

Post-traumatic posterior urethral stricture: clinical considerations

Travma sonrası arka üretral darlık: Klinik değerlendirme

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Summary

Post-traumatic urethral stricture is a common challenging problem, usually associated with pelvic fracture. There are many questions on its proper management such as proper pre-operative evaluation, maximum length of the defect to be operated by perineal approach, whether urethral realignment on first encounter of urethral injury should be performed, and the best way for managing children with the disease. The aim of that review is to find the proper answers to these challenging questions and to provide some simple tips that can help to achieve a higher success rate. English literature on post-traumatic posterior urethral stricture, both in adults and pediatric age groups, were reviewed from Medline. Five questions was thought to be challenging for urologists on confronting a case of post-traumatic posterior urethral stricture, and answers for those questions could be achieved on the review of work of eminent urologists concerned with such challenging problem. Pre-operative evaluation of every case of urethroplasty should combine at least three modalities; combined retrograde urethrogram and cystogram, urethral ultrasound and endoscopic study. There are certain tips to be taken before and during surgery helping to improve the outcome, including sterile urine and tension-free anastomosis. Most authors agree on 2.5 cm to be a safe defect length to achieve tension-free anastomosis. Primary realignment is a simple procedure that may decrease the need of surgical intervention. Perineal urethroplasty can be applied in children similar to adults.

Key words: Realignment; urethral stricture; urethral trauma.

Özet

Travma sonrası üretral darlık, genellikle pelvik kırıkla beraber görülen sık karşılaşılan zor bir sorundur. Bu soruna uygun yaklaşımla ilgili çok sayıda sorun vardır: uygun pre-operatif değerlendirme, perineal yaklaşımla opere edilebilecek maksimum hasar uzunluğu, üretral yaralanma ile ilk karşılaşmada üretral realignment yapılmalı mı ve bu sorunu olan çocuklara en uygun yaklaşım gibi. Bu derlemenin amacı bu zor sorulara uygun yanıtları bulmak ve daha yüksek başarı oranlarına ulaşmak için basit ipuçları vermektir. Yetişkin ve pediatrik yaş grubunda travma sonrası arka üretral darlık ile ilişkili İngilizce literatür Medline'dan taranmıştır. Travma sonrası arka üretral darlık vakalarının değerlendirilmesinde ürologların karşılaştığı özellikle zor olabilecek beş sorun düşünülmüş ve bu sorunları konu alan önemli ürologların çalışmaları gözden geçirilerek sorunlara cevaplar bulunabileceği öngörülmüştür. Her üretroplasti vakasının preoperatif değerlendirmesinde üç yaklaşım birleştirilmelidir; kombine retrograd ürotrogram ve sistogram, üretral ultrasonografi ve endoskopik çalışma. Cerrahi öncesinde ve cerrahi sırasında uygulanabilecek, sonucu iyileştirmeye yardımcı olabilen, steril idrar ve basınçsız anastomoz gibi bazı öneriler vardır. Çalışmaların çoğunda basınçsız anastomozu sağlamak için güvenli hasar uzunluğu olarak 2.5 cm'de birleştirilmektedir. Primer realignment, cerrahi girişim ihtiyacını azaltabilecek basit bir işlemdir. Perineal üretroplasti çocuklarda yetişkinlere benzer şekilde uygulanabilir.

Anahtar sözcükler: Realignment; üretral darlık; üretral travma.

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Post-traumatic posterior urethral stricture is one of the challenging problems for urologists. Patients subjected to urethral stricture secondary to pelvic trauma should be first classified into two groups; adults, where the stricture is mostly located in the membra-

nous urethra and the chance for complete urethral disruption is relatively low (42%), and children where the stricture has a higher incidence to be located in the prostatic urethra or even involving the bladder neck and has a higher incidence to be a complete dis-

ruption (69%).^[1] Additionally, the small prostate and rudimentary puboprostatic ligaments^[2] can be easily torn with trauma allowing lifting up of the prostate and longer gap between both urethral ends.

Most posterior urethral injuries are the result of blunt pelvic trauma, mostly related to a vehicle accident or a fall from height. The urethral injury in most of cases occurs indirectly by shearing forces, due to immobility of the prostate.^[3]

Posterior urethral trauma is considered the most debilitating injury, because if it is not managed properly, it may cause to severe impairment of the quality of life, by affecting continence and potency, plus the development of urethral stricture that may require repeated interventions.

The aim of our review is to clarify simple manoeuvres and techniques that can be conducted in the pre-operative and intra-operative settings, in order to achieve better outcomes.

The material for this review was obtained through a search of the Medline database. The search was limited to publications in English language, concerning technical aspects in the management of post-traumatic posterior urethral stricture, both in adults and pediatric age groups.

Following five questions were thought to be challenging for urologists on confronting a case of post-traumatic posterior urethral stricture and answers for those questions could be achieved on the review of work of eminent urologists concerned with such challenging problem.

Question 1: Is there a stricture in the true urethra, with preservation of urethral continuity? Or is there a segment of scar tissue between both urethral ends, and if so what is the length of the urethral gap?

To properly answer that question, three measures should be performed; combined retrograde urethrog-raphy with cystography, ultrasound of the urethra, and endoscopic study.

Combined cystourethrogram is the first tool to be done for evaluation of the length of the urethral defect and certain tips should be kept in mind to obtain a helpful radiological image. First; the bladder neck should be opened in the film to avoid over-estimation of the defect length.^[4] Second; the combined film should be radiologically imaged in different positions; to clearly

define both urethral ends and to avoid the mistake of extravasation of urinoma as a posterior urethra that may result in under-estimation of the defect length.^[5]

Urethral ultrasound is the second tool that can be helpful for two aspects; first to confirm the length of the defect and second to measure the degree of fibrosis in the wall of the urethra, to help in decision making for the mode of management.^[5] McAninch et al.^[6] were the first to define the role of ultrasonography in the evaluation of urethral stricture. Gupta et al.^[7] graded the degree of spongiofibrosis, based on encroachment of the urethral lumen, into mild (<33%), moderate (33- 50%), and severe (>50%).

The third tool to be taken before management is the endoscopic evaluation-urethroscopy and ante-grade cystoscopy. It helps to visualize the bladder neck to properly estimate the defect length and visualize the mucosa to confirm whether it is a true stricture or a distraction defect. It also visualize and manage possible secondary bladder stones, prior to considering reconstruction of the urethral stricture.^[4]

Some authors^[8-10] advocate the role of magnetic resonance imaging in the pre-operative evaluation to precisely measure the stricture length, the degree of fibrosis, and the degree of prostatic displacement, although it is still not widely used in clinical practice, and not cost-effective in our institution.

Question 2: Are there any tricks to achieve higher success and decrease the rate of complication?

These tricks can be categorized into two:

1) Pre-operative:

- a- Proper estimation of the defect length and the degree of fibrosis, as mentioned before.
- b- Urine analysis and urine culture; it should be ensured that the urine should be sterile prior to intervention. Roehrborn et al.^[11] detected that patients with pre-operative urinary tract infection had a twice failure rate than those with pre-operative sterile urine.
- c- Radiological measurement of the length of the bulbar urethra. Koraitim^[12] measured the length of the bulbar urethra and its elastic index, and he concluded that the bulbar urethra can extend to bridge a stricture for a maximum of one third of its length, beyond that the anastomosis would be under tension. Morey and Kizer^[13] also demonstrated that urethral reconstruction

is proportional to the length and elasticity of the distal urethral segment.

- d- Detailed sexual history of the patients. In a published series by Tunc et al.,^[14] detailed sexual history of 58 patients showed that 25.8% developed significant erectile dysfunction following urethral trauma that should be looked for and considered before attempting stricture repair.

2) Intra-operative:

- a- Al-Rifaei et al.^[15] demonstrated that a midline approach and sparing neurovascular bundles can decrease the rate of post-operative erectile dysfunction to as low as 4.5%.
- b- Dalpiaz et al.^[16] demonstrated that the sphincter and their innervations can be safely preserved by dissecting the connective tissue plane between the sphincter and urethra allowing their separation, which can result in improving both continence and erectile functions rate post-operatively.
- c- Morey and McAninch^[17] stressed that complete excision of scar tissue is the most important step to achieve success.
- d- Koraitim^[18] reported that on excising the sclerosed prostatic apex, the urethra mucosa should be pulled down and fixed to the prostatic capsule, to be sure for proper mucosa to mucosa anastomosis.

- e- Tension free urethral anastomosis is crucial for successful results.^[19]

- f- Extensive mobilization of the penile urethra should be avoided, because of the risk of both proximal ischemia and chordae.^[20]

- g- Tunc et al.^[14] demonstrated that splitting of the corporeal bodies, helps reducing the urethral curve and shortens the actual distance between urethral ends.

- h- Adequate urine diversion is essential to allow proper healing.^[4]

Fig. 1 illustrates the tricks required to achieve higher success rate.

Question 3: What is the maximum length of the defect that can be treated by perineal end-to-end anastomosis?

There is no agreement in the literature about the maximum length of stricture that can be treated by end-to-end anastomosis.

Most urologists agree with a distance of 2.5 cm, to be a safe defect length that can be treated by end-to-end anastomosis^[12] being tension-free to achieve 100% success rate. Many authors demonstrated higher success rate, with just excessive urethral mobilization that allowed them to bridge a gap reaching 5 cm.^[13,21] Table 1 illustrates large case series of patients undergoing perineal urethroplasty.

Table 1. Case series of patients undergoing posterior urethroplasty

Study	Total urethroplasty	Perineal approach (%)	Mean length of the defect
Tunc et al. ^[14]	77	77 (100%)	NR
Hafez et al. ^[21]	35	35 (100%)	2.6
Lumen et al. ^[39]	61	61 (100%)	3.5
Gupta et al. ^[40]	138	138 (100%)	2.2
Cooperberg et al. ^[41]	134	129 (96%)	2.1
Kizer et al. ^[42]	142	137 (96%)	NR
Koraitim ^[43]	155	115 (74%)	3
Flynn et al. ^[44]	122	122 (100%)	3.1
Corriere ^[45]	63	58 (92%)	NR
Ennemoser et al. ^[46]	31	31 (100%)	2.5
Mundy ^[47]	82	82 (100%)	NR
Webster and Ramon ^[48]	74	74 (100%)	NR
NR: Not Reported			

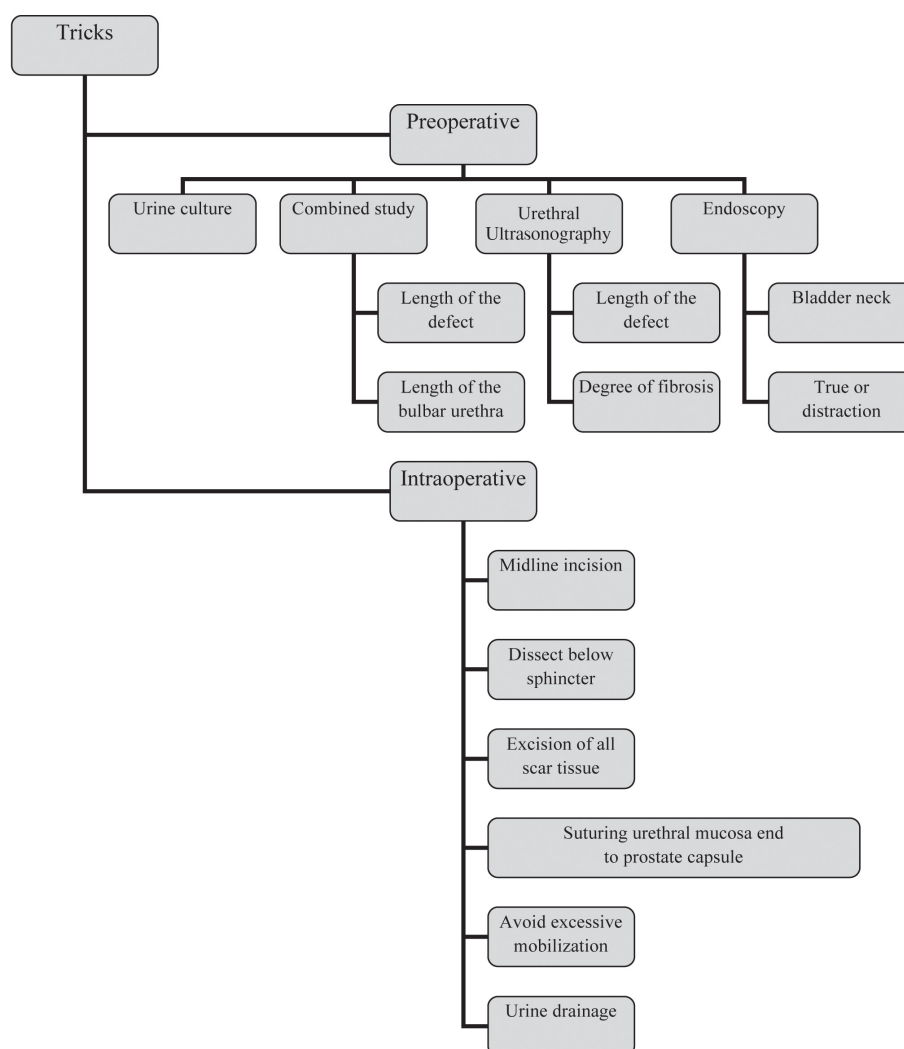


Figure 1 Algorithm for pre-operative and intra-operative tricks.

Question 4: Should primary realignment be performed or not?

Many authors^[22-25] have demonstrated a high success rate of endoscopic primary realignment, following post-traumatic posterior urethral stricture, with management of recurrent stricture either by repeated dilatation or urethroplasty.

Tunc et al.^[26] proposed a urethral dilation protocol, 10 days following endoscopic visual urethrotomy, and to be used frequently in the early weeks, to help prevent scar tissue development and decrease the rate of stricture recurrence, with a resulting 10% recurrent stricture versus 55% for cases not subjected for

post-operative dilation. Gucuk et al.^[27] proposed the same principal and combined steroids with dilation, to lower the recurrence rate.

We believe that the same principal can be used safely for cases with incomplete posterior urethral injury, where primary realignment can be done better endoscopically, followed by urethroscopy 2 to 3 weeks later to assess the urethral continuity and mucosal healing, which can even decrease the need for visual urethrotomy on follow-up.

Mouraviev et al.^[28] compared the results of patients that were treated by primary realignment and those with delayed repair urethroplasty. They concluded that

early urethral realignment was feasible and decrease the incidence for subsequent stricture therapy by 50%.

Many authors studied cases subjected to urethroplasty, following failed realignment, and they demonstrated no adverse effect of the previous manoeuvre on the success rate.^[29,30]

Asci et al.^[31] studied the sexual and voiding dysfunction following posterior urethral injuries caused by pelvic fracture with either delayed urethroplasty or immediate urethral realignment, they concluded that sexual and voiding dysfunctions are the result of injury itself, not the repair and that primary realignment cases had more favourable outcomes.

For children encountered with urethral trauma, early attempts may be best done, not only for primary realignment, but also for anastomosis. Many surgeons, since long time, prohibited immediate surgical management in children, thinking that any attempt to evacuate the pelvic hematoma may trigger more bleeding and may result in more injury to the pelvic nerves and vessels. However, we should consider that delaying the urethral trauma management in children would result in higher upper urethral end and prostate in the lower abdomen, with intervening hematoma, that would cause complex urethral stricture with a lower success rate and higher rate of complications.

Avanoglu et al.^[32] reported a series of 27 male children, of which 14 underwent primary realignment, 9 underwent primary alignment with anastomosis, and 4 underwent delayed repair. They concluded that primary realignment with urethral anastomosis had the highest rate of success with no major complications. Balkan et al.^[33] compared the results of repair of posterior urethral injury in children managed by delayed repair versus early realignment, and they concluded that urethral stricture in patients who underwent early realignment was less developed than in those who underwent delayed repair. Nerli et al.^[34] reported their long-term follow-up on 22 children and documented that immediate urethral realignment in children should be attempted to prevent long-term complications. Gundogdu et al.^[35] used primary realignment in the treatment of 12 children with complete posterior urethral rupture and reported that the stricture developed in most of them was dilatable, and they concluded that if the stricture developed in children post-primary realignment was dilatable, primary urethral realignment should be the initial treatment of choice for such patients.

Fig. 2 illustrates our approach for a case with post-traumatic posterior urethral stricture and implies our technique for primary endoscopic realignment as an initial measure, in addition to insertion of suprapubic catheter to ensure proper urine drainage, then followed by the previously discussed radiological studies to achieve definitive management.

Question 5 : Is perineal end-to-end anastomosis suitable for the children with high riding prostate?

Until recently it was believed that perineal urethroplasty in children is technically difficult, because the bladder and prostate are located in the abdomen, the pelvis is less capacious,^[36] and the perineum is confined in children.^[37]

Zhou et al.^[1] reported the long-term follow-up results of 25 boys and reported a success rate of 94.7% for simple stricture and 63.6% for complex strictures, that are considered satisfactory and comparable to the results of surgery applied to adults. Hafez et al.^[21] reported the long-term follow-up results of 35 children with post-traumatic posterior urethral stricture treated by single stage perineal urethroplasty and confirmed a high success rate of 89% for a mean stricture length of 2.6 cm. Orabi et al.^[4] reported their long-term follow-up findings of 50 children and confirmed the ability of perineal urethroplasty with or without inferior pubectomy to achieve tension-free urethral anastomosis for a gap up to 4 cm. Koraitim^[38] reported his findings on 68 children and concluded that the initial attempt in every case of urethral stricture should be by perineal approach and the transpubic procedure should only be used, if tension-free anastomosis could not be obtained.

Conclusion

Pre-operative evaluation of every case of urethroplasty should combine at least 3 modalities which are combined retrograde urethrogram and cystogram, urethral ultrasound, and endoscopic study. There are certain tips to be taken before and during surgery helping to improve the outcome, including sterile urine, tension-free anastomosis, and excision of all scar tissues avoiding excess mobilization of the anterior urethra. Most authors agree on 2.5 cm to be a safe defect length to achieve tension-free anastomosis, although longer defect may still be managed successfully, using perineal approach. Primary realignment is a simple procedure that we advise to start with, due to the high likelihood to decrease the need of surgical intervention. Similar to adults, perineal urethroplasty should be the first approach in children.

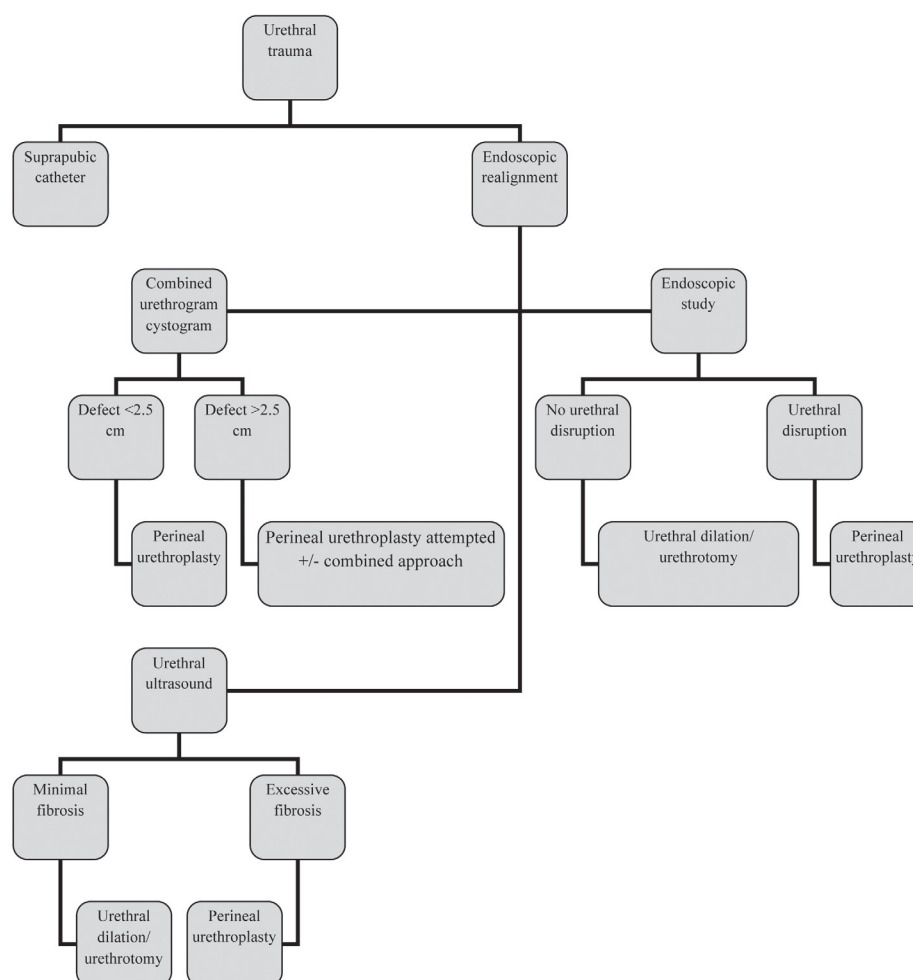


Figure 2 Algorithm for management of cases with posterior urethral stricture.

Conflict of interest

No conflict of interest was declared by the authors.

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