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Review of vasocutaneous fistulas and other rare complications after vasectomy

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Introduction Vasectomy is a surgical procedure for male sterilization. It is a very common procedure in daily urological practice with a low complication rate. Haematoma formation, wound infection, chronic scrotal pain, and spontaneous recanalization are well-known complications. Fistula formation and testicular infarction are less common following a vasectomy. In this article we provide a review of literature regarding rare complications after vasectomy.

Material and methods A manual electronic search of the PubMed Medline and Web of Science Core Collection databases was performed encompassing all included reports until 30 September 2022 to identify studies that assessed patient complications after a vasectomy.

Results Urethrovasocutaneous fistulas are by far the most prevalent, while vasocutaneous, vasovenous, and arteriovenous fistulas are seldom reported. In discharging fistulas, a fluid analysis can be done to discriminate different types. In all cases scrotal exploration and ligation of the fistula was performed. If present, an underlying bladder outlet obstruction should be treated. Scrotal infarction is another infrequently reported complication of vasectomy. Diagnosis is made by scrotal ultrasound and colour Doppler. Treatment is usually conservative, but orchiectomy should be considered in larger infarctions. Simple wound infections are common in patients post vasectomy. More complex infections are rare but can result in serious and even fatal complications.

Conclusions Common complications after vasectomy are well known and usually well discussed with patients. However, rare complications can occur, and it is important that they are recognized by clinicians.

Key Words: vasectomy ‹› male sterilization ‹› complication ‹› fistula ‹› wound drainage ‹› testicular infarction

INTRODUCTION

Vasectomy is a safe, effective, and widely accepted method to obtain permanent birth control in males. By cleaving and closing off the vas deferens, spermatozoa are prevented from being expelled during ejaculation. It is a commonly performed and minor procedure that can be performed under local or general anaesthesia, but complications such as scrotal haematoma, wound infection, chronic scrotal pain, and spontaneous recanalization may develop in a minority of patients. Other complications such as fistulas, testicular infarction, and necrosis are rare. In this article we aim to provide an extensive review of the literature concerning rare complications after vasectomy.

MATERIAL AND METHODS

A manual electronic search of the PubMed Medline and Web of Science Core Collection databases, encompassing all included reports until 30 September 2022, was performed to identify studies that assessed patient complications after a vasectomy. The following search query was used limited to citation titles and abstracts: "[(vasectomy or male sterilization) and (com-

plication* or fistula or testicular necrosis or testicular infarction)]". References of selected articles were also reviewed to identify potential additional cases.

RESULTS

A flow chart of the literature searches and screening results is presented in Figure 1. Articles that passed the initial screening process were re-examined by the authors to ensure inclusion criteria compliance. The identified complications after vasectomy are summarized in Table 1.

Vasectomy is the most common non-diagnostic procedure in urology, and it is the most reliable form of male contraception, performed in about 40–60 million men worldwide [1]. Complications shortly after vasectomy include the formation of haematoma, wound infection, and short-term postoperative pain [2, 3]. Postoperative bleeding and scrotal haematoma are the most common complications, with an incidence of about 4–22% [4, 5]. Some long-term complications can also be seen, such as chronic pain syndrome, vasitis nodosa, sperm granuloma, and epididymal obstruction. Approximately 1% of men who undergo vasectomy report chronic scrotal pain that affects quality of life [6]. Early and late spontaneous recanalization can also occur. Other, rarer complications such as fistulas and testicular infarction have been reported in the literature. These rare complications are discussed.

Fistula formation

Urethrovasocutaneous fistula

Hanley et al. [17] reported a case in 1945 of a 66-year-old man with a small sinus on his left scrotum. His complaint was discharge of clear fluid since his prostatectomy 9 months earlier from the site where he had had an incision for a vasectomy. The leakage was not constant but was sometimes enough to wet his clothes. A specimen of this fluid was collected and was tested for urea. This showed 1.8 mg per cent of urea, thus proving it was urine. A scrotal exploration under local anaesthesia followed freeing and ligating the discharging end of vas. No further leakage occurred according to the author.

In 1960 Carlton et al. [14] reported 2 cases with urethrovasocutaneous fistulas. The first case was a 77-year-old man who underwent a transurethral resection of the prostate (TURP) and a bilateral scrotal vasectomy, who presented 12 years after surgery. His complaints included lower urinary tract symptoms and leakage of urine from his right scrotum each time he urinated. A voiding cystourethrography (VCUG) was performed, which showed flow of contrast medium into the seminal vesicles and both vasa deferentia. A urethroscopy revealed adenomatous prostatic tissue with a dilated proximal prostatic fossa and an open bladder neck. The orifices of the ejaculatory ducts were gaping widely. A TURP was performed to remove all the tissue distal to the verumontanum. The postoperative course was uneventful, and the urinary fistula closed spontaneously after the TURP.

The second case was a 65-year-old patient admitted to the hospital 6 weeks after a TURP and bilateral vasectomy. The reason for his admission was acute back pain, thought to be of arthritic origin because there was sciatic radiation. During his admission he also complained about 2 enlarged tender masses in the upper scrotum, which he first noticed 2 weeks after his surgery. An incision and drainage were then performed. Afterwards, the wounds failed to heal, and a persistent watery drainage was seen from the wound during urinating. A urological workup showed a poor urinating stream and a postmicturition residue of 250 ml. A VCUG showed contrast medium in the left vas deferens, but no contrast was seen radiographically in the right vas. After the urethrogram, however, viscid contrast medium was seen coming out of the right-sided fistula, thus confirming the existence of a bilateral fistula. Urethroscopy showed residual apical prostatic tissue distal to the verumontanum. A transurethral catheter was inserted, and prostatic surgery to remove the residual apical tissue was proposed. The latter was refused

Table 1. *Complications after vasectomy*

Complication	Incidence rate
Scrotal haematoma	4–22% [4, 5]
Wound infection	3–4% [4, 7, 8]
Chronic pain syndrome	1–14% [6, 8, 9]
Sperm granuloma and vasitis nodosa	40% [5]
Recanalization	
Early	0.2–5.3% [10]
Late	0.03–1.2% [1, 11, 12]
Fistula formation	
Urethrovasocutaneous fistula	8 cases [13–17]
Vasocutaneous fistula	2 cases [18]
Urethrocutaneous fistula	1 case [19]
Vasovenous fistula	1 case [20]
Arteriovenous fistula	1 case [21]
Testicular infarction or necrosis	6 cases [22–27]
Abscess formation	4 cases [28–31]
Sexually transmitted infections	2 cases [32, 33]
Fournier's gangrene	7 cases [33–39]
Infective endocarditis	8 cases [40–45]

by the patient, and after 2 weeks the catheter was removed. He left the hospital without a catheter and failed to return for follow-up.

Desai et al. [15] reported in 1986 a case of a 62-year-old man with recurrent UTI. Urine flow rates and cystoscopy showed bladder outflow obstruction for which a bladder neck incision was made. An improvement was seen for 6 months, after which a severe right-sided epididymitis occurred necessitating an orchiectomy because of persistent pain and swelling. For this procedure a scrotal incision was made, and a left scrotal vasectomy was performed simultaneously. Six years later the patient presented with a chronically discharging sinus on both sides of the scrotum. An exploration showed a small abscess cavity on the right side and a tract on the left side, which led to the cut end of the proximal vas deferens. After curettage, both vasal ends were ligated again, but the left scrotal wound continued to drain. Several months later the diagnosis became apparent because the patient reported increased leakage after micturition. Flow rate studies revealed a poor urinary stream, and a scrotal sinogram revealed continuity with the vas and seminal vesicle. Leakage of methylene blue was seen during micturition after instillation in the bladder. VCUG indicated that urinary reflux into the left vas, and endoscopy showed a prominent verumontanum with enlarged lateral prostate lobes and a middle lobe. A TURP was performed, and the left vas was ligated at the internal ring of the groin. Postoperatively no leakage was seen, and the patient remained asymptomatic at one year of follow-up.

In 1988 Assimos et al. [13] reported a case of a 71-year-old man with a urethrovasocutaneous fistula after 2 transurethral resections of the prostate for bladder outlet obstruction and a vasectomy. The patient was known to have a neurogenic bladder, a small bladder capacity on urodynamics, and an anterior urethral stricture following the 2 TURPs. He also suffered from recurrent UTI due to these comorbidities. A fistulogram was performed, which showed filling of the vas deferens, the ejaculatory duct, the prostatic urethra, and the bladder. As treatment the fistulous tract and a segment of the involved vas deferens were removed under local anaesthesia. No recurrence of fistula was reported after 2 years of follow-up.

Guan et al. [16] also described 3 cases of urethrovasocutaneous fistulas.

Vasocutaneous fistula

A case of a vasocutaneous fistula was reported in 2009 by Gaden et al. [18] in a 37-year-old man who presented with a persistent subcutaneous scrotal swelling that appeared intermittently. This swelling became painful and burst, discharging a milky fluid through the skin. Nine years earlier he underwent a vasectomy. Because at the time of the symptoms the patient met a new partner with whom he wanted to start a family, he was referred to the conception centre. There he was instructed to collect the discharging fluid, and a sample of 2 ml was retrieved. Investigation of this sample showed the presence of a low concentration of spermatozoa (<0.1 million/ml). The sample was deemed insufficient for cryopreservation. Further information about the treatment for the fistula was not reported in the article.

An example of a vasocutaneous fistula at the time of presentation can be seen in Figure 1. This patient underwent a surgical revision under local anaesthesia. A circular incision was made around the lesion, and a dissection around the vas deferens was performed (Figure 2). A ligature with a resorbing suture was placed around the exposed vas, and the distal part was resected. The stump was then buried inside a small pouch underneath the Dartos layer.

Urethrocutaneous fistula

In 2021 Kumar et al. [19] reported a case of a 32-year-old man who underwent a vasectomy under local anaesthesia. The same evening, he presented with

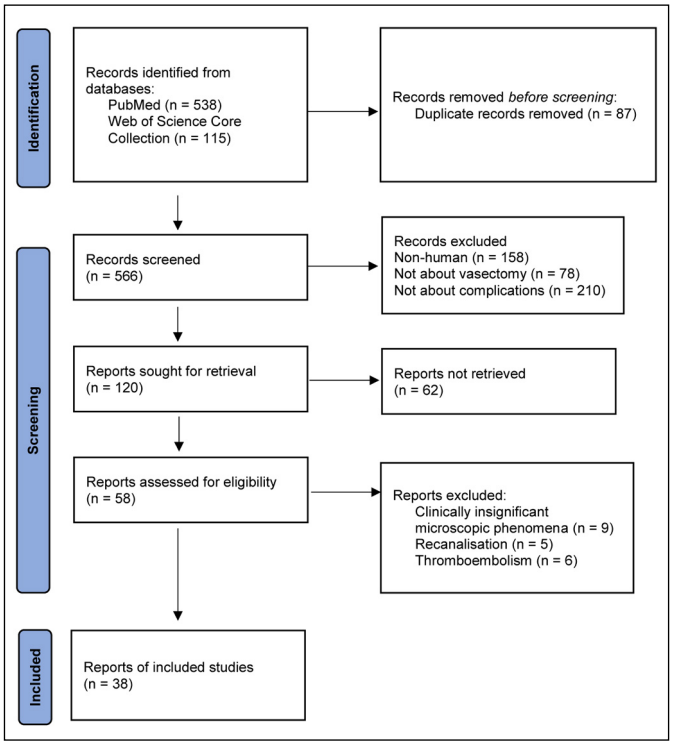

Figure 1. *Flow chart of literature searches and screening results.*

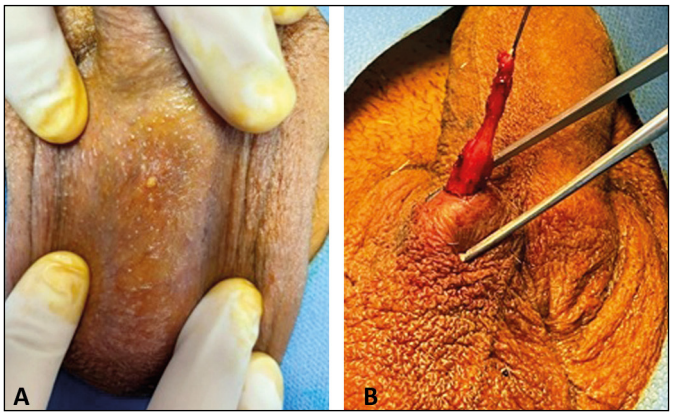

Figure 2. A. *Small lesion with discharge of fluid on the scrotum at the scar of the previous vasectomy.* **B.** *Dissection around the vas deferens.*

acute urinary retention for which a transurethral catheterization was performed with a 14 French Foley catheter. One week later the catheter was removed, and the next day the patient reported a urinary leak from the left scrotal incision. A new catheter was inserted and left in place for 2 weeks, during which he continued to have minimal urine leakage from the scrotal wound. At this time a suprapubic catheter was inserted, and a retrograde urethrogram was performed. This revealed contrast extravasation from the penobulbar junction of the urethra, suggesting a urethrocutaneous fistula. After inserting the suprapubic catheter, the patient still had minimal leakage of urine due to bladder spasms. An anticholinergic regimen was started, and the leakage resolved. After one month the patient underwent a new retrograde urethrogram showing a minimal narrowing of the urethra at the site of injury but no extravasation of contrast medium. The suprapubic catheter was subsequently removed. After 6 months uroflowmetry showed a normal urine flow and a well-healed wound. No further scrotal urine leakage was seen. The vasectomy itself was a failure because semen analysis showed viable sperm.

Vasovenous fistula

In 1997 Rajan et al. [20] reported a case of a vasovenous fistula after vasectomy. The patient was a 44-year-old man who presented with haematospermia and haematuria 3 months after a vasectomy. After the procedure a large haematoma and persistent left-sided scrotal pain remained present. The left testicle was swollen and red during examination. After applying pressure to the left scrotum and spermatic cord the next void appeared to be bloody. A cystoscopy was then performed, which revealed blood emanating from the left ejaculatory duct. After this an exploration of the left hemiscrotum was performed. This revealed a vein traversing into the area of the proximal vas where previously placed clips were present. The vein and vas were dissected to clean tissue and were ligated afterwards. Postoperatively no complications occurred and the haematuria and haematospermia resolved. Also, the left-sided scrotal pain improved significantly.

Arteriovenous fistula

An arteriovenous fistula was reported in 1985 by J. Auman [21] in a 39-year-old man who underwent a vasectomy in 1963. Postoperatively a scrotal haematoma was seen, which was subsequently treated conservatively. Ten years after the vasectomy the patient presented with a non-tender right posterior scrotal mass. Enlarged veins in the pampiniform plexus were palpated, and these did not empty in the supine position. Auscultation of these veins revealed a loud bruit and a palpable thrill, thus leading to the diagnosis of a spermatic cord arteriovenous fistula. A surgical intervention was initially declined by the patient because he was asymptomatic at that time. In 1967, however, this patient presented with groin pain and discomfort in the right scrotum. Physical examination showed a progressive dilatation of the right pampiniform plexus. A scrotal exploration was performed showing a large arteriovenous fistula in the right spermatic cord. The arterial site arose from the deferential artery near the proximal site of vas ligation. The testis was normal, and the testicular artery was intact. The fistula was ligated on both the arterial and venous sites. The symptoms resolved postoperatively, and no recurrence of the fistula was reported.

Testicular infarction and necrosis

A handful of cases deal with segmental testicular infarction [22–26], and only one described complete testicular necrosis [27]. Most of the patients present with acute testicular pain and scrotal swelling in the first few days following a vasectomy, although testicular infarction was found 2 years later on a routine scrotal ultrasound [24]. Another case presented as a pseudo-appendicitis leading to an appendectomy, with the pain persisting afterwards [23].

Infection

Infectious complications following a vasectomy vary from basic wound, urinary, and epididymal infections to Fournier's gangrene, infective endocarditis, and abscesses [4].

Abscesses

Three cases reported abscess formation of the seminal vesicles in the first few weeks postoperatively [28, 29, 30]. Another report discussed an abscess of the vas deferens 6 years after a vasectomy procedure [31]. Most patients present with scrotal pain and swelling. Often temperature and inflammatory markers were elevated. Scrotal and transrectal ultrasound, CT, and MRI were used as diagnostic tools. Treatment consisted of surgical or radiological drainage of the abscesses and an antibiotic course.

Sexually transmitted infections

In 1974 a patient presented with primary bilateral chancres of vasectomy wounds following sexual intercourse, which was successfully treated with daily penicillin injections for 10 days [32]. Ramaswamy et al. [33] reported a case of a rapidly progressive scrotal infection one week after vasectomy and one day after receiving fellatio. Cultures from the patient's wound and his wife's pharyngeal mucosa confirmed the presence of Streptococcus pyogenes. Both cases emphasize the importance of minimizing exposure during postoperative healing.

Fournier's gangrene

Fournier's gangrene following a vasectomy has been documented in 7 cases, including one leading to death [33–39]. All men where healthy at the time of vasectomy, except for one who suffered from diarrhoeal illness prior to the operation [37]. This is an acute, rapidly progressive, necrotizing complication of the genital and perineal region with a potentially fatal outcome, which requires early aggressive necrectomy and broad-spectrum antibiotics.

Infective endocarditis

Eight cases describe coagulase-negative staphylococcal endocarditis after vasectomy in patients with formerly normal valves requiring valvular reconstruction [40–45]. The aortic valve was most commonly involved, and the mitral valve only twice. Staphylococcus lugdunensis was found in 6 cases; other implicated pathogens were S. hominis and S. warneri. One patient suffered an embolic stroke because of this [45].

CONCLUSIONS

Common complications such as postoperative haematoma, scrotal pain, and spontaneous recanalization are well known and are usually discussed in the initial workup with patients. However, many other rare complications may occur following this commonly performed procedure. It is important for surgeons to have knowledge of these complications and to be able to recognize, investigate, and treat them when they occur.

Among fistulas, urethrovasocutaneous and vasocutaneous are the most reported. Arteriovenous and vasovenous fistulas after vasectomy are both extremely rare with only one case report of each in the literature [20, 21]. The time of presentation of fistulas may vary from weeks to years after the procedure, and the usual complaints include swelling of the scrotum and discharge of fluid from the scrotum [4, 13, 16]. In urethrovasocutaneous fistulas the discharging fluid is clear and there is usually more discharge during or after micturition. In the discussed cases there was usually also a history of TURP or bladder outlet obstruction (BOO) [13, 14, 15, 17]. The diagnosis is based on history and physical examination, but further investigation can be achieved by testing the fluid for urea (or creatinine), performing a VCUG, and showing discharge of contrast medium through the fistula. Treatment of these fistulas is by scrotal exploration and ligating the fistula. If BOO is present, this should also be treated because recurrence of fistula formation has been reported [15, 46].

In vasocutaneous fistulas there is discharge of fluid (possibly milky) from the scrotum, and there may also be swelling of the scrotum. The diagnosis is made based on history taking and physical examination, but analysis of the fluid can show spermatozoa [18]. The treatment is surgical exploration and ligation of the fistula.

In testicular infarction, symptoms usually occur within days after surgery. The diagnosis is based on history taking and physical examination [47]. A scrotal ultrasound can indicate changes in testicular tissue by showing an inhomogeneous mass and duplex ultrasound may show decreased perfusion in (parts of) the testis. Treatment is usually conservative in partial infarction, but in larger infarction a total orchiectomy should be considered [22, 26]. Failure of vasectomy is seen when the testicular artery is mistaken for vas deferens [23, 25]. Routine pathologic examination of the vas is not recommended but can be done if in doubt about the nature of the removed tissue [47].

Simple wound infections are commonly seen in patients post vasectomy. More complex infections such as Fournier's gangrene and endocarditis are rare, but they need to be addressed early to avoid serious and possibly fatal complications.

CONFLICTS OF INTEREST
The authors declare no conflicts of interest.

DECLARATION OF PATIENT CONSENT
The authors certify that they obtained all appropriate patient consent forms. In the form, the patient gave consent for images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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CONTRIBUTION DETAILS
Robby PA Lamoury: concept, design, data acquisition, data analysis, manuscript preparation, manuscript editing; Jasper Pauwels: literature search, data acquisition, data analysis, manuscript preparation; Stefan De Wachter: manuscript preparation, manuscript editing, manuscript review; Tim Brits: design, manuscript editing, manuscript review

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