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## Review

## Q1 A brief review on anterior urethral strictures

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**Abstract** The treatment of urethral strictures remains a challenging field in urology even though there are a variety of procedures to treat it at present, as no one approach is superior over another. This paper reviewed the surgical options for the management of different sites and types of anterior urethral stricture, providing a brief discussion of the controversies regarding this issue and suggesting possible future advancements. Among the existing procedures, simple dilation and direct vision internal urethrotomy are more commonly used for short urethral strictures (<1 cm, soft and no previous intervention). Currently, urethroplasty using buccal mucosa or penile skin is the most widely adopted clinical techniques and have proved successful. Nonetheless, complications such as donor site morbidity remain a problem. Tissue engineering techniques are considered as a promising solution for urethral reconstruction, but require further investigation, as does stem cell therapy.

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## 1. Introduction

Urethral stricture is a common and challenging disease in urology. Currently, there are numerous surgical procedures

to treat this disease. However, the diversity of treatment modalities reflects the scarcity of an optimal technique [1].

The male urethra can be divided into two parts, the posterior urethra which consists of the membranous and

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prostatic urethra, and the anterior urethra which includes bulbar and the penile urethra. The bulbar urethra is enclosed by the bulbospongiosus muscle and the penile urethra runs from the distal margin of the bulbospongiosus to the fossa navicularis and external meatus.

Considering the variety of surgical treatment modalities, urologists must be up-to-date with the use of different surgical techniques to deal with various conditions. The purpose of this article is to overview the current management of anterior urethral stricture, providing a brief discussion of the controversies regarding this issue and possible future advancements.

## 2. Etiology

Urethral stricture in developed countries mainly involves the anterior urethra, in particular the bulbar tract, which accounts for 46.9% [2]. In addition, 30% occur in the penile urethra, and the remainder in a combination of the two and panurethra. The reasons for stricture also vary by site. Basically, the anterior urethral strictures are caused by the following:

- (1) Iatrogenic injuries are the most common reason for anterior urethral stricture [3]. In recent years, the rapid development of diagnosis and clinical techniques have resulted in more urological procedures performed in the clinic, leading to an increase in the incidence of iatrogenic injuries. Among the iatrogenic cases, catheterization appeared to be the most frequent cause, followed by hypospadias repair and transurethral surgery [2]. Mostly, stenotic segment caused by iatrogenic injury often involves the penile urethra and meatus, which may occur as a result of ischemia after urological endoscopic procedures, cardiovascular surgery or a long-term placement of an indwelling catheter.
- (2) Idiopathic strictures occur more commonly in the bulbar urethra and are more frequent in younger versus older patients (48% vs 23%) [4]. For younger patients, strictures may arise from unrecognized childhood trauma or a congenital anomaly in urethral development [5]. By contrast, decreased tissue blood supply and ischemia have been proposed as a possible mechanism in the older patients [6].
- (3) Traumatic scarring after blunt straddle injury causes urethral stricture in the bulbar tract involving the spongiosum tissue. The blunt perineal trauma compresses the urethra against the pubic symphysis [7], causing urethral incontinuity, local bleeding and urinary extravasation, giving rise to inflammation and scarring.
- (4) Inflammatory stricture refers to a post-infectious inflammatory reaction where the urethral lumen is narrowed [3]. This etiology is more common in undeveloped countries. In developed countries, lichen sclerosus is a more frequent cause of inflammatory strictures and often involves panurethra.

Other causes of anterior strictures such as infection, tumor, and prostatectomy only account for minor proportion.

## 3. Diagnosis and preoperative assessment

Before clinical treatment, a precise diagnosis and preoperative evaluation of anterior urethra stricture is necessary. While the American Urological Association symptom index captures the most common voiding complaints of men with urethral stricture, including lower urinary tract symptoms (LUTS) or acute urinary retention (AUR), 22.3% of patients have different presenting complaints [8]. The most common symptoms include spraying of urinary stream, dysuria or no symptoms. For men with lichen sclerosus, obstructive symptoms are more common. Sexual dysfunction was also reported, most commonly in patients with failed hypospadias repair and lichen sclerosus [9]. A validated, accurate methodology for diagnosis is needed to fully capture the presenting comprehensive voiding symptoms and other complaints of men with urethral stricture disease.

The current standard is to use combined ascending and descending urethrograms to image the urethra, supplemented by urethroscopy when necessary [10]. However, one study suggested that independently reported retrograde urethrograms (RUGs), which are not usually performed by urologists, are not as accurate as reported by primary physicians. Consequently, such information should be used with caution for preoperative planning [11]. By contrast, urethroscopy allows urologists to directly view the length and ischemic condition, which is favorable to the evaluation of urethral narrowing and selection of treatment option. Ultrasonography of the anterior urethra is a reliable and valuable procedure to help select the optimal anterior urethral reconstructive approach [12].

## 4. Management of anterior urethral stricture

The purpose of management of urethral stricture is to restore the defect of the urethra continuity and to regain a patent urethra. Treatment options include simple dilation, urethrotomy, and a variety of urethral reconstructive techniques such as tissue engineering techniques. The choice of the treatment option must take all factors into consideration, such as the site, length, etiology of the strictures as well as any previous surgery. In addition, it is widely acknowledged that there is no one appropriate procedure for all stricture conditions [13].

## 5. Dilation

As one of the most common modalities used in clinic, urethral dilation is less invasive with minimal side effects, and appropriate for patients unwilling to undergo urethral surgery. A randomized study [14] compared dilation and direct vision internal urethrotomy (DVIU), showing no significance difference in the curative outcomes between the two modalities. However, due to the high recurrence rate of this procedure, urethral dilation is often performed as a palliative maneuver and most patients will require a further urethral repairing surgery [13].

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