cystourethroscopy; N/A: Not applicable.

Ultrasound, CT, and other imaging examinations are the methods used for diagnosing SVA[6]. The typical CT manifestations include unilateral or bilateral seminal vesicle dilation, central irregular low-density areas, and thickening of adjacent organs[5]. On MRI, the abscesses are usually round, with low T1-weighted imaging and high T2-weighted imaging signals[10].



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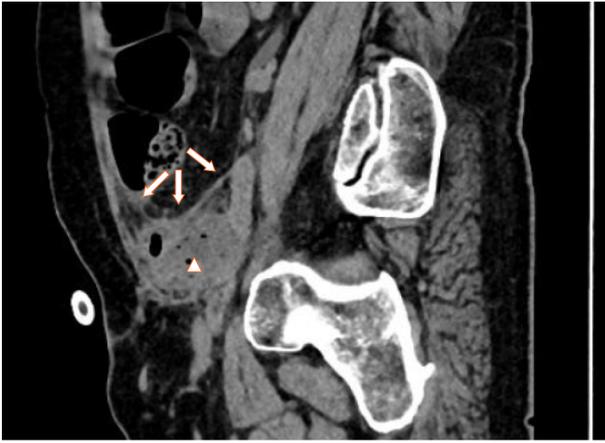
Figure 4 Three-dimensional computed tomography reconstruction showing the primary and secondary abscesses. A: Transverse view; B: Sagittal view; C: Coronal view. The primary focus is located at the baseline center, the white arrows indicate the vas deferens, and the arrowheads show the secondary focus.

Infectious diseases can occur in the seminal vesicles, for which antibiotic anti-infective treatment is the first choice. However, once an abscess is formed, conservative treatment is often ineffective[5]. Because of the trauma and long recovery time of open surgery, abscess puncture and drainage is currently the first choice for treatment. The common puncture methods include transurethral/transvesical drainage under cystoscopy and ultrasound-guided transrectal drainage[11,12]. Regarding the diagnosis and treatment of this case, the patient was admitted to the hospital and due to the ineffectiveness of conservative treatment, the left SVA of the perineum was punctured and drained under local anesthesia, and a small amount of purulent fluid was aspirated out. However, the symptoms were not significantly relieved after puncture, and the infection was exacerbated. In addition, abdominal CT showed the possibility of an abdominal abscess, so an exploratory laparotomy was performed.

Abdominal cavity infection is a common and frequently occurring disease in general surgery and is caused by bacteria, chemical stimulation, and other factors. Intraoperative organ rupture, perforation, trauma, and other diseases are common causes of peritonitis. The common pathogenic bacteria of peritonitis include hemolytic *Streptococcus*, *Pneumococcus*, and *Escherichia coli*[13,14]. Direct diffusion is one of the main routes by which bacteria enter the abdominal cavity. In this case, neither preoperative imaging examination nor intraoperative exploration revealed perforation or rupture of any abdominal organs that may have led to secondary peritonitis. Culture of the pus showed *Klebsiella pneumoniae*, which is not surprising, considering that this species originates from the urinary system. By repeating the preoperative abdominal imaging examination, we found that the primary foci of the SVA spread through the ejaculatory duct-vas deferens and accumulated in the loose connective tissue of the extraperitoneal fascia to form secondary foci. The transverse abdominis muscle was anterior to the secondary abscess, and the peritoneal reflex was superior, where purulent material contacted the peritoneum, resulting in acute peritonitis and intra-abdominal inflammation (Figures 4 and 5).

CONCLUSION

By reviewing the diagnosis and treatment of this case, we summarize our experience and conclusions as follows: (1) An indwelling urinary catheter increases the risk of urinary tract infection, and the catheter indwelling time should be shortened as much as possible. For patients who must have a long-term indwelling catheter, the catheter should be replaced regularly, and high-quality nursing care should be actively performed. Elderly and frail patients with urinary tract infection should be treated in a timely



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Figure 5 Sagittal computed tomography image showing the relationship between the secondary focus and the pelvis and abdominal cavity. The white arrows indicate the peritoneum, and the arrowhead shows the secondary focus.

manner to prevent the occurrence of complications; (2) For bacterial resistance, multiple infections, and other problems, broad-spectrum antibiotics are used for anaerobic bacteria and Gram-negative bacteria; and (3) Early primary disease and complications should be considered at the same time, including the full drainage of SVA in the early stage, as well as active surgical intervention for abdominal infection. Clinicians can use various imaging examinations to fully understand the occurrence, development, and prognosis of the disease. In this case, the general condition of the patient before surgery was poor, and the patient's condition was complicated with sepsis. Early exploratory laparotomy, removal of the abscess, and adequate drainage were the best options.

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FOOTNOTES

Author contributions: Shi BM and Chen QN contributed to the conception and design of the study and performed the operation on the patient; Li K and Liu NB collected the data, performed the data analysis, and wrote the initial draft of the manuscript; Liu JX participated in the clinical management and follow-up of the patient, and analyzed and interpreted the data; all authors contributed to drafting and revising the manuscript and approved the submitted version.

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