

Treatment of Urethral Stricture Disease by Internal Urethrotomy, Dilatation, or Stenting

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Abstract

Management of urethral strictures depends on the characteristics of each individual case and remains a great challenge in reconstructive urology. Treatment of anterior urethral strictures usually starts with minimally invasive procedures, such as urethral dilatation or internal urethrotomy. The popularity of these methods is based on the simple application, the low complication rate, and the fact that most general urologists do not perform open urethroplasty. These methods offer faster recovery, minimal scarring, and fewer infections, although recurrence is always possible. Success depends on adequate vascularity within the underlying spongiosal tissue, which may substantially increase the failure rate. Because the recurrence rate has remained higher than it was in past decades, various modifications of urethral stricture treatment have been suggested, including laser urethrotomy and urethral stents. Since the late 1980s, two different approaches have been studied to prevent scarring contraction: permanent stent versus temporary stents left indwelling for a limited time and then removed. Although the first reports seemed to promise excellent outcomes, longer follow-up began to cast doubt on the usefulness of urethral stenting as a primary treatment modality for urethral stricture disease. The purpose of our study was to evaluate the published literature with respect to any new information on minimally invasive procedures in the treatment of urethral strictures.

Patient summary: The optimal indications for dilatation or internal urethrotomy are simple bulbar strictures <2 cm without spongiofibrosis or history of previous treatment. Recurrent urethral strictures after repeated interventions are usually more complex and can render the definite open urethral surgery more difficult.

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1. Introduction

Urethral stricture disease presents the constriction of the urethral lumen caused by scarring or fibrosis of urethral mucosa or surrounding spongiosal tissue. The management of urethral stricture disease remains one of the most

challenging problems in urology, with a goal of creating a urethra of an adequate calibre by dilatation or endoscopic incisions of the stricture or by one of the recent techniques for urethroplasty [1,2]. Treatment of urethral strictures is complex and depends on the location, length, and character of the stricture [3]. It requires detailed knowledge of

anatomy and pathophysiology and proper selection of reconstructive techniques for each patient [4]. Less invasive procedures such as urethrotomy, stenting, or dilation continue to play roles in the treatment of urethral strictures, as a first-line option in some selected patients [5–8].

Incision (splitting) of the stenotic part of the urethra followed by spontaneous healing remains a unpromising method with a high rate of restenosis. The recurrence rates are higher in longer and multiple strictures, in penile compared with bulbar strictures, and in those with post-operative infections. Numerous techniques including catheterisation, repeated dilation, brachytherapy, and intraurethral use of various antifibrosis agents have been used to counter the process of wound contraction or to regulate the extracellular matrix [9]. However, there is insufficient evidence of efficacy for any of these techniques or agents. Data show that there is no difference between urethral dilation and internal urethrotomy in terms of long-term outcomes; success rates range widely from 8% to 80%, with long-term success rates of 20–30% [10–12]. For both procedures, the risk of recurrence is greater for men with longer strictures, penile urethral strictures, multiple strictures, presence of infection, or history of prior procedures [13]. Analysis has shown that repeated use of urethrotomy is neither clinically effective nor cost-effective in these patients. The clinical decision on the particular stricture recurrence-prevention technique should be carefully tailored to each patient [14]. In addition, most patients who were on intermittent dilation or self-dilation described difficulty and pain as moderate and inconvenience as low but reported poor quality of life [15]. Several rationales support the continued use of urethrotomy despite its lack of efficacy: It is a simple and quick procedure with a short recovery time and is perceived to have low incidence of complications [16].

To improve the poor overall outcomes of dilatation and urethrotomy, urethral stents are being used and continually modified as a minimally invasive treatment [1]. The concept of permanent urethral stenting was introduced by Milroy et al in 1988, when they presented a new modality for the treatment of urethral stricture disease [17]. Despite the promising outcomes in the first reported series, later reports showed a high stricture recurrence rate with stent-related complications such as incontinence, postvoiding dribbling, stent migration, perineal pain, or stent obstruction [18–22]. Disadvantages and high complication rates awoke interest in new, improved stents, including retrievable as well as biodegradable stents. Early reports using removable temporary stents are promising; however, time will confirm real expectations [23].

This paper reviews the techniques, results, indications, and complications for minimally invasive urethral stricture treatment.

2. Dilatation and internal urethrotomy

Dilatation and/or internal urethrotomy are standard procedures that are readily available and minimally invasive.

The main goal is to achieve a patent urethra with non-obstructive voiding and without voiding complications. Techniques vary from blind urethral dilatation and incision to direct-visualisation urethrotomy using a cold or hot knife or various types of lasers.

2.1. Dilatation

Dilatation is usually performed under local or general anaesthesia and involves stretching the stricture using progressively larger dilators. Thin dilators of increasing diameters are gently inserted into the urethra from the tip of the penis (meatus) to open up the urethral narrowing without causing any further injury to the urethra. The thinner dilators are safer because they do not easily make a false passage and cause trauma, which induces more fibrosis. Alternatively, the stricture can be dilated with urethral catheters of increasing size or with a special inflatable balloon. Balloon dilations have been reported as relatively atraumatic with minimal risk of false passage and possible trauma, spongiofibrosis, and stricture recurrence. This approach sometimes requires cystoscopy to pass the guide wire through the stricture or to inflate the balloon under direct vision [24,25]. New techniques have recently been recommended for the prevention of urethral trauma during dilation, such as a flexible-tip lubricated guide wire or hydrophilic guide wire followed by insertion of increasing diameters of dilators and/or a specially created (S-shape) coaxial dilator [26–28]. Dilation is rarely a cure and needs to be repeated periodically. If the stricture recurs too rapidly, the patient may be instructed on how to insert a catheter into the urethra periodically to prevent early closure. This procedure may need to be repeated from time to time, as strictures may recur. Finally, the principle of nontraumatic dilation is best described by the statement, “The skill of the urologist is measured by his gentleness” [29].

2.2. Internal urethrotomy

Internal urethrotomy is a method for stricture opening using transurethral incision, either by Otis urethrotome with a blind approach or under direct visualisation of the urethral channel (direct vision internal urethrotomy [DVIU]) [30]. The internal urethrotomy involves an incision through the scar to healthy tissue to allow for maintenance of a larger luminal calibre after healing. One of the main disadvantages of Otis urethrotome is the possibility of tearing the stricture rather than cutting it; tearing yields less favourable results. DVIU was popularised after the initial report of Sachse in 1970s [31]. His technique involved a single cold-knife incision through all visible scar tissue at the 12 o'clock position. Many authors later reported the same simple incision, since it minimises the risk of severe urethrorrhagia due to injury of the corpus cavernosum [10,32,33]. Recently, a survey of members of the American Urological Association showed that 86% of urologists in the United States perform only one incision at the 12 o'clock position [34]. Concerns have been raised

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