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Surgery in Motion

One-stage Penile Urethroplasty Using Oral Mucosal Graft and Glue

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Abstract

Background: Repair of penile urethral strictures is a challenging problem for which different techniques have been suggested.
Objective: To describe a new surgical technique for one-stage penile urethroplasty using an oral graft and glue, and to assess its safety and efficacy.
Design, setting, and participants: A retrospective review of medical records for patients who underwent one-stage penile urethroplasty using oral mucosa and glue from February 2013 to October 2014 was performed.
Surgical procedure: The penile urethra was opened and the urethral plate was incised to create a wide window within which the oral graft was pasted with glue. The urethra was sutured over the catheter.
Outcome measurements and statistical analysis: Clinical data were collected in a database. Intraoperative and postoperative complications and outcomes were assessed. A descriptive statistical analysis was performed.
Results and limitations: Fourteen patients were included in the study. Median operative time was 60 min. The median postoperative stay was 3 d. Three intraoperative and one postoperative complication occurred. In all patients, voiding cystourethrography 2 wk after surgery failed to show urethral fistula or sacculation. No patients complained of penile chordee or sexual dysfunction after surgery. Median follow-up was 16 mo. Among the 14 patients, 12 (85.7%) procedures were successful and two (14.3%) were failures. Study limitations include the small sample size and short follow-up.
Conclusions: An in vitro study and a one-stage reconstruction of penile urethral strictures with an oral mucosa graft and glue showed that the procedure is safe and efficient, but further studies including larger series of patients and longer follow-up are required.
Patient summary: We report on the repair of penile urethral stricture using one-stage urethroplasty with oral mucosa and glue. This new technique was safe and effective, with limited complications and satisfactory outcomes. We plan to increase the use of this technique in the future.

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1. Introduction

The aetiology of penile urethral strictures includes many and various causes. In developing countries, postinfection strictures related to *Neisseria gonorrhoea* still account for the majority of anterior urethral strictures. However, while infective urethritis has shown a decreasing trend in these countries, there has been an increase in strictures related to instrumentation and catheters [1–3]. Conversely, in developed countries there has been a decrease in infective urethritis and an increase in strictures related to iatrogenic idiopathic causes, lichen sclerosus (LS), and failed hypospadias repair [4–6].

Penile urethral strictures may require a one or two-stage repair. Complete obliteration of the external urethral meatus, wood-hard fibrosis that extends into the penile tract, and the removal of complex strictures associated with fistulae, scarring, chordee, abnormal meatus, small glans, and deficiency of the dartos layer are better managed using a staged reconstruction [7–9]. In one-stage penile urethroplasty, use of a flap or graft is still the suject of debate [10]. In recent years, graft use for anterior urethroplasty has become the most popular option for any augmentation tissue repair [10]. However, the current literature is too limited to answer the question of whether a flap or graft is superior for one-stage penile urethroplasty. Published reports include only a collection of retrospective patient series and meta-analysis, with variable definitions for stricture recurrence and successful outcomes, and success rates reported for penile urethroplasty using a flap or graft are similar [10].

In 1994, Snodgrass [11] described incision of the urethral plate for distal hypospadias repair, and in 1999 Hayes and Malone [12] suggested placement of a dorsal oral graft inlay into a Snodgrass incision of the urethral plate. In 2001, Asopa et al [13] suggested use of the techniques described by Snodgrass, Hayes, and Malone for hypospadias surgery for penile urethral stricture repair. In our centre, the Asopa technique for one-stage penile urethroplasty has been used since 2001, with a 81.8% success rate [14].

The aim of this study is to describe the technique for one-stage penile urethroplasty including new surgical innovations, and to assess outcomes in a preliminary series of patients at our high-volume centre.

2. Patients and methods

2.1. Study population

Data were retrospectively collected from the medical records for a consecutive series of 14 patients who underwent one-stage penile urethroplasty at our centre between February 2013 and October 2014. All patients were counselled about the risks, benefits, and alternative treatments before providing their informed consent. The last follow-up for each patient reflects the last point of contact with the office. Follow-up was calculated for each patient as the time elapsed between the date of surgery and the date of their last office follow-up. The institutional review board approved the study. Patients who had undergone one-stage penile urethroplasty using an oral graft and glue and who had minimum of 12 mo of follow-up met the inclusion criteria for the study. Patients with LS or incomplete clinical records at follow-up analysis were excluded from the study. The primary outcome of interest was postoperative failure-free survival in the overall population. The secondary outcome of interest was evaluation of laboratory findings.

Preoperative data collected included age, clinical history, urine culture, retrograde and voiding cystourethrography, urethral ultrasonography, and urethroscopy. Clinical data consisted of stricture aetiology (idiopathic, trauma, infection, catheter, instrumentation) and previous treatments (dilation, urethrotomy, or urethroplasty). Urethrography was used to assess the stricture length and site. Uroflowmetry and a urine culture were repeated every 6 mo in the first 2 yr and annually thereafter. When symptoms of decreased force of stream were present and the maximum urinary flow rate (Q_{max}) was $<$12 ml/s, urethrography, urethral ultrasound, and urethroscopy were repeated to fully document restricture features. Patient demographic data and stricture characteristics at presentation are reported in Table 1.

The glue used on patients in this study was Glubran 2 (GEM, Viareggio, Italy), an *N*-butyl-2-cyanoacrylate combined with a monomer (methacryloxy sulfolane) with good adhesive and haemostatic properties. The glue combination is ready to use and, once in contact with blood, the liquid and tissues polymerise in an exothermic reaction of approximately 45 °C [15]. The longer radical chain has a lower polymerisation temperature than Histoacryl, which results in lower toxicity and fewer inflammatory reactions [16]. Glubran 2 has been used for many procedures including skin closure of abdominal wounds, suture reinforcement, arterial-venous embolisation, endoscopic treatment of bleeding gastroduodenal ulcers and varices, occlusion of external biliary fistulas refractory to endoscopic drainage, endoscopic closure of pancreatic fistulas and for the fixation of polypropylene mesh in open and laparoscopic hernia repair, oncology and oral and cardiovascular surgery [16–19].

2.2. Laboratory tests in vitro

Preliminary studies on oral mucosa cells from tissue-engineered cultures were used to ascertain the effects of the glue on cells and tissues. Biopsy tissues from the bulbar urethra and oral mucosa were obtained from patients during urethroplasty. Urethral and oral mucosa keratinocytes were cultured on a feeder layer of lethally irradiated 3T3-J2 cells as previously described [20]. Fibroblasts were isolated by explant and cultivated on plastic. Cytotoxicity was analysed by dropping cyanoacrylic-based surgical glue on confluent keratinocyte and fibroblast cultures. Cultures were photographed and digitally analysed immediately and at up to 47 d. Dead cells were quantified at 24 h and 7 d. The long-term effects of adhesive contact on fibroblasts and keratinocytes were assessed by secondary plating and colony-forming efficiency assays, respectively.