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Overview about repair of pelvic fracture urethral injuries and Delayed Outcomes

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Abstract: Delayed repair of pelvic fracture urethral injuries presents a significant challenge in urology, demanding a nuanced approach balancing the risks of immediate intervention with the potential complications of delayed reconstruction. While early urethral realignment is generally preferred, various factors, including patient instability, associated injuries requiring prioritization, and the presence of significant pelvic hematoma, may necessitate a delayed approach. This delay introduces several complexities. The initial inflammatory response and subsequent fibrosis contribute to increased surgical difficulty, often resulting in more extensive urethral dissection and a higher risk of complications such as stricture formation, fistula development, and incomplete healing. Accurate assessment of the urethral injury is crucial, employing imaging techniques such as retrograde urethrography and cystourethroscopy to delineate the extent of damage and guide surgical planning. Various surgical techniques exist, including anastomotic urethroplasty, buccal mucosal graft urethroplasty, and substitution urethroplasty, each with its own indications and potential advantages and disadvantages depending on the specific injury pattern and the degree of fibrosis. The choice of technique is further influenced by the patient's overall health, comorbid conditions, and functional expectations. Outcomes following delayed repair are often less favorable than those following primary repair, with higher rates of stricture formation and the need for further interventions such as urethral dilation or subsequent surgical revisions. Long-term follow-up is therefore essential to monitor for complications and to ensure optimal urinary function. Further research is needed to optimize surgical techniques, develop improved strategies for managing complications, and potentially identify predictive factors that might aid in the selection of optimal timing and surgical approach for delayed repair of pelvic fracture urethral injuries, ultimately improving patient outcomes. This includes exploring the role of minimally invasive techniques and novel materials to minimize tissue trauma and enhance healing.

Keywords: *Delayed repair, pelvic fracture, urethral injuries*

Introduction.

Anteroposterior compression, lateral compression, vertical shear (Malgaigne fracture), and combinations thereof are the main ways in which pelvic fractures are classified based on the direction of the force of damage.[1]

While urethral injuries are uncommon in small fractures, pelvic fractures that rupture the pelvic ring and large blunt shearing forces are the most common causes of post fracture internal injuries (PFUIs).4-6Data from later studies revealed a significantly lower incidence of PFUI (1.4-2%), despite prior estimates suggesting a rate of 10-25% of males with pelvic fracture.7-11,It is possible to classify the male urethra as either anterior or posterior. In the front of the urinary tract, you'll find the fossa navicularis, penile urethra, and bulbar urethra; in the back, you'll find the prostatic and membrane urethras. By way of the perineal diaphragm, the posterior urethra attaches to the pubic bone via the puboprostatic ligaments and the perineal membrane..2

Pelvic ring disruption can tear the ligaments from the attachments to the urethra at this level due to its lack of distensibility and the absence of protective surrounding spongy tissue or prostatic parenchyma, and certain fracture locations are associated with increased risk of urethral injury.3-5

Pelvic fractures from high-energy blunt force trauma can cause injury to the posterior urethra, known as pelvic fracture urethral injury, which is most commonly associated with unstable pelvic fractures. Pelvic fracture urethral injury should be suspected if a patient with pelvic trauma has blood at the meatus and/or difficulty voiding, and retrograde urethrography should be carried out if the patient is stable.6-9

Once urethral injury has been confirmed, it is critical to promptly begin urine drainage. One option is to realign the urethra over a urethral catheter, while another is to insert a suprapubic tube. Although primary realignment may reduce the likelihood of urethral stenosis following a pelvic fracture urethral injury, the operation is controversial due to its potential for worsening stenosis and its potential risks. When inflammation and fibrosis cause urethral stenosis, the best course of treatment is delayed urethroplasty, which is usually done three months following the event. Delay urethroplasty using the perineal approach requires four ancillary procedures: bulgar urethral mobilization, corporal separation, inferior pubectomy, and urethral rerouting. Even though pelvic trauma can hinder continence mechanisms, it is believed that proper continence is provided by repairing pelvic fracture urethral injuries.ten to fourteenBased on their examination of 362 patients hospitalized with pelvic fractures to a level 1 trauma center in the US, Aihara et al. found that urethral damage is significantly predicted by enlarged symphysis and fracture of the inferior pubic ramus on multivariate analysis.15 Out of 203 individuals studied, the group most likely to sustain urethral injury had straddle fractures in conjunction with sacroiliac joint diastasis, next straddle fractures alone, and finally Malgaigne's fracture.16Malgaigne fractures greatly enhance the risk of urethral damage, according to a big retrospective cohort of 31,380 patients with pelvic fractures from the National Trauma Data Bank in the United States.10Prompt further evaluation for evaluation of urethral damage is required following pelvic ring disruption, even though the pattern of pelvic fracture does not in and of itself indicate the existence of urethral injury.2

People used to think that PFUIs—pelvic fracture urethral injuries—took place at the level of the membranous urethra and were caused by ripping the prostate from that structure.1, 7, and 18In fact, injuries can happen anywhere along the membranous urethra, including the prostatic apex, the bulbar urethra-membranous urethra junction, or distal to the urethra; however, the latter is where adult patients are most often injured.Twelve, nineteenThe urogenital diaphragm and pubic bone are highly adherent to the urethra close to the striated sphincter, but they are less so farther away. This makes the bulbar urethra more vulnerable to urethral damage. This was demonstrated in a cadaveric investigation.20The location of injury in children is often closer to the prostate and bladder neck compared to adult patients. This is due to anatomical factors such as the brittle tissues of an immature pelvic structure, the relative intra-abdominal position of the bladder and an immature prostate, which increase the likelihood of severe urethral disruption in children.2, pp. 21–23On top of that, compared to adults, children have a substantially increased risk of PFUI following unstable pelvic fractures such straddle and Malgaigne fractures.16People used to think that PFUIs—pelvic fracture urethral injuries—took place at the level of the membranous urethra and were caused by ripping the prostate from that structure.1, 7, and 18In fact, injuries can happen anywhere along the membranous urethra, including the prostatic apex, the bulbar urethra-membranous urethra junction, or distal to the urethra; however, the latter

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Presentation and assessment of PFUIs

Two hallmarks of perforated urethral urethritis (PFUI) include a mobile, superiorly displaced prostate and blood at the urethral meatus.24, 25While the presence or absence of blood at the meatus is a common indicator of urethral injury, the presence or absence of bleeding cannot be definitively determined, and the amount of bleeding does not necessarily indicate the severity of the damage.25, 24, 27In order to rule out a rectal injury, which can be identified by blood on the inspection fingerand/or a palpable rectal laceration, it is essential to perform a rectal examination.16, 28, 2,In the acute context of PFUI, a rectal examination may reveal a prostate that is superiorly displaced, also known as a "high-riding" prostate. This is because, in young guys in particular, the pelvic hematoma that results from pelvic fractures can make it difficult to palpate a small prostate with precision.29, 30, 27,Other symptoms of urethral damage include a swollen, palpable bladder as a result of not being able to urinate and trouble or failure to pass a urethral catheter.1, 31,Also, keep in mind that it could be more than 1 hour after the damage before you notice any clinical signs.30

The usual diagnostic procedure for acute PFUI suspicion is retrograde urethrography.21, 26, 32Urthrography can pinpoint the exact location and degree of urethral damage. There have been a number of proposed classifications based on urethrography data, but none of them have gained universal approval.2Grade 1 is a stretch injury, grade 2 is a contusion, grade 3 is a partial disruption, grade 4 is a complete disruption, and grade 5 is a complete or partial disruption of the posterior urethra with associated tear of the bladder neck, rectum, or vagina. This simple classification was recently provided by the EAU and is relevant in the treatment of urethral injuries.28Fig. 1 shows the diagnostic criteria for a perforated urethral ultrasound (PFUI): the presence of contrast extravasation into the periurethral region or the area surrounding the inferior surface of the prostate. If the urethral branch is partially or completely disrupted, the retrograde urethrogram will reveal extravasation while the bladder is still full (Fig. 1a) or without bladder filling (Fig. 1b), respectively. Because some patients experiencing a partial disruption may also be experiencing sphincter spasms that block the entry of contrast medium into the bladder, it is not always easy to distinguish between a partial rupture and a complete rupture.30, 28,Two hallmarks of perforated urethral urethritis (PFUI) include a mobile, superiorly displaced prostate and blood at the urethral meatus.24, 25While the presence or absence of blood at the meatus is a common indicator of urethral injury, the presence or absence of bleeding cannot be definitively determined, and the amount of bleeding does not necessarily indicate the severity of the damage.25, 24, 27In order to rule out a rectal injury, which can be identified by blood on the inspection fingerand/or a palpable rectal laceration, it is essential to perform a rectal examination.16, 28, 2,In the acute context of PFUI, a rectal examination may reveal a prostate that is superiorly displaced, also known as a "high-riding" prostate. This is because, in young guys in particular, the pelvic hematoma that results from pelvic fractures can make it difficult to palpate a small prostate with precision.29, 30, 27,Other symptoms of urethral damage include a swollen, palpable bladder as a result of not being able to urinate and trouble or failure to pass a urethral catheter.1, 31,Also, keep in mind that it could be more than 1 hour after the damage before you notice any clinical signs.30

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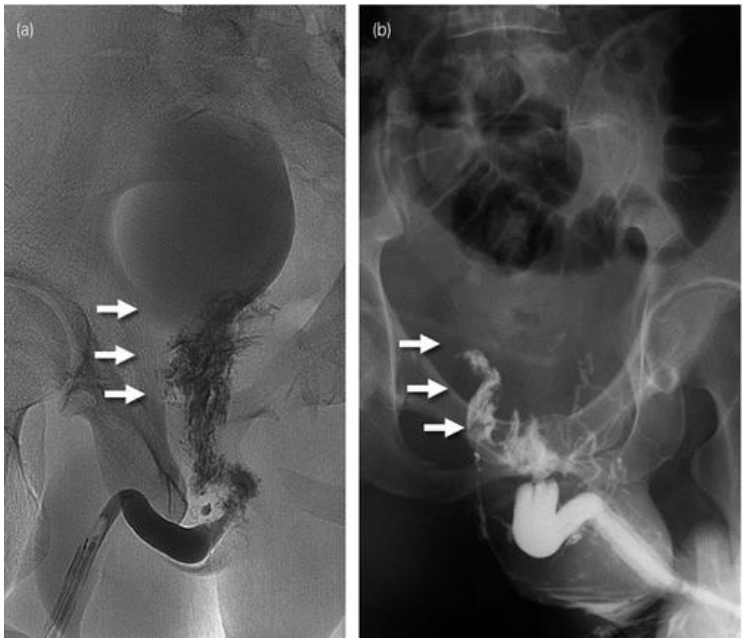

Figure 1: Retrograde urethrography immediately after trauma in (a) a patient with partial disruption and (b) a patient with complete disruption. Arrows indicate contrast medium extravasated from disrupted sites.

Acute management of PFUI

Urinary tract injuries do not usually pose a life-threatening threat on their own, but pelvic fractures that involve genitourinary injuries are more likely to be more severe, to cause other injuries (such as to abdominal organs), to prolong the patient's hospital stay, and to increase the risk of death.9, 35As a result, the primary goals of initial medical treatment should be patient stabilization and resuscitation, followed by the identification of any related injuries. Urinary outflow blockage, extravasation, and secondary sepsis are acute complications that can arise from urethral damage. In the immediate aftermath of a urethral injury diagnosis, the patient's bladder drainage must be prioritized in order to avoid infection and urinary extravasation.31, 29,Initial treatment should be based on the patient's hemodynamic status and the seriousness of any accompanying injuries. Figure 2 shows the flow diagram for PFUI management as per the EAU and AUA recommendations.30, 31, 28To achieve bladder drainage, two therapeutic methods are available. Putting an SPT into the bladder is the most hassle-free option; it can be done in the ER or during laparotomy to fix related injuries. If a patient is not stable enough to undergo retrograde urethrography, SPT should be placed as a first line of treatment until the possibility of a urethral injury can be ruled out.31Avoid blind urethral catheterization prior to urethrography if at all possible; doing so increases the risk of infection and may exacerbate urethral damage, but no conclusive research has demonstrated this to be the case.1, 31,Early PR, whether with a cystoscope or a simple catheterization, is another possibility.2, 31 and 28The risks of primary open realignment include entering the

pelvic hematoma with decompression, loss of tamponade, uncontrolled bleeding, poor visualization, and an inability to accurately assess the degree of urethral disruption. If there are concurrent bladder or rectal injuries that pose a risk of urinary incontinence or pelvic abscess if left untreated, then realignment should be avoided.[2, 36, 37]Despite the fact that PR is an option for hemodynamically stable patients according to both the EAU and AUA recommendations, the matter is still contentious.The development of stenosis is practically guaranteed with SPT implantation alone, but with 31, 28 PR, the risk is minimized.39, 38While there was no statistically significant difference in the risks of erectile dysfunction or incontinence between the two treatments, a recent meta-analysis demonstrated that the rate of developing future stenosis was considerably reduced in the PR group compared to the SPT group (OR 0.12).Reports indicate that patients who have successfully undergone PR can resume urination earlier than expected.40The length of stenosis is shorter than when PFUI is controlled solely by SPT implantation, and the posterior urethra and the prostate can be well-aligned, even if further stenosis does arise.41Among the many potential benefits of PR is its potential utility in the interdisciplinary care of trauma patients. Patients with PFUI frequently need surgical repairs for pelvic fractures; however, there is a danger of seeding infection from an open reduction and internal fixation when SPTs are inserted, and the surgical plan for pelvic fracture repair may be affected by the orthopedic physicians' decisions to place SPTs.8With PR, these dangers can be avoided during the healing of pelvic fractures. Gomez proposed a selective approach to acute PFUI therapy; if open reduction and internal fixation is deemed essential, PR could offer urine drainage and a sufficient operating field for the orthopaedic procedure.42When comparing PR with SPT, the former is clearly the more economical choice for monitoring PFUIs.43

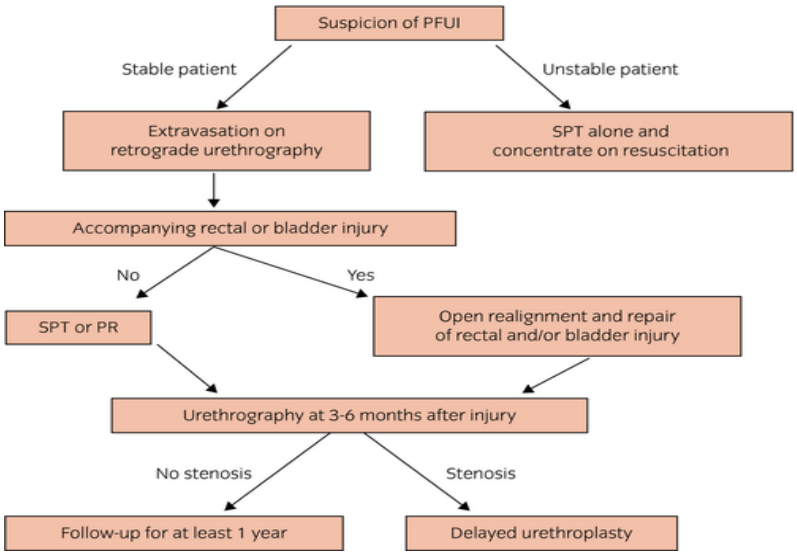

Figure 2: Flowchart for PFUI management.

However, there are a number of issues with PR in the immediate treatment of PFUI that have been highlighted in the current research. This selection bias could lead to the false impression that PR is more effective than it actually is if performed on patients with little injuries who may recover regardless of the chosen treatments.44Reportedly, the success rate of PR at a level 1 trauma hospital in the USA is at 9%, which is lower than what has been previously reported.8The amount of urethral damage induced by PR is directly correlated to the surgeon's level of expertise, making PR a technically hard procedure.45It should be mentioned that extended attempts at pressure relief should not be done, as this could worsen the damage.45Not everyone should use PR extensively, as Arora et al. warned in their description of a horrific PR consequence (Fig. 3a).45In order to rule out the chance of an improperly inflated balloon at the disruption site, radiographic or ultrasound confirmation of the proper placement of the Foley balloon catheter within the bladder is required following the successful introduction of a urethral catheter (Fig. 3b).28

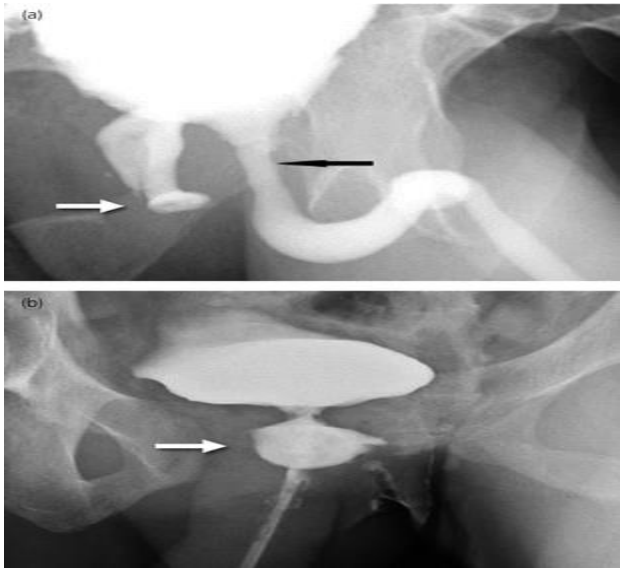

Figure 3: Consequences of inappropriate PR for PFUI. (a) Bulbar urethra was inappropriately aligned to the false tract (black arrow). The true proximal urethral end is indicated by white arrow. (b) Periurethral cavity (arrow) developed at the disruption site due to a balloon inappropriately inflated there.

A number of writers have noted that the majority of patients whose acute urethral injuries are treated with PR end up with a chronic, unstable condition that necessitates further urethrotomies and dilations.[39, 46, 47]Urinary tract patency and weak stream voiding are common outcomes of percutaneous urethral ligation (PR), while PR has the potential to initiate a cascade of needless and potentially dangerous urethrotomies and dilations to keep urethral patency.47Patients managed solely by SPT placement were never observed to have iatrogenic urethral trauma, according to Tausch et al., while patients managed by PR who underwent several urethrotomies exhibited this complication. 47While some authors have argued that PR improves urethroplasty outcomes, others have argued that it does not shorten the duration of the procedure, increases blood loss, or shorten the length of the stenosis, and that there is no discernible difference in continence or erectile function following surgery.[39, 46, 47]The surgical result of delayed urethroplasty is negatively affected by PR and future urethrotomies and dilations, according to some researchers.49, 48A double-edged sword, according to these reports, is public relations.39Since there is a dearth of high-quality evidence, acute PFUI care continues to be a contentious topic, as previously stated. To shed light on this matter, the American Association for Trauma Surgery is conducting a prospective multicenter cohort trial to compare the results of PR and SPT placement.44For at least one year following injury, patients should be constantly monitored due to the increased risk of urethral stenosis associated with PFUI, regardless of whether PR or SPT placement is first used to address the condition.

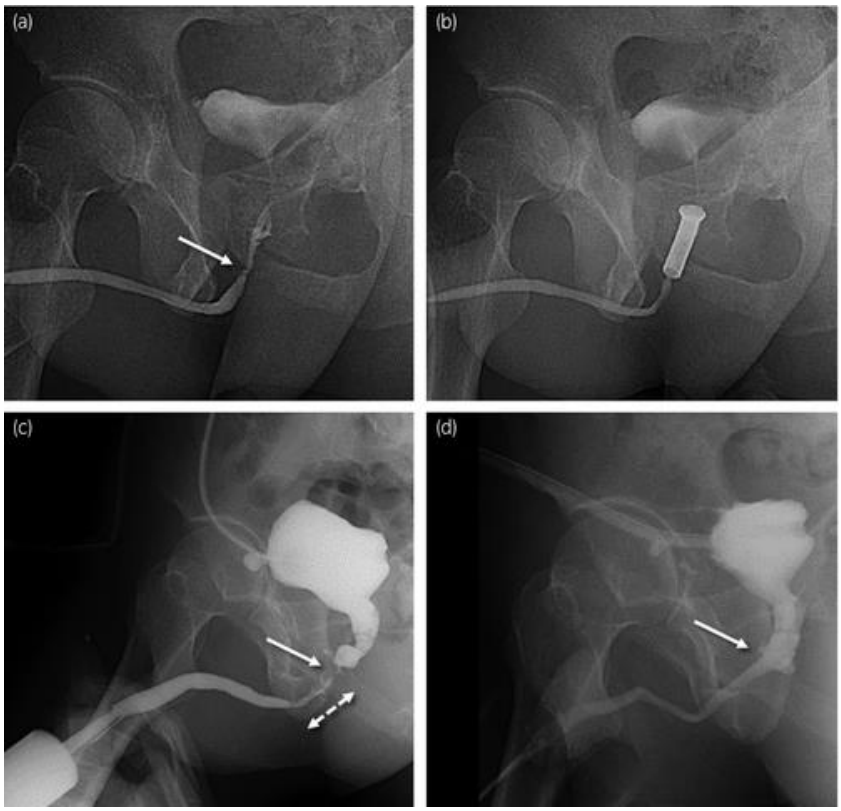

Figure 4: A case of complicated stenosis caused by repeated transurethral procedures after PFUI. (a) Despite the short urethral stenosis initially (arrow), (b) the patient received repeated transurethral procedures including urethral stenting. (c) Finally, the stenosis became obliterative (arrow) and extended to the bulbar urethra (dotted arrow), necessitating (d) excision of a long urethral segment during delayed urethroplasty. Arrow indicates the anastomotic site.

Delayed management for PFUI

Three major complications resulting from PFUI are urethral stenosis, ED and urinary incontinence. Because most patients with pelvic fractures are young with a significant life expectancy, their management can significantly improve QOL and allow recovery of function.

Urethral stenosis

Strategy of urethral stenosis management

Delay urethroplasty is the gold standard for treating PFUI because of the high incidence of urethral stenosis it causes, even in patients who have successful PR.1, 28, 32If you want your urethroplasty to go well, you shouldn't try to do it within three to six months of the first trauma. By then, the local healing process won't have finished, making surgical dissection more challenging and decreasing your chances of success.32,50, 26,No one suggests waiting less than three months before undergoing urethroplasty, even though some professionals recommend waiting as little as three to six weeks.26Despite the fact that most urologists will stick with transurethral procedures like urethrotomy or office- or self-dilation for as long as they can, these methods are only useful for temporary, non-obliterative stenosis and should not be repeated.52Not only are repeated transurethral treatments pointless, but they also increase the likelihood of stenosis complications such increased tissue damage and more difficult urethroplasty, as already noted.(32, 53)Patients with stenosis

following PFUI should not have urethral stent placement due to the significant risk of stenosis complications associated with this transurethral surgery.53Urologists need to know that delayed urethroplasty is never a good substitute for transurethral operations.

Review of narrowing of the urethral opening

Choosing the right surgical treatments and achieving effective outcomes for urethral stenosis requires an accurate assessment. Prior to delayed urethroplasty, a thorough evaluation is conducted to determine the bladder neck competency and urethral stenosis. This includes retrograde and antegrade cystoscopy to examine the bladder neck and damaged urethral ends, as well as retrograde urethrography and combined voiding cysto-urethrography, also known as "up and down urethrography"2. 32However, urethrography may not reliably ascertain the extent of the posterior urethra's three-dimensional displacement, and inadequate contrast material filling of the posterior urethra can make it challenging to precisely quantify the length of the urethral stenosis.55, 54Furthermore, traditional urethrography may not be very good at detecting coexisting disorders such periurethral diverticula, false passageways, or fistulas.55A non-invasive alternative to urethrography, magnetic resonance imaging (MRI) accurately measures the length of the stenosis, provides a detailed description of the degree of scarring, and shows the direction and extent of urethral displacement, making it an ideal tool for evaluating perforated urethral stenosis (PFUI). 56 to 58Furthermore, MRI has the capacity to detect periurethral conditions that traditional urethrography misses, such as a periurethral fistula, cavity formation, or the protrusion of the rectum into the space between the ruptured urethral ends. The cost-effectiveness of magnetic resonance imaging (MRI) for preoperative assessment is an area that needs further research, although the technology has the potential to improve urethroplasty by aiding surgeons in recognizing surgical anatomy.(57, 59)

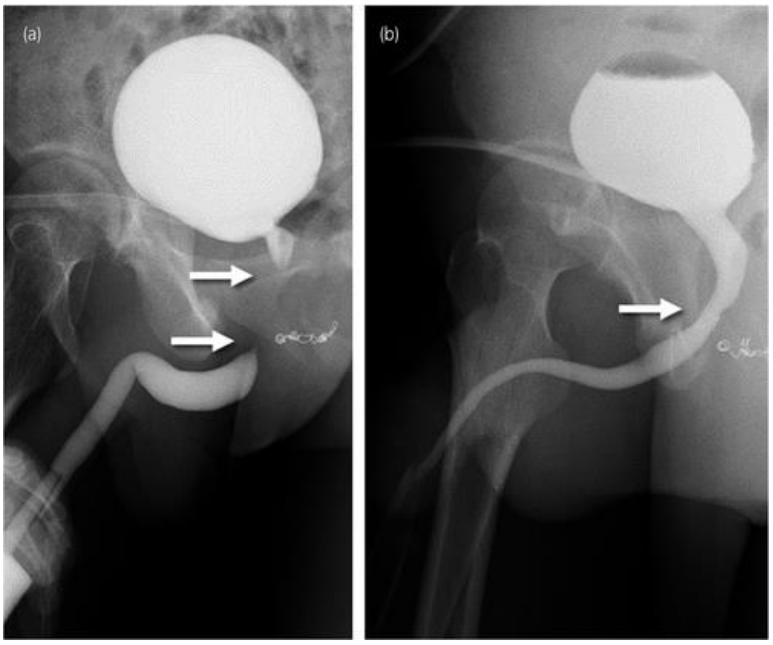

Figure 5: (a) Combined retrograde and antegrade urethrography 3 months after injury in the same patient as Figure 1a. Arrows indicate the proximal and distal urethral ends. (b) Post-urethroplasty voiding cystourethrography in the same patient. Arrow indicates the anastomotic site.

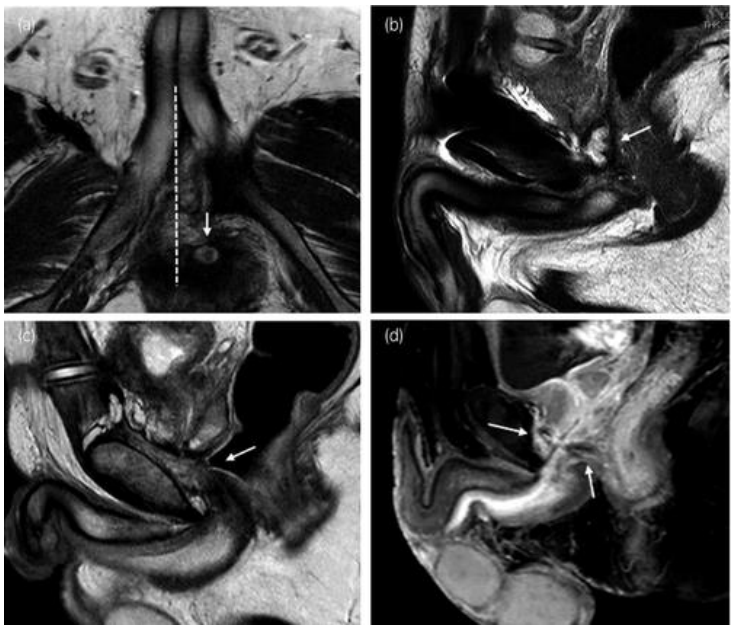

Figure 6: Representative preoperative MRI findings in patients with urethral stenosis after PFUI. (a) Lateral displacement of the proximal urethral end (arrow) from the midline (dotted line) in the axial T2-weighted image, (b) cavity formation just behind the proximal urethral end (arrow) in the sagittal T2-weighted image, (c) bulging of the rectum into the urethral gap (arrow) in the sagittal T2-weighted image. (d) Periurethral fistulas (arrow) in contrast-enhanced T1-weighted image.

Procedure of delayed urethroplasty

At present, the majority of cases of urethral stenosis can be treated with a single-stage perineal anastomotic urethroplasty, also known as delayed anastomotic urethroplasty. This procedure involves completely removing the scar, bringing the normal urethral mucosa from the two halves of the ruptured urethra back together, and then creating a tension-free anastomosis. This method was initially developed by Turner-Warwick in the 1970s60, and later refined by Webster and Ramon with the use of four separate ancillary techniques.61When doing a re-do, substitution urethroplasty with skin flaps or ileal grafts is usually reserved for patients who have a particularly large gapand/or very little remaining bulbar length.62, 53,Simply put, the surgeon chooses between a midline or curved perineal incision to expose the bulbar urethra, and the patient is placed in either a conventional or an exaggerated lithotomy position.two, fourteenAs a first step in auxiliary techniques, the bulbar urethra is moved circumferentially from the penoscrotal junction to the site of the disruption. This allows the urethra to be stretched to bridge the gap between the two ends of the urethra following scar tissue excision, allowing for an overlapping spatulated anastomosis (Fig. 7a).31The next step is to separate the bulbar urethra from the perineal body and cut it at the spot where the disruption occurred. When doing bulbar urethral transection, it is common practice to ligate and sacrifice the bulbbar arteries. This can reduce blood flow to the spongiosal sac and raise the likelihood of ischemia failure during reconstruction. According to Gomez et al., a unique method for preserving the bulbar arteries was used to prevent these problems. After 26 months of follow-up, all 26 patients were found to be voiding regularly.63

Locating the damaged proximal urethral end and establishing an anastomosis within a constrained pelvic operating area are the two most challenging aspects of delayed anastomotic urethroplasty.26A curved metallic sound, like a Van Buren sound, is guided into the bladder and out the other side via the suprapubic tract and the bladder neck in order to locate the proximal urethral end. You can feel the metallic sound's tip in your perineum, which is where the proximal urethral end is. If the proximal urethral end cannot be located or if the anastomotic tension is apparent because of a long urethral gap, the surgeon should think about using additional ancillary techniques. These techniques include developing the intercrural space by corporal splitting at the

level of the triangular ligament and retracting laterally (second step of ancillary techniques; Fig. 7b), performing partial resection of the inferior pubic arch (third step of ancillary techniques; Fig. 7c), rerouting the urethra around one crus (fourth step of ancillary techniques) to widen the exposure and allow further proximal dissection, and straightening the bulbar urethra (last step of ancillary techniques) to further reduce any length between the two urethral ends. A simplified perineal method is one that uses just steps 1 and 2, while an expanded perineal approach uses steps 3 and 4.2If these four steps are not enough to reach the proximal urethral end, an abdominoperineal approach may be needed (Figs. 8, 9). This is especially true in children, re-do cases, and cases with complex stenosis, periurethral cavity, false passage, open bladder neck, and recto-urethral fistula.22, 64–68It has been brought to light that the surgical results, and not the preoperative imaging, typically determine the type of repair (i.e., the auxiliary approach that is needed).7Andrich et al. concluded that preoperative urethrography cannot predict the length of stenosis because they did not find a meaningful correlation between the two variables.53, 69Previously, we assessed the function of MRI in determining the urethroplasty type in an effort to circumvent this issue.59Exact prediction of urethroplasty type from preoperative imaging scans is still not obvious; additional research is needed to address this matter.2

One of the most difficult reconstructive operations in urology involves pelvic fracture urethral damage. An end-to-end anastomosis, also known as a bulbomembranous anastomosis, is typically an efficient method for repairing a destroyed or stenosed urethra. A tension-free anastomosis can be made by following a series of surgical processes. Preoperative decision-making is guided by a thorough evaluation of the patient's anatomical defects, including the location of the stenosis, the extent of the distraction injury, and the integrity of the bladder neck. This evaluation should be conducted before surgery. According to recent studies, a perineal approach is sufficient for the management of the majority of pelvic fracture urethral distraction defects (PFUDD). However, it is critical for all surgeons dealing with these types of injuries to be well-versed in the full range of surgical procedures required to fix PFUDD.

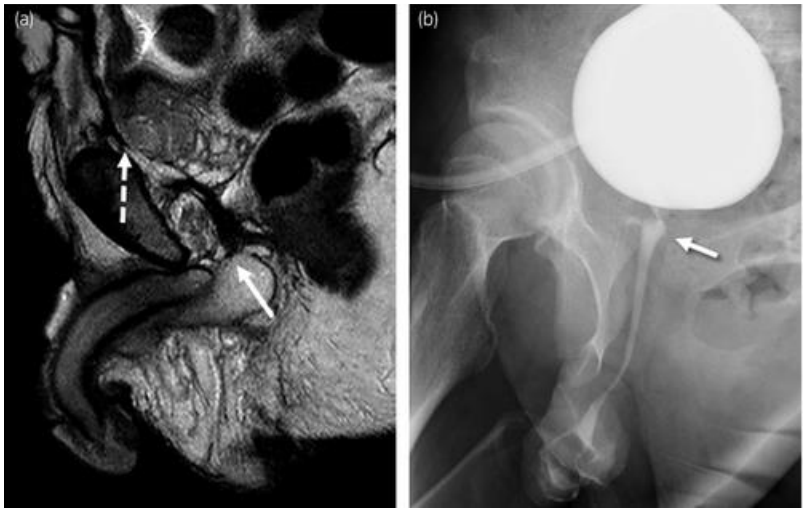

Figure 7: A case of severe PFUI with secondarily developed long urethral stenosis requiring an abdominoperineal approach. (a) Preoperative sagittal T2-weighted MRI showed a long urethral gap. Arrow indicates the distal urethral end and dotted arrow indicates the proximal urethral end. (b) Postoperative voiding cystourethrography. Arrow indicates the anastomotic site.

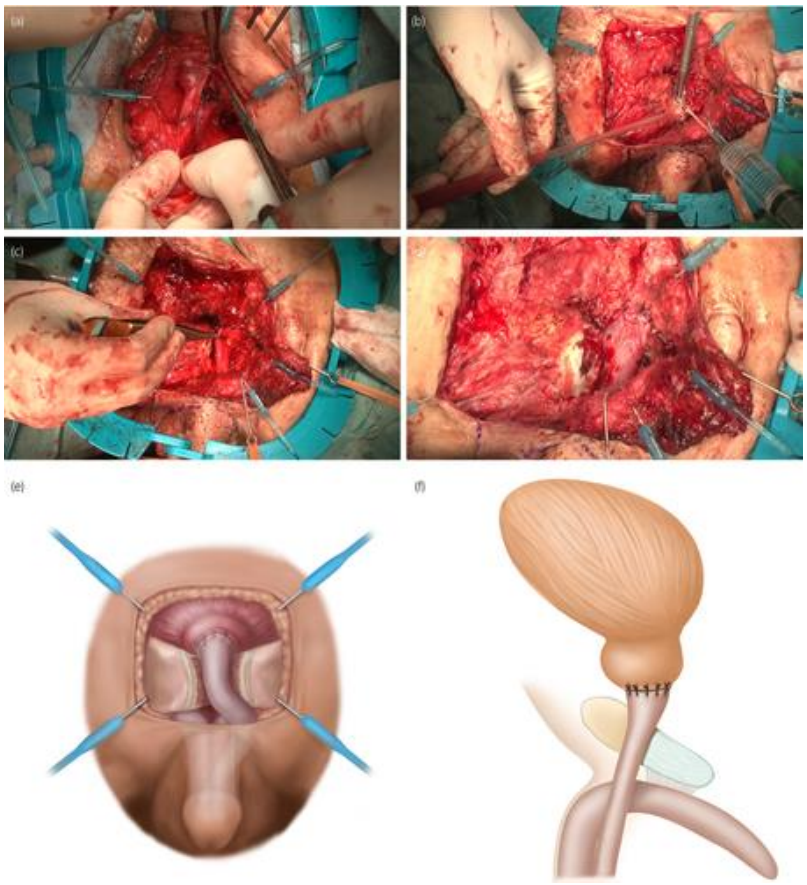

Figure 8: Images and scheme of operative procedures of abdominoperineal urethroplasty. (a) The bulbar urethra (arrow) is circumferentially mobilized perineally. (b) The superior surface of the pubis is excised to create a space to pass the mobilized urethra (arrow). (c) The bulbar urethra is rerouted around the left side of the corporal body and is passed on the resected surface of the pubis, and (d) urethral anastomosis is completed. The schemes of (e) coronal and (f) sagittal postoperative images are also shown.

Careful removal of scar tissue from the urethral end is required before the mucosa at the proximal end can be exposed. In our technique, six 4-0 PDS sutures are used to draw down and anchor the urethral mucosa edge to the surrounding tissue. This prevents the urethral end from retreating proximally, as mentioned above.66Eight interrupted 4-0 PDS sutures are used to reaproximate the urethral mucosa after scar tissue on the mobilized bulbar urethra is removed (Fig. 7d). For the anastomosis, we utilize a 16-Fr silicone catheter as the urethral stent, and to make sure there's enough urine drainage, we also keep an SPT in the bladder. When a dead space is present after a partial pubectomy or corporal splitting, it is prudent to keep a suction drain tube in place.Careful removal of scar tissue from the urethral end is required before the mucosa at the proximal end can be exposed. In our technique, six 4-0 PDS sutures are used to draw down and anchor the urethral mucosa edge to the surrounding tissue. This prevents the urethral end from retreating proximally, as mentioned above.66Eight interrupted 4-0 PDS sutures are used to reaproximate the urethral mucosa after scar tissue on the mobilized bulbar urethra is removed (Fig. 7d). For the anastomosis, we utilize a 16-Fr silicone catheter as the urethral stent, and to make sure there's enough urine drainage, we also keep an SPT in the bladder. When a dead space is present after a partial pubectomy or corporal splitting, it is prudent to keep a suction drain tube in place.

Post-urethroplasty management and surgical outcome

Surgeons have different approaches to postoperative care. To ensure that the anastomosis is healing properly, our clinic recommends waiting two to three weeks following urethroplasty before inserting the urethral catheter and doing peri-catheter retrograde urethrography. After removing the catheter, voiding cystourethrography can be performed if the anastomotic site is patent and no contrast medium leaking was observed (Fig. 5b). After a few days of trouble-free bowel movements, the SPT is removed. The urine flow rate is recorded when the SPT is removed and serves as a reference point for subsequent monitoring. At 3, 6, and 12 months, as well as every year thereafter, we check the patients' urine flow rate and a patient-reported outcome measure. At 6 months, we do cystoscopies.70Urinary flow rate reduction or indications of obstructive voiding need a cystoscope and urethrography evaluation for recurring stenosis. Despite the fact that delayed urethroplasty performed by a skilled surgeon has a low complication rate and a high success rate (almost 90%), recurrent stenosis can occur either soon after the urethral catheter is removed (typically within 48 hours) or months or even years after the procedure.[78, 79]Inadequate mobilization of the bulbar urethra, tension at the anastomosis from insufficient scar tissue excision, or severe vascular damage at the initial injury are the most common causes of early recurrent stenosis, which manifests as an inability to void. In such cases, salvage urethroplasty is typically necessary.78–80, 23,On the other hand, a single urethrotomy is typically enough to fix late recurrent cases, which manifest as a diminished urine stream because the anastomosis has shrunk.[78, 79]

Erectile dysfunction

An increased risk of erectile dysfunction (ED) is linked to pelvic floor injury (PFUI); a recent meta-analysis found an average incidence of 34%, which is more than the risk in individuals with pelvic fractures alone.numbers 81 and 82.As a result of the original pelvic fracture rather than its treatment, erectile dysfunction (ED) develops in patients with pelvic fractures. Urethral injury is more likely to be a surrogate for extensive pelvic injury affecting the neurovascular structures central for erectile function, rather than the direct cause of ED.77, 84Direct injury to the crural or tunica albuginea, leading to intracorporal fibrosis or venous leakage, veno-occulusive dysfunction, arterial insufficiency, and neurological damage are all potential factors that contribute to the pathophysiology of erectile dysfunction.80, 84Among the important predictors of erectile dysfunction after percutaneous fundoplication of the ureter (PFUI), Koraitim et al. found that pubic diastasis, lateral prostatic displacement, and lengthy urethral stenosis were the most strongly associated with an increased risk of erectile dysfunction.No. 83While it may take up to two years after damage, a natural return of potency typically happens within the first year as a consequence of neuronal function rebuilding following neuropraxis and/or the creation of supplementary penile artery supply following arterial occlusive lesions.No. 83Determining whether additional therapy is necessary and doing an evaluation of sexual function is best done two years following the first trauma. The standard method of treatment involves the use of oral medicines initially, with phosphodiesterase type 5 enzyme inhibitors, and then, if that does not work, intravenous injection therapy.2

Potty Training

Both the internal sphincter (located in the bladder neck) and the external sphincter (located in the membrane urethra) are necessary for urinary continence in men. An antiquated view holds that after the external sphincter is removed and the membranous urethra is avulsed from the prostate apex, the bladder neck's ability to maintain continence becomes paramount.1, 7, and 18In most instances, the external sphincter is able to retain some function even when the disruption happens at the bulbomembranous junction, which is just distal to it.86, 85, 20, 19,Cystoscope evidence19, cadaver20, and urodynamic tests all provide credence to this notion about the disruption site.86Consequently, the majority of patients report adequate continence following delayed urethroplasty for PFUI.85Nearly 90% of the males in Cooperberg et al.'s sample showed no indications of incontinence when asked about their voiding function following delayed urethroplasty.71In a retrospective

study conducted at a referral facility, Fu et al. found that 88% (447/510) of the men were able to achieve continence following delayed urethroplasty.No. 87Nevertheless, even a small amount of urethral stenosis can cause harm to the external sphincter, as can a complicated urethral disruption or the complete excision of scarring. Incontinence of the urine in these individuals is contingent upon the proper functioning of the bladder neck.12There is a significant risk of urine incontinence following any further surgery on the prostate or bladder neck, including transurethral prostate resection. If a patient experiences severe incontinence following delayed urethroplasty, staged installation of an artificial urinary sphincter may be an option to consider.An increased risk of erectile dysfunction (ED) is linked to pelvic floor injury (PFUI); a recent meta-analysis found an average incidence of 34%, which is more than the risk in individuals with pelvic fractures alone.numbers 81 and 82.As a result of the original pelvic fracture rather than its treatment, erectile dysfunction (ED) develops in patients with pelvic fractures. Urethral injury is more likely to be a surrogate for extensive pelvic injury affecting the neurovascular structures central for erectile function, rather than the direct cause of ED.77, 84Direct injury to the crural or tunica albuginea, leading to intracorporal fibrosis or venous leakage, veno-occulusive dysfunction, arterial insufficiency, and neurological damage are all potential factors that contribute to the pathophysiology of erectile dysfunction.80, 84Among the important predictors of erectile dysfunction after percutaneous fundoplication of the ureter (PFUI), Koraitim et al. found that pubic diastasis, lateral prostatic displacement, and lengthy urethral stenosis were the most strongly associated with an increased risk of erectile dysfunction.No. 83While it may take up to two years after damage, a natural return of potency typically happens within the first year as a consequence of neuronal function rebuilding following neuropraxis and/or the creation of supplementary penile artery supply following arterial occlusive lesions.No. 83Determining whether additional therapy is necessary and doing an evaluation of sexual function is best done two years following the first trauma. The standard method of treatment involves the use of oral medicines initially, with phosphodiesterase type 5 enzyme inhibitors, and then, if that does not work, intravenous injection therapy.2

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Conclusion

Both the immediate and long-term management of perforated female urethral stricture (PFUI) continues to be a contentious urological topic. Improved quality of life and prevention of substantial long-term morbidity can result from early detection and proper treatment. The technical complexity of the necessary procedures and the rarity of PFUI make its management a challenging task.

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