

Abstract

Urethral stricture is increasing in prevalence, mainly due to the increase in the number of transurethral procedures.

The **gold standard** for the diagnosis of strictures in the anterior urethra is **retrograde cystourethrography (RCU)**, however, it has some **counterpoints**, such as the lack of accuracy in assessing the **length of the stenosis**, **lack of evaluation of spongiofibrosis** and the **use of ionizing radiation and contrast**.

Urethral ultrasound (UUS) is a relatively **simple** method to assess the length of stricture, in addition to demonstrating an **improved correlation with periurethral anatomy and the presence of spongiofibrosis**.

This study aims to evaluate the role of UUS in the assessment of male urethral stenosis and in optimizing the therapeutic decision.

Introduction

Urethral stenosis is an increasingly prevalent disease in our daily life, mainly due to the increase in the number of transurethral procedures (1)

There are several etiologies, which vary in incidence in different regions of the world (2). In developed countries, the disease is more associated with iatrogenic and idiopathic causes, unlike in developing countries, where the main cause is external trauma. Among the main causes of urethral stricture are inflammatory-infectious diseases (in particular gonorrhea and lichen sclerosus), external trauma, iatrogenic injuries, urethral catheterization, urethral instrumentation in surgical procedures, pelvic radiotherapy and brachytherapy, congenital and idiopathic causes (3,4)

Patients with urethral stenosis may evolve with reduced urinary stream, high post-void residual and lower urinary tract symptoms (5). The gold standard for diagnosing anterior urethral strictures remains RCU, due to its cost-effectiveness and accessibility, in addition to providing information on length and location, aiding surgical planning (6). However, the RCU has counterpoints, such as the lack of accuracy for assessing the length of the stenosis, absence of anatomical details such as spongiofibrosis, making use of ionizing radiation and contrast. Variations in the patient's position during the examination and penile traction can alter the radiographs and generate a low accuracy assessment of the stenosis, generally underestimating it. **UUS is a non-invasive, relatively simple and low-cost method to evaluate and determine the length of the stenosis, in addition to demonstrating better anatomical details, with more accuracy than URC and not requiring the use of antibiotics**

Methods and Materials

A comparative study was performed in 12 patients with anterior urethral stenosis, using UUS (12 MHz transducer) as a complement to RCU in the evaluation, to determine if there was a greater accuracy in length scouting of the stenosis, presence of spongiofibrosis and change in surgical approach

In the descriptive analysis, continuous variables were expressed in terms of summary measures (mean, median, standard deviation and quartiles), while categorical variables were expressed in terms of percentages.

Results

During the study, 31 patients who met the inclusion criteria were initially selected, and after applying the exclusion criteria, 12 patients with anterior urethral stenosis remained, who were evaluated and completed the entire protocol, having undergone RUC and UUS.

The mean age of the patients was 60.7 years, with 58.33% of the stenosis located in the bulbar and 41.67% in the penile urethra. The evaluation with UUS brought additional categories of information. **Spongiofibrosis was found in 66.67% of the cases**, with a **positive correlation with a change of surgical approach**, an alteration that cannot be found in the RCU. The **length of the stenosis at UUS showed a greater correlation with intraoperative findings** than the values found at RCU, with significance. The **change in therapeutic modality** occurred in **58.33% of patients after UUS**, due to the increased size of the stenosis and the presence of spongiofibrosis.

Results

Most patients (66.67%) reported some type of discomfort/pain during the RUC, while 91.67% of the patients stated that they had no discomfort during the UUS.

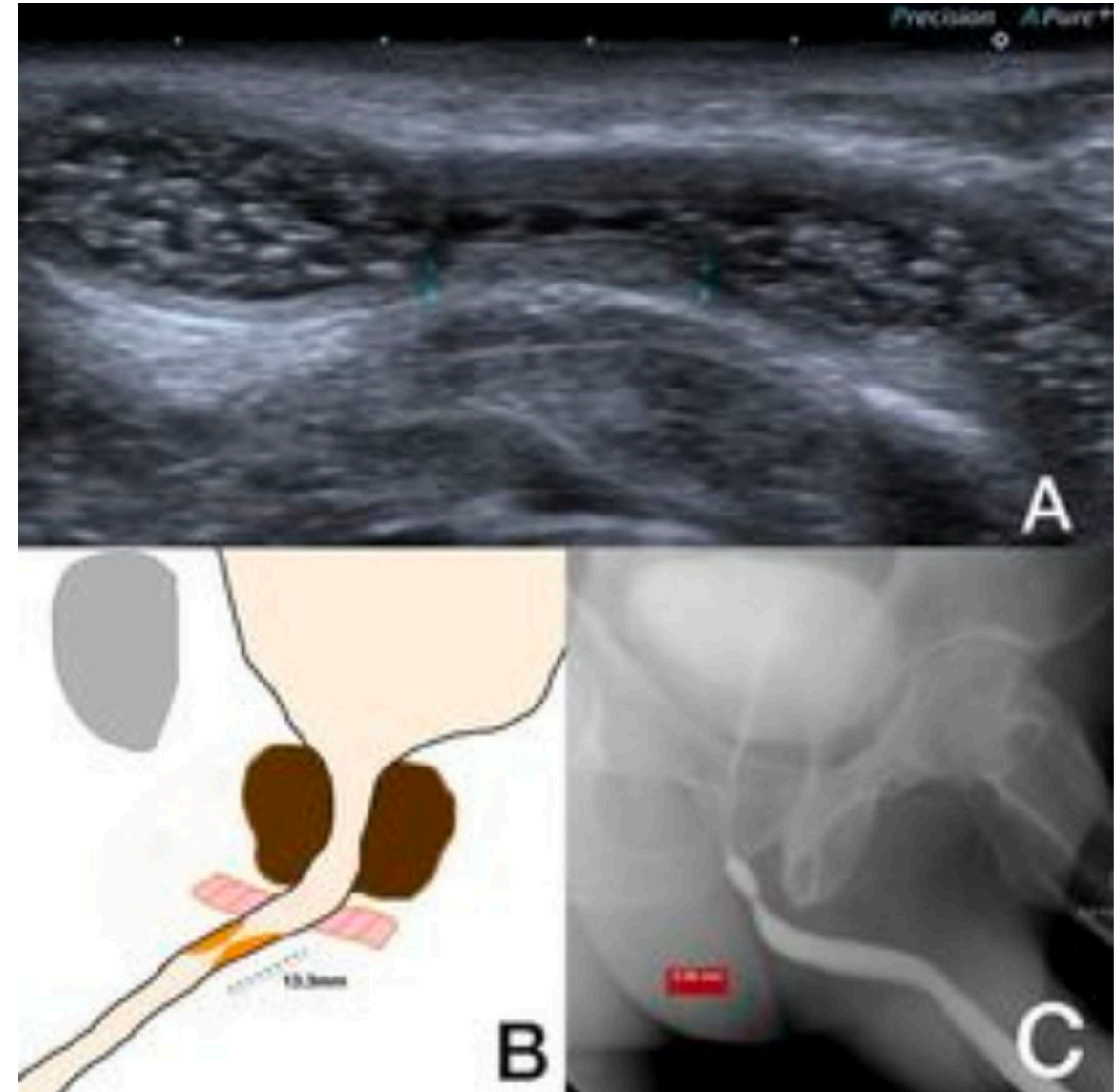


Figure 1 - A: UUS bulbar stenosis; B: Graphic model; C: RCU bulbar stenosis;

Discussion

Urethral stenosis usually affects young adults, causing morbidity and discomfort. Patients may present with obstructive symptoms, infection, or urinary retention. The precise determination of the urethral stenosis is determinant and critical for the treatment decision of these patients. The RUC is the most used technique in the diagnosis and the UUS has been presenting itself as a new tool for additional evaluation of the urethra, with better evaluation of the length, location of the stenosis and evaluation of periurethral tissues. **UUS identified the presence of urethral stenosis in 100% of cases with a previous diagnosis of RUC.** Treatment of anterior urethral stenosis is complex, and larger stenosis are best treated with reconstructive surgical techniques, while small stenosis can be treated by endoscopic techniques.

While RUC can detect stenotic disease, it does not provide a correct assessment of the extent of spongiofibrosis and can measure the length of the stenosis with less precision, which can directly impact the correct choice of surgical technique. **The use of UUS provides a real benefit in the evaluation of these characteristics.** Spongiofibrosis is another critical determinant for appropriate treatment and prognostic definition. **An excess of fibrotic tissue leads to a high rate of recurrence.** The **evaluation of stricture length seems to be more accurate in UUS** than in RUC, and the presence of spongiofibrosis is manifested by periurethral tissue thickening, associated with increased tissue echogenicity and the presence of posterior acoustic shadowing in the affected region. However, the dynamic nature of UUS can determine the presence and degree of spongiofibrosis, by evaluating the formation of an echogenic shadow along the stenosis or affected areas, resulting from a high deposition of collagen.

The main limitation of this study is represented by the small number of patients, which, in the end, only allowed us to define preliminary conclusions

Conclusions

A UUS protocol was carried out in individuals with anterior urethral stenosis, where UUS, which is a simple, safe and effective exam for the evaluation of the anterior urethra, is used in a complementary way to traditional methods.

In contrast to RUC, this three-dimensional dynamic study is more accurate for assessing the length of the stenosis and allows for a better characterization of the stenosis in terms of evaluating periurethral tissues, such as the presence of spongiofibrosis.

Additionally, during UUS the patient is not exposed to ionizing radiation and the use of iodinated contrast. It has also been demonstrated that it is an exam with less discomfort for the patient during its performance.

References

1. Verla W, Oosterlinck W, Spinoit AF, Waterloos M, Martins FE. A Comprehensive Review Emphasizing Anatomy, Etiology, Diagnosis, and Treatment of Male Urethral Stricture Disease. Vol. 2019, BioMed Research International. Hindawi Limited; 2019.
2. Alwaal A, Blaschko SD, McAninch JW, Breyer BN. Epidemiology of urethral strictures. Transl Androl Urol. 2014 Jun;3(2):209–13.
3. Lumen N, Campos-Juanatey F, Dimitropoulos K, Greenwell T, Martins FE, Osman N, et al. Urethral Strictures EAU Guidelines on. 2022.
4. Latini JM, McAninch JW, Brandes SB, Chung JY, Rosenstein D. SIU/ICUD Consultation on Urethral Strictures: Epidemiology, Etiology, Anatomy, and Nomenclature of Urethral Stenoses, Strictures, and Pelvic Fracture Urethral Disruption Injuries. Urology. 2014 Mar;83(3):S1–7.
5. Wessells H, Angermeier KW, Elliott S, Gonzalez CM, Kodama R, Peterson AC, et al. Male Urethral Stricture: American Urological Association Guideline. Journal of Urology. 2017 Jan 1;197(1):182–90.
6. Rosenbaum CM, Reiss CP, Borgmann H, Salem J, Fisch M, Huber J, et al. Management of Anterior Urethral Strictures in Adults: A Survey of Contemporary Practice in Germany. Urol Int. 2017;99(1):43–50.
- 7.