Correlation between retrograde urethrography and ultrasound in urethral stricture diagnosis

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ABSTRACT

Background: Generally we refer to urethral stricture as a pathology that affects the anterior urethra. Posterior urethral stricture has different etiologies and is generally secondary to disruption caused by pelvic fracture. The study of choice for evaluation of the urethra has traditionally been retrograde micturating cystourethrography (MCU). McAninch et al. began evaluating the male urethra through sonourethrography (SUG). The aim of our study was to compare MCU and SUG in the study of the urethra and to determine their clinical correlation. We retrospectively analyzed patients diagnosed with urethral stricture within the time frame of January 1999 to June 2010 that were registered in our hospital database.

Methods: Nineteen patients with urethral stricture that fit the inclusion criteria were analyzed and the measurements obtained through MCU and SUG were compared.

RESUMEN

Introducción: Generalmente nos referimos a la estenosis uretral como una patología que afecta a la uretra anterior. Por otro lado, la estenosis de uretra posterior tiene etiologías diferentes y es generalmente secundaria a la disrupción provocada por una fractura de pelvis. Históricamente, el estudio de elección para la evaluación de la uretra ha sido la cistouretrografía retrógrada miccional (CURG). McAninch y colaboradores iniciaron la evaluación por ultrasonido de la uretra masculina (USU).

Objetivo: El objetivo de nuestro estudio es comparar la CURG con el USU en la uretra, para conocer la correlación clínica. Analizamos de manera retrospectiva la base de datos de los pacientes con diagnóstico de estenosis uretral de nuestro Instituto, entre enero de 1999 a junio del 2010.

Material y métodos: Se analizaron a 19 pacientes con diagnóstico de estenosis de uretra, que cumplieran los
Results: A correlation coefficient of 0.691 was obtained with a $p < 0.001$ for the MCU measurements. Our case series produced results that were comparable with those established in the medical literature. The existing correlation between both study methods is good and it is better in strictures that are longer than 2 cm.

Conclusions: MCU and SUG correlation is satisfactory, especially in strictures longer than 2 cm.

Keywords: Urethral stricture, retrograde urethrocystogram, sonourethrography, Mexico.

INTRODUCTION

We generally refer to urethral stricture as a pathology that affects the anterior urethra and that is secondary to compressive-type traumatic injury (fractures, iatrogenic injury) or to inflammatory lesions (infections). On the other hand, posterior urethral stricture has different etiologies and is generally secondary to disruption caused by a pelvic fracture. The study of choice for evaluating the urethra has traditionally been retrograde micturating cystourethrography (MUC); however, there are limitations secondary to variations in the position and retraction of the penis that can considerably modify the appearance of the stricture zones. Likewise, MUC only provides information on the urethral lumen. It is not able to evaluate the adjacent periurethral tissue, particularly corpus spongiosum fibrosis resulting from the lesion known as spongiofibrosis, which is an important factor when planning surgical treatment. In the case of complex strictures, their characteristics and their extension cannot be precisely determined, thus limiting surgical planning.

McAninch et al. studied the male urethra through sonourethrography (SUG) during the mid 1980s in San Francisco, California. Their objective was to precisely evaluate urethral strictures by introducing a gel or saline solution and taking sequential images and they demonstrated a greater sensitivity and specificity in relation to anterior urethral stricture characterization with this imaging method than with MUC. Therefore, the aim of our study was to compare MUC and gray scale SUG to determine whether or not there was a preoperative clinical correlation between these two methods in our hospital center.

METHODS

We retrospectively analyzed the patients diagnosed with urethral stricture within the time frame of January 1999 and June 2010 at our institution from the information contained in the hospital database. All patients that had preoperative MUC and SUG were included in the study. The analyzed variables were: length, degree of spongiofibrosis, and minimum urethral diameter. The ultrasound studies were done by two radiologists (APB and CCG) and cystourethrography was carried out at the Radiology and Imaging Department of our institute and reviewed by the same two radiologists (APB and CCG).

A correlation analysis with the Spearman correlation coefficient test was used to make the statistical analysis.

RESULTS

Nineteen patients diagnosed with urethral stricture that met the inclusion criteria were enrolled in the study. MUC and SUG measurements were compared. A correlation coefficient of 0.691 with a $p<0.001$ was obtained between the MUC and SUC measurements. Figure 1 shows the correlation in a dispersion diagram. Stricture length measured by MUC was stratified into
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Can be used as a good screening method for patients with symptoms that are suggestive of stricture. Its main disadvantage is technical variation, which can result in both the overestimating and underestimating of the stricture.5, 6

McAninch began analyzing strictures through SUG in 1988. This method is not often used in the evaluation of urethral pathology, perhaps because its benefits are not widely known and because the general radiologist may not be familiar with the technique. However, this modality provides a multiplanar evaluation of the urethra, and there is no need for ionic contrast material or ionizing radiation administration.5 It can be an outpatient procedure carried out at the patient's bedside or in the physician's office. The study can be used as an intraoperative guide and as a postoperative evaluation. In addition to precisely determining stricture length and diameter, SUG also provides periurethral information that is very important for making surgical treatment decisions. An exact evaluation of stricture length is obtained through SUG, even of the small bulbar strictures that can be underestimated with MUC.

Three groups: < 1 cm (group 1), 1 - 1.99 cm (group 2), and > 2 cm (group 3). The correlation between the lengths measured by MUC and by SUG was obtained for each group. In group 1 the correlation was 0.150 (p=0.749), in group 2 it was 0.536 (p=0.215), and in group 3 it was 0.947 (p=0.014) (Table 1). The correlations are shown in dispersion diagrams (Figures 2 to 4).

Table 1. MUC and SUG analysis correlation by groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Length</th>
<th>Correlation*</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>&lt; 1</td>
<td>0.150</td>
<td>0.749</td>
</tr>
<tr>
<td>Group 2</td>
<td>1.1 - 1.9</td>
<td>0.536</td>
<td>0.215</td>
</tr>
<tr>
<td>Group 3</td>
<td>&gt; 2</td>
<td>0.947</td>
<td>0.014</td>
</tr>
</tbody>
</table>

*Spearman correlation coefficient.

Urethral strictures have been classified into two large groups: anterior and posterior. This classification has both etiologic and therapeutic purposes. Anterior strictures are generally secondary to trauma or infection and are usually associated with a scarring in the surrounding tissue (corpus spongiosum) known as spongiofibrosis. Clinically, urethral strictures present with a decrease in urinary flow, associated infections such as epididymitis or prostatitis, and a small group of patients can present with acute urinary retention.2 It is crucial to preoperatively determine stricture length in order to establish the best therapeutic option. Traditionally, those strictures that do not surpass 1.5 cm in length can be managed endoscopically (internal urethrotomy) with good results, whereas the first choice treatment for strictures > 1.5 cm is surgery.

Since 1910, when Cunningham popularized MUC, it has been considered the criterion standard for urethral stricture diagnosis.4 Nevertheless, since the 1980s other imaging methods have been incorporated, such as gray scale SUG and magnetic resonance imaging (MRI). MUC offers the advantages of: a low exposure to radiation, speed, availability, low cost, and good diagnostic capacity. In addition it can be used as a good screening method for patients with symptoms that are suggestive of stricture. Its main disadvantage is technical variation, which can result in both the overestimating and underestimating of the stricture.5, 6

McAninch began analyzing strictures through SUG in 1988. This method is not often used in the evaluation of urethral pathology, perhaps because its benefits are not widely known and because the general radiologist may not be familiar with the technique. However, this modality provides a multiplanar evaluation of the urethra, and there is no need for ionic contrast material or ionizing radiation administration.5 It can be an outpatient procedure carried out at the patient's bedside or in the physician's office. The study can be used as an intraoperative guide and as a postoperative evaluation. In addition to precisely determining stricture length and diameter, SUG also provides periurethral information that is very important for making surgical treatment decisions. An exact evaluation of stricture length is obtained through SUG, even of the small bulbar strictures that can be underestimated with MUC.

![Figure 1. Length of urethral stenosis by cystourethrography vs ultrasound.](image1.png)

![Figure 2. Group 1.](image2.png)
In 1996 Chou et al. described a classification based on stricture length and spongiosal tissue involvement. They established the following categories of urethral stricture:7

I Short stricture (< 2.5 cm in length) with a minimum of spongiosal tissue involvement
II Short stricture with moderate spongiosal tissue involvement
III Short stricture with important spongiosal tissue involvement
IV Long stricture (> 2.5 cm) or multiple strictures with moderate spongiosal tissue involvement
V Long stricture or multiple strictures with extensive spongiosal tissue involvement

In 2004, Choudhary et al. published a case series comparing MUC and SUG in the diagnosis of anterior strictures. They reported that both methods had a similar diagnostic capacity, but SUG was superior in estimating bulbar urethral strictures, in stricture length precision, in visualizing the surrounding tissue, and in determining the degree of tissue involvement (spongiofibrosis).8 In 2004, Babnik et al. suggested that both studies should be jointly carried out for a better diagnosis.9 Recently El-Ghar et al. published a series of 30 patients that compared MRI and the combination of SUG and MUC. They concluded that the combination of these two studies provided the same diagnostic accuracy as the MRI study. However, the MRI had the advantage of evaluating the secondary pathologies of the cohort (fistulas, lithiasis).1

The results of our case series were comparable to those established in the medical literature; the existing correlation between the two methods is good and it is better in strictures that are longer than 2 cm. To the best of our knowledge, this case series is the first to be published in Mexico. The fact that it is retrospective and that its cohort is small are limitations to our study.

CONCLUSIONS

The correlation between MUC and SUG is adequate, especially in strictures longer than 2 cm. We consider SUG to be a complementary method for achieving an improved lesion characterization in order to plan and carry out a better surgical technique.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FINANCIAL DISCLOSURE

No financial support was received in relation to this article.

REFERENCES

