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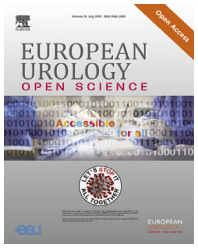

European Association of Urology

Reconstructive Urology

Contemporary Outcomes of Surgery for Primary and Recurrent Genitourinary Fistulae in a Well-resourced Country

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Abstract

Background: Urinary fistula (UF) is a global health problem but less common in well-resourced countries. Over the past decade there has been a trend toward managing UF in dedicated centres. Most of the evidence for surgical treatment is from individual case series, with few publications that involve high numbers. We describe the repair of recurrent and complex UF cases and outcomes in a tertiary referral setting.
Objective: To describe UF aetiology, repair techniques, and outcomes.
Design, setting, and participants: This is a retrospective study of a series of patients undergoing UF repair at a specialist unit.
Outcome measurements and statistical analysis: We describe the aetiology, cure rate, complications, and postoperative urinary incontinence rates for the series of UF cases.
Results and limitations: A consecutive series of 98 patients was identified, all of whom were tertiary referrals. Of these, 31 (31.6%) had at least one prior attempt at repair at another centre. The median age was 48 yr (interquartile range [IQR] 40–60.25). The median time from occurrence to repair was 12 mo (IQR 6–12). UF occurred most commonly following hysterectomy (48.0%), Caesarean section (9.2%), other gynaecological surgery (7.1%), and anti-incontinence surgery (7.1%). Complex fistulae (eg, repeat cases, radiation, ureteric involvement) comprised 41 of the cases (41.8%). Most patients with vesicovaginal fistula underwent repair via a transabdominal approach (70.4%). Tissue interposition was used in 96 cases (98%). There were no Clavien-Dindo grade >3 complications. Two patients (2%) had a persistent UF postoperatively. Two patients (2%) developed recurrence more than 2 yr after their initial repair, and both were successfully repaired at our centre. Twelve patients (12.3%) developed de novo overactive bladder, 22 (22.5%) developed stress urinary incontinence (13 had subsequent incontinence surgery), and two (2%) developed bladder pain (both had a subsequent cystectomy).

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Conclusions: Despite a high rate of recurrent and complex UF, successful lasting closure was achieved in 96% of our cases. A minority of patients developed other problems such as de novo overactive bladder and stress urinary incontinence that may require further treatment.

Patient summary: Urinary fistula is an abnormal opening or connection in the urinary tract and is less common in well-resourced countries. As a consequence, management of this condition is more frequently undertaken at specialist units. Even patients with a complex fistula and those who have had multiple attempts at repair can experience a cure. Urinary leakage is a common complication after the operation but can be successfully managed with surgery.

1. Introduction

Urinary fistula (UF) is a problem that is significantly more common in low-resourced countries (LRCs) than in well-resourced countries (WRCs). This difference is because of differences in aetiology in the two settings [1]. While obstetric UF cases are commonly seen in LRCs because of poor access to obstetric care, iatrogenic injury accounts for a greater proportion of UF cases seen in WRCs. In WRCs, vesicovaginal fistula (VVF), the most common UF subtype, occurs following gynaecological surgery, usually a hysterectomy (60% of cases) [1], with one in every 788 hysterectomy procedures associated with UF [2].

Approximately 120 UF repairs are performed annually basis in the UK [3]. Although the number of UF cases appears to be decreasing overall, there is evidence that posthysterectomy UF cases are increasing [2]. It is still the case they are encountered relatively rarely by the general urologist. Surgical management can be challenging due to limited surgical access and particularly challenging situations occur following radiotherapy, in obese patients, following prior extensive surgical intervention, and when the intestinal tract is involved.

The need for centralisation of UF surgery was recognised two decades ago [4]. However, at present there is no formalised referral pathway for surgical management of UF in most countries, despite increasing subspecialisation within urology and gynaecology and the trend towards referral to reconstructive specialists. As a referral centre for reconstructive problems, we have seen a growing number of patients with UF who have had prior attempts at repair. Here we describe the UF characteristics, surgical approaches, and outcomes for cases operated on in the past decade.

2. Patients and methods

Operative and demographic data were reviewed retrospectively for patients undergoing UF repair by three urologists at a single centre. Preoperative data included UF aetiology, time to surgery, adjunctive procedures, and number of previous attempts at repair. Patients underwent examination under anaesthesia and cystoscopy/vaginoscopy (with passage of a guidewire through the fistula tract) to identify the UF site and proximity to the ureteric orifices. A urethrovaginal fistula (UVF) was defined as any fistula from the urethral meatus to the bladder neck. VVF included any fistula proximal to the bladder neck. UF cases were classified as complex if they recurred after previous attempts at repair, involved the bowel, ureter, or uterus, occurred after radiotherapy or concomitant removal of vaginal mesh, or if major bladder surgery (augmentation or partial cystectomy) was performed.

Repairs are generally performed either within 2 wk of the index surgery if practical or, if discovered beyond the 2-wk threshold, then after 3 mo to allow resolution of inflammation. A transabdominal approach was used for supratrigonal VVF and when defects were large or involved either the ureter(s) or uterus. A vaginal approach was used for low VVF and for UVF. Abdominal repair was performed using the O'Connor technique with nonoverlapping suture lines and tissue interposition. Omentum was used for interposition where available, while a Martius flap was utilised for transvaginal repair. Catheters were removed following an absence of extravasation on cystography in the second postoperative week.

The primary outcome was closure of UF, assessed according to resolution of symptoms, clinical examination, and/or a postoperative cystogram (in VVF). Other outcomes included complications, long-term urinary symptom sequelae, and the need for further treatments.

3. Results

3.1. Demographic data

A total of 98 consecutive patients underwent UF repair. The median age was 48 yr (interquartile range [IQR] 40–60.25). There were 62 (63.3%) tertiary referrals. The median time from fistula occurrence to repair was 12 mo (IQR 6–12). In total, 31/98 cases (31.7%) had undergone a prior attempt at repair elsewhere. VVF (including vesicouterine fistula), UVF, and ureterovaginal fistula accounted for 78/98 (79.6%), 18/98 (18.4%) and 2/98 (2%) cases, respectively. Of the 98 cases, 41 (41.8%) were a complex UF.

3.2. Aetiology

Aetiology was ascertained in 94/98 cases (Table 1). The most common aetiology was surgery, accounting for 80/98 cases (81.6%), followed by radiotherapy (6/98, 6.1%) and obstetrics (4/98, 4.1%). The most common individual cause was

abdominal hysterectomy (47/98, 48%), followed by Caesarean section (9/98, 9.2%), other gynaecological surgery (6/98, 6.1%) and anti-incontinence surgery (7/98, 7.1%).

3.3. Operative and postoperative data

Of the 98 patients, 71 (72.5%) underwent a transabdominal repair and 27 (27.6%) had a transvaginal repair. Of the 78 VVF cases, 69 (70.4%) were repaired transabdominally. Tissue interposition was used in 96/98 cases (98.0%), including omental (67/98, 68.4%), Martius (25/98, 25.5%), and peritoneal flaps (4/98, 4.1%). Adjunctive procedures were performed in 15/98 cases (15.3%), as listed in Table 2. Postoperative complications occurred in 11/98 cases (11.2%), including eight Clavien-Dindo grade 1 and three Clavien-Dindo grade 2 complications. No Clavien-Dindo grade >2 complications occurred. Postoperative cystography was performed at 2–4 wk for all patients undergoing VVF repair; a leak was found initially in 3/78 cases (3.9%) and for one patient a second cystogram (1–2 wk later) demonstrated resolution.

3.4. Outcomes

The median follow-up was 6.5 mo (IQR 4.25–12.75). Overall anatomical success was 95.9% (Table 3). The success by type of fistula was 96.2% for VVF, 94.4% for UVF, and 100%, for ureterovaginal fistula. In total, four patients had a persistent or recurrent fistula. Two patients with VVF had a persistent leak on postoperative cystography; both patients had a complex UF, one due to radiotherapy and one who had two previous repair attempts performed elsewhere and a body mass index of >45 kg/m^2. The patient with prior radiotherapy had salvage treatment with an ileal conduit diversion, while the other patient awaits a further attempt at repair. Two patients developed recurrence >2 yr after repair; one had a VVF (initially repaired transvaginally and subsequently repaired transabdominally) and the other had a recurrent UVF.

The closure rate was 95.5% in primary cases and 96.8% in repeat cases. The closure rate was 96.5% for simple UF and 95.1% for complex cases. Among primary cases, closure was 100% for an abdominal approach and 81.3% for a vaginal approach. For repeat cases, closure was 95% for an abdominal approach and 100% for a vaginal approach. Overall, the success rate was 98.6% for a transabdominal approach and 88.9% for a transvaginal approach.

In total, 12/98 patients (12.2%) developed de novo overactive bladder, of whom ten were managed with medication and two had resolution of symptoms after surgery to treat stress urinary incontinence (Table 4). A total

Table 1 – Fistula aetiological groups and individual aetiologies

Aetiology	Patients, *n* (%)
Surgical	80 (81.6)
Abdominal hysterectomy	47 (48.0)
Caesarean section	9 (4.1)
Other gynaecological surgery	7 (7.1)
Vaginal mass excision	2
Ovarian cyst/oophorectomy	2
Prolapse repair	2
Incontinence surgery	7 (7.1)
Transvaginal tape	5
Transobturator tape	1
Colposuspension	1
Urethral diverticulectomy	3 (3.0)
Other urological surgery	6 (6.1)
Cystectomy and neobladder	3
Cystectomy and ileal conduit	1
Nephroureterectomy	2
Colorectal surgery	4 (4.1)
Obstetric	4 (4.1)
Delivery related	3
Uterine rupture	1
Radiotherapy	6 (6.1)
Other	2 (2.0)
Sexual violence	1
Eroded pessary	1
Unknown	4 (4.1)
Total	98 (100)

Table 2 – Adjunctive procedures at the time of urinary fistula surgery

Adjunctive procedure	Patients, *n* (%)
Vagina	5 (5.1)
Removal of transvaginal tape	2
Vaginoplasty	1
Colpocleisis and perineorrhaphy	1
Excision of vaginal mass	1
Bowel	3 (3.1)
Repair of colovaginal fistula	1
Small bowel resection	1
Appendectomy	1
Bladder/ureter	4 (4.1)
Ureteric reimplantation	2
Augmentation cystoplasty	1
Partial cystectomy	1
Other	3 (3.1)
Repair of incisional hernia	2
Colposuspension	1
Total	15 (15.3)

Table 3 – Cure rate of surgery for urinary fistula at last follow-up

Category	Patients, *n*/*N* (%)
Cure rate by fistula site	
Vesicovaginal	75/78 (96.2)
Urethrovaginal	17/18 (94.4)
Ureterovaginal	2/2 (100)
Cure rate by previous surgery	
Primary	64/67 (95.5)
Vaginal	13/16 (81.3)
Abdominal	51/51 (100)
Repeat	30/31 (96.8)
Vaginal	11/11 (100)
Abdominal	19/20 (95)
Cure rate by fistula complexity	
Simple	55/57 (96.5)
Complex	39/41 (95.1)
Cure rate by approach	
Transabdominal	70/71 (98.6)
Transvaginal	24/27 (88.9)

Table 4 – Long-term sequelae following urinary fistula surgery

Sequela and management	Patients, *n*/*N* (%)
De novo overactive bladder	10/98 (10.2)
Drug therapy	10/12
Surgery	2/12
Stress urinary incontinence	22/98 (22.5)
Conservative management	9/22
Surgery	13/22
Bladder pain	2/98 (2.0)
Cystectomy	2/2

of 22 patients developed stress incontinence (22.5%); nine were managed conservatively and 13 underwent surgery. Two patients developed refractory bladder pain as a result of prolonged catheterisation and development of a small-capacity painful bladder, and underwent cystectomy.

4. Discussion

For a condition that causes such misery, surgical management of UF remains a topic devoid of level 1 evidence to guide treatment recommendations. The various issues in fistula surgery are difficult to evaluate in a randomised controlled trial, so most of the evidence in the literature comprises case series such as the present one. Our series represents practice at a high-volume centre in the WRC setting of the UK National Health Service. The aetiologies are representative of UF seen in WRCs. The findings are relevant and timely in the context of a move towards formalisation of referral pathways and centralisation of care in the UK, and provide an opportunity to discuss several issues concerning outcomes, surgical approaches, and surgical training.

The rate of secondary repairs in our series (31.7%) is high compared to most series from WRCs, while complex UF constituted 41.8% of our cases. Despite this, anatomical closure was achieved at the first attempt for 95.9% of patients. Excluding the two cases with recurrence after >2 yr, the initial overall success rate was 98.0%. These results compare favourably to published series from WRCs. From the same setting in the UK, the largest series was reported by Hilton [5], who achieved an anatomical closure rate of 95.7% in a series of 283 women (22% reoperative). In the systematic review by Hillary et al [1] the mean overall success for all UF surgeries in series from WRCs was 94.6% (the percentage of reoperative cases was unknown). A more recent systematic review by Bodner-Adler and colleagues [6] on VVF following benign gynaecologic surgery found a higher mean cure rate of 97.98% (3.8% reoperative).

Reoperative surgery is more complex and associated with poorer outcomes. Hilton [5] found a significantly lower closure rate of 88.2% for reoperative cases compared to 98.2% for primary cases ($p = 0.003$). This is probably because of a greater degree fibrosis, impaired blood supply, and adhesions; alternatively, the fistulae involved may have been inherently more difficult, accounting for why the initial surgery failed. The closure rate we achieved for repeat cases was similar to that for primary cases (95.5% primary vs 96.8% repeat). We hypothesise that our equivalent outcomes are attributable to use of the abdominal approach with omental interposition in all reoperative VVFs. Another point is that if these repeat cases had been initially performed in a specialised centre, it is likely that they would not recur with the consequences of continuing distress to the patient.

For VVF there is controversy regarding several aspects, particularly the optimal surgical approach. Outside of specific situations in which abdominal access is essential (eg, a high fistula, ureteric or uterine involvement, concomitant bladder augmentation) [7], it is traditionally held that the best technique for VVF repair is the one that the surgeon judges as providing the best chance of repair at the first attempt [8]. In the era of evidence-based medicine and subspecialisation, it can be questioned whether this is still a valid concept. In this series we used the abdominal approach more commonly than the vaginal approach (72.4% vs 27.6%). This is in contrast to the review by Hillary et al [1], which revealed that 70.7% of procedures for UF in WRCs were performed vaginally. Bodner-Adler and colleagues [6], who included only VVF, found that the abdominal approach was used for a greater proportion of cases, at 51% (open 36%, laparoscopic/robotic 15%) compared to 39% via the vaginal route. Clearly the case mix has an impact on the relative use of the different surgical approaches.

We found greater success for abdominal compared to vaginal repair of UF (98.6% vs 88.9%). Conversely, the review by Hillary and co-workers [1] revealed success rates of 90.8% and 83.95% for vaginal and abdominal approaches, respectively. In their review, Bodner-Adler and colleagues [6] found success rates of 93.8%, 97.05%, and 98.87% for vaginal, abdominal, and laparoscopic/robotic approaches to VVF, respectively. Given the heterogeneity in UF and patient characteristics between studies, interpretation of summary data is problematic. In addition, there are other potential confounders, including selection bias, surgical skill, experience, and then effect of a learning curve in reported “single surgeon” series. Subjecting the issue to a randomised controlled trial would be difficult, as few surgeons would consider themselves in true equipoise.

Clearly the vaginal approach has advantages over the abdominal approach in terms of invasiveness. In addition, Warner and colleagues [9] found that the operative time was longer for the abdominal (3.72 h, success 86%) than for the vaginal approach (3.28 h, success 91%), associated with a longer postoperative stay (8 vs 4 d) and greater cost. Mohr and colleagues [10] reported similar findings and no difference in sexual function between vaginal and abdominal repair. Regardless of the surgical approach, the rate of failure should be included in considerations of cost given the need for repeat surgery along with further hospital visits and investigations.

Laparoscopic/robotic surgery has the advantages of the abdominal approach while reducing invasiveness [11]. While success rates are reportedly similar to those for open surgery (71.4–100%), the series are generally small and likely to be highly selected [12,13]. Only two of articles

included in a recent review contained a sample size in excess of 15 patients [13]. Of 78 cases for which the information was provided, 33.3% had prior attempt at repair. The relatively shorter learning curve for robotic surgery and the widespread access to robots present an opportunity for reconstructive surgeons who favour the abdominal approach to reduce the invasiveness of the surgery and improve postoperative recovery. A major challenge, depending on case complexity, will be mobilisation of vascularised tissue interposition, particularly omentum.

Notwithstanding questions of invasiveness of surgery and health economics, an important factor to consider is the psychological morbidity for patients associated with failed repair. This is a phenomenon that anyone engaging in this surgery will recognise. In the obstetric literature it is recognised that delay in treating UF can lead to deleterious consequences, including depression, divorce, and loss of earnings [14]. In this respect the old dictum that "there is no such thing as brave surgeons, just brave patients" holds true: an abdominal approach with omental interposition, although more invasive and associated with greater postoperative convalescence, may be preferable if it offers better access to high VVF and a higher chance of success in a particular patient. Surgical training and experience are key and surgeons should be experienced in both vaginal and abdominal approaches and engage the patient in a shared decision-making process.

In WRCs such as the UK, it is essential that surgeons undertaking surgery for UF have appropriate training and work within teams with significant experience in managing UF [15]. A clear association between workload and outcome has already been demonstrated [3]. Expertise as a laparoscopic or robotic surgeon alone is not supportive of "having a go"; indeed, we have noted a recent trend in referrals after failed initial robotic repairs. It must be borne in mind that nearly all patients have undergone prior surgery and often have a "complex" abdomen. Clearly, with minimally invasive approaches it is sometimes necessary to convert to open surgery, and therefore surgeons should be trained in all surgical approaches and techniques.

We believe that the key to good outcomes in UF is the same as for all reconstructive surgery: a thorough preoperative work-up including discussion at a specialist reconstruction multidisciplinary team meeting, an approach akin to the one widely accepted as optimal in the management of oncourological conditions. An understanding of the principles of reconstructive surgery, as well as a range of reconstructive skills gained from managing lower urinary tract dysfunction, is crucial. Undoubtedly, skills gained in both abdominopelvic surgery and the excision of urethral diverticula and urethral surgery lend themselves favourably to the repair of all UF types.

It is important to remember that many iatrogenic bladder injuries are recognised intraoperatively (40–90%) [16] and a urologist can be called to the operating theatre and asked to repair a bladder injury vaginally or abdominally. To do this competently, some experience of the principles of UF surgery, in particular how to achieve good exposure, is invaluable. Indeed, prevention of a fistula by sound repair of an intraoperative injury is better than cure. Thus, we advocate centralisation to regional centres so that skills are passed on to residents, who will be the surgeons called to repair injuries in the acute setting when they become independent specialists in hospitals across our nations. Exposure to reconstructive urological surgery should continue to be an essential component of urological training.

The limitations of this series are common to most studies published on this subject. The review is retrospective and the patient and fistula characteristics are heterogeneous, representing "all comers". We have not formally assessed patient-reported outcomes, including quality of life and sexual function, but our personal experience is that following successful repair all patients report benefit and the vast majority require no clinical follow-up for this condition. We have not classified UF according to the Goh criteria [17], which is a system used to grade UF complexity, as it has been demonstrated that it has no prognostic value in nonobstetric UF [18].

5. Conclusions

Although the best chance of repair is at the first attempt, we found a similarly high success rate for reoperative cases. Individualisation of the surgical approach according to the fistula and the patient characteristics has yielded excellent outcomes. In light of the available evidence, we caution against a dogmatic approach with regards to selection of the surgical approach.

In WRCs, it is essential that surgeons undertaking surgery for UF have appropriate training and work within teams with significant experience in managing UF. Moreover, it is critical that surgeons have the reconstructive skills to deal with concomitant problems, including incontinence, small bladder capacity, and ureteric injury. The advent of robotic technology holds the potential advantage of optimising access for the abdominal approach while mitigating against the risks of open surgery. We feel that robot-assisted minimally invasive surgery should be introduced, but carried out in specialist centres by reconstructive urological surgeons with appropriate open surgical expertise. This will allow comparative evaluation of open and robotic approaches and potentially provide the opportunity for evolution of practice.

The findings of this study lend support to the centralisation of management to areas of high workload by an experienced multidisciplinary team. This needs to be tempered by the potential harm done by inadvertently deskilling many surgeons by restricting who performs such specialist surgery too severely.

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Study concept and design: Osman, Chapple.
Acquisition of data: Hillary, Gulamhusein, Downey, Osman.
Analysis and interpretation of data: Osman.

Drafting of the manuscript: Osman.
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