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*Screening, Diagnosis, and Prevention in Clinical Practice:
Evidence from Argentine and Latin American Medicine
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Value of preoperative urodynamic testing for the diagnosis of occult urinary incontinence in pelvic organ prolapse experience at the Sanatorio de la Mujer, Rosario

Valor del estudio urodinámico preoperatorio para el diagnóstico de Incontinencia Urinaria Oculta en Prolapso de Órganos Pélvicos, experiencia del Sanatorio de la Mujer, Rosario

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ABSTRACT

Introduction: pelvic floor disorders, such as pelvic organ prolapse (POP) and urinary incontinence (UI), significantly affect more than 50 % of women over the age of 60, coexist in up to 70 % of cases, and share common pathophysiological factors. A common complication associated with POP is occult stress urinary incontinence (OSUI), which can manifest as de novo urinary incontinence after corrective surgery. Preoperative diagnosis of OSUI using multichannel urodynamic studies, considered the gold standard, allows both conditions to be treated simultaneously in a single surgical procedure.

Objective: to identify the capacity of urodynamic studies to diagnose the presence of CUUI prior to surgery to resolve pelvic organ prolapse.

Method: observational, descriptive, retrospective, cross-sectional study that included patients between 40 and 90 years of age with stage II, III, or IV POP who underwent reconstructive surgery at the Sanatorio de la Mujer, Rosario, between September 2022 and January 2024. Data were collected from clinical records and surgical protocols, analyzing urinary continence at 10 and 40 days postoperatively.

Results: 11,4 % of patients developed de novo stress urinary incontinence, with a higher mean age (64,2 years) compared to those who did not present this complication (59,7 years). Diagnostic tests revealed that urethral hypermobility had a sensitivity of 75 % and a specificity of 25 %, while the provocation test was highly specific (100 %) but had zero sensitivity.

Conclusion: the urodynamic study showed a high capacity to diagnose preoperative SUI, preventing de novo urinary incontinence in 89 % of patients. However, its accuracy needs to be improved, particularly in patients with predisposing factors such as advanced age and severe stages of POP.

Keywords: Pelvic Organ Prolapse; Occult Stress Urinary Incontinence; Urodynamic Studies; De Novo Urinary Incontinence.

RESUMEN

Introducción: las patologías del piso pélvico, como el prolapso de órganos pélvicos (POP) y la incontinencia urinaria (IU), afectan significativamente a más del 50 % de las mujeres mayores de 60 años, coexisten hasta en un 70 % de los casos y comparten factores fisiopatológicos

comunes. Una complicación frecuente asociada al POP es la incontinencia urinaria de esfuerzo oculta (IUEO), que puede manifestarse como incontinencia urinaria de novo tras la cirugía correctiva. El diagnóstico preoperatorio de IUEO mediante estudios urodinámicos multicanal, considerados el estándar de oro, permite tratar simultáneamente ambas condiciones en un único procedimiento quirúrgico.

Objetivo: identificar qué capacidad tiene el estudio urodinámico de diagnosticar la presencia de IUEO previo a la cirugía resolutive del prolapso de órganos pélvicos.

Métodos: estudio observacional, descriptivo, retrospectivo y de corte transversal que incluyó a pacientes de entre 40 y 90 años con POP en estadios II, III o IV, sometidas a cirugía reconstructiva en el Sanatorio de la Mujer, Rosario, entre septiembre de 2022 y enero de 2024. Los datos se recolectaron a partir de registros clínicos y protocolos quirúrgicos, analizando la continencia urinaria a los 10 y 40 días postoperatorios.

Resultados: El 11,4 % de las pacientes desarrollaron incontinencia urinaria de esfuerzo de novo, con una edad media mayor (64,2 años) respecto a quienes no presentaron esta complicación (59,7 años). Las pruebas diagnósticas revelaron que la hipermovilidad uretral tuvo una sensibilidad del 75 % y una especificidad del 25 %, mientras que la prueba de provocación fue altamente específica (100 %) pero con sensibilidad nula.

Conclusión: el estudio urodinámico mostró alta capacidad para diagnosticar la IUEO preoperatoria, evitando incontinencia urinaria de novo en el 89 % de las pacientes. Sin embargo, es necesario perfeccionar su precisión, particularmente en pacientes con factores predisponentes como edad avanzada y estadios severos de POP.

Palabras clave: Prolapso de Órganos Pélvicos; Incontinencia Urinaria de Esfuerzo Oculta; Estudios Urodinámicos; Incontinencia Urinaria se Novo.

INTRODUCTION

Female pelvic floor disorders have been underestimated and therefore underdiagnosed throughout history, culturally considered a “normal” part of the aging process in women and “logical” as a result of obstetric history and hormonal changes, among other factors, that women experience throughout their lives.

The truth is that these pathologies are highly prevalent (more than 50 % of the female population over 60 years of age) and often have a serious impact on the quality of life of patients and their immediate environment, as we will see, which can lead to more serious pathologies (Arias Amador et al., 2021).

In turn, another problem we have historically faced is the low rate of consultations by women, due to the modesty or embarrassment generated by urogynecological symptoms, such as involuntary urine loss, the presence of a vaginal lump, and/or anal incontinence (Tizón-Bouza et al., 2020).

Currently, in line with the leading role that women have gained in society, these issues are increasingly being discussed, more information is available, women are more encouraged to seek help, and urogynecology (the specialty that addresses this group of pathologies) has undergone exponential growth in the last 20 years.

The first medical challenge has been to eradicate the cultural concept of “normality” for symptoms that severely affect women. That, in addition, have multiple treatments that can

greatly improve them and, in many cases, even cure them permanently.

Among the most prevalent and important urogynecological pathologies are pelvic organ prolapse (POP) and urinary incontinence (UI), which, although they are distinct and independent pathologies, can occur simultaneously in up to 70 % of cases because they share the same pathophysiological mechanisms and predisposing factors (Espitia de la Hoz, 2019).

UI is defined by the International Continence Society (ICS) as a complaint of involuntary urine loss.

There are different types of UI, including stress urinary incontinence (SUI), urge urinary incontinence (UUI), and a combination of both in the same person, known as mixed urinary incontinence (MUI).

IUE is defined as involuntary urine leakage during physical exertion or activity (e.g., sports), or when sneezing or coughing. Meanwhile, IUU is defined as involuntary urine leakage associated with urgency (Haylen et al., 2010).

The ICS defines POP as the descent of one or more of the following structures: the anterior vaginal wall, the posterior vaginal wall, and the apex of the vagina (cervix/uterus) or dome after a hysterectomy (Haylen et al., 2010).

However, the problem we face in this group of patients is the underestimation of the presence of potential coexisting SUI, given the high association between both pathologies, as mentioned previously.

In other words, we often encounter patients who consult for POP and who do not present with SUI in their daily lives, only reporting the symptom of a lump and even difficulty emptying their bladders (Espitia de la Hoz, 2019).

We know that the definitive treatment for POP is primarily surgical, involving reconstructive pelvic floor surgery to reposition the prolapsed compartments in their original place and restore their proper function (Walters & Karram, 2008).

Twenty-five percent of women with POP who do not report SUI will develop the symptom (SUI de novo) after prolapse surgery if this condition is not diagnosed and treated properly. This preoperative situation is called “hidden or potential urinary incontinence” (HUI) (Loaiza Quirós & Parada Peña, 2021).

It is therefore important to note that prior diagnosis allows us to treat both POP and occult stress urinary incontinence (OSUI) simultaneously (in the same surgical procedure), as well as to avoid unnecessary treatments in patients who do not have this condition, thereby reducing costs and possible complications (Van der Ploeg et al., 2016).

As we have said previously, over the last 20 years, urogynecology has undergone revolutionary developments in both innovative conservative and surgical treatments, as well as in the complementary studies carried out before treatment, which have exponentially reduced postoperative complications and recurrences, as well as “de novo” urinary incontinence.

This is where multichannel urodynamic testing comes in. Despite its limitations, it is

considered the gold standard in the study of urinary incontinence. However, its ability to diagnose occult SUI in POP is debated in the literature (Serati et al., 2019).

Therefore, the value of urodynamic testing as the main element for diagnosing the risk of de novo SUI after POP surgery is taken into consideration and questioned.

What is the value of urodynamic testing for the diagnosis of OUI before POP surgery and its role in strategic surgical decision-making?

Objective

To assess the ability of urodynamic testing to diagnose the presence of OUI prior to surgery to resolve pelvic organ prolapse.

METHOD

Design

A quantitative, observational study was conducted using a descriptive, cross-sectional, retrospective design. Urodynamic studies performed between September 2022 and January 2024 were collected and analyzed.

Scope

This research was conducted in the Gynecology Department of the Sanatorio de la Mujer, Rosario, Santa Fe, Argentina. It is a private hospital located in the city center.

Population and sample selection criteria

The study included adult female patients with stage 2, 3, or 4 pelvic organ prolapse who did not have associated stress urinary incontinence and who underwent reconstructive surgery at the Gynecology Department of the Sanatorio de la Mujer during the period, and whose urodynamic study prior to surgery was negative.

Inclusion criteria

- Patients over 40 years of age.
- Patients with negative results from their urodynamic study prior to surgery.

Exclusion criteria

- Patients undergoing concomitant anti-incontinence surgery.
- Patients with positive results in their preoperative urodynamic study.

Among the women who met the sample selection criteria, two groups were formed based on the presence or absence of postoperative continence.

Sampling and sample size

Sampling was non-probabilistic and convenience-based. The final sample consisted of those patients who met the inclusion criteria specified for this study.

Instruments

A review of secondary sources and medical records was conducted, obtaining data from urodynamic studies and surgical procedures performed by the Pelvic Floor Department of the Sanatorio de la Mujer from September 2022 to January 2024.

Data were collected from the urodynamic studies of all patients who underwent POP surgery during the period, with a special focus on the diagnosis of SUI.

The surgical protocols and postoperative follow-ups of patients who, according to urodynamic tests, did not present OUI by reducing the prolapse through provocation maneuvers were analyzed.

This made it possible to determine how many of these patients remained continent after surgery, confirming the initial diagnosis, and how many developed de novo urinary incontinence in the postoperative period (evaluated at 10 and 40 days), even though the study had not detected OUI.

With these data, recorded on a spreadsheet (see Appendix 3), the failure rate of the urodynamic study and its ability to predict the onset of de novo SUI were calculated.

Definitions

Instrumentation: refers to the use of suction cups or forceps in vaginal deliveries.

Pelvic organ prolapse: refers to the descent of one or more organs, including the uterus, vagina, urethra, bladder, rectum, sigmoid colon, or small intestine, from their normal anatomical position.

Urinary incontinence refers to any involuntary loss of urine. **POP-Q classification:** refers to a standardized system for pelvic organ prolapse, where the system provides measurements at nine (9) points on the vaginal walls and vulva using stress maneuvers. The prolapse quantification profile offers an ordinal staging system for POP, in which these measurements are used to identify five stages (0-1-2-3-4) of POP.

Urodynamic study results: refer to the tests carried out during the study and observation of urethrovaginal behavior during the filling and emptying phases.

Variables

- **Age:** discontinuous quantitative variable. Recorded according to the patient's date of birth.
- **Parity:** discontinuous quantitative variable. Recorded according to the number of pregnancies (P), natural births (B), cesarean sections (C), abortions (A), and ectopic pregnancies (EP).
- **Higher birth weight:** quantitative variable. Recorded according to the highest weight of the children she has had.
- **Instrumentation:** dichotomous nominal qualitative variable. Recorded according to whether or not the patient had instrumentation during her pregnancies.
- **Pelvic organ prolapse:** dichotomous nominal qualitative variable. Recorded according to whether or not the patient presented symptoms of POP.
- **Urinary incontinence:** dichotomous nominal qualitative variable. Recorded according to whether or not the patient presented symptoms of UI.
- **Prolapse classification (POP-Q):** ordinal qualitative variable. Recorded according to the stage of prolapse, with stages 1, 2, 3, or 4 possible.
- **Urodynamic study result:** dichotomous nominal qualitative variable. Recorded according to the result of the preoperative urodynamic study, with a possible negative or positive result.

- Surgery: nominal polytomous qualitative variable. Recorded according to the type of surgery performed on the patient to resolve the prolapse.
- Post-surgery: polytomous nominal qualitative variable. Recorded according to the patient's condition after surgery, at 10 and 40 days. Possible outcomes were stress urinary incontinence, urge urinary incontinence, mixed urinary incontinence, or 100 % continence.

Data analysis

The analysis of the data obtained was exported to Excel, where the findings could be visualized using graphs and tables.

The demographic and clinical characteristics of the patients were described using descriptive statistics. Age was presented as the mean and standard deviation. Other variables, such as parity and obstetric history, were summarized using frequencies and proportions.

The results of the preoperative urodynamic study were summarized using frequencies and proportions. The frequency of postoperative de novo SUI was determined as the proportion of patients with new symptoms of urinary incontinence after POP surgery.

To evaluate the relationship between preoperative urodynamic results and the occurrence of de novo SUI, groups with and without de novo SUI were compared using Student's t-tests or ANOVA (for continuous variables) and chi-square (for categorical variables). The ability of preoperative urodynamic testing to predict de novo SUI was evaluated using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

Ethical considerations

The principles established in the Declaration of Helsinki and the Personal Data Protection Law (Law 25,326), applicable throughout the national territory, were respected, ensuring the anonymity of patients and the confidentiality of the information obtained. Authorization was obtained from the Gynecology Department of the Sanatorio de la Mujer in Rosario to conduct the study, and approval from the Medical School Administration was also obtained.

RESULTS

A sample of 42 participants was obtained, of which 35 met the established inclusion criteria. Seven cases were excluded for failing to meet eligibility requirements or for incomplete data. The final sample consisted of 35 female patients. The mean age was 60,1 years, with a standard deviation of 8 666.

The baseline characteristics of the sample showed that 100 % of the participants had a history of at least one pregnancy. Among the patients, 4 (11,3 %) had a single pregnancy, 12 (34,2 %) had two pregnancies, 11 (31,4 %) had three pregnancies, and 8 (22,8 %) had four pregnancies.

These results show that 93 pregnancies occurred among the 35 patients studied. Of the total pregnancies, 82 (88,1 %) resulted in vaginal delivery. Among the remaining 11 pregnancies, 6 resulted in cesarean section, 4 ended in miscarriage, and 1 resulted in an ectopic pregnancy.

In addition, the baseline data for this study showed that forceps were used during delivery in 6 of the women studied. This means that of the 82 pregnancies that ended in delivery, instruments were used in 7,3 % of cases. Another important finding that was corroborated was

the higher weight of the children born. The average weight was 3,725 grams, ranging from 2,870 to 4,500 grams.

Of the 35 patients studied, 12 (34,2 %) had a history of having a child with a high birth weight (> 4,000 g).

These patients underwent a thorough medical history review, which confirmed that all had symptoms of POP, i.e., 100 % had a foreign body sensation, lump, or heaviness.

However, only 3 of them had symptoms compatible with SUI, and only 8,5 % had symptoms compatible with involuntary urine loss, either associated with stress or urgency.

The physical examination of the patients confirmed the presence of POP and the stage of each patient using the POP-Q (Pelvic Organ Prolapse Quantification) system. Figure 7 shows the percentage of prolapse predominance in our patients. Stage III Ba with an apical component was the most frequent.

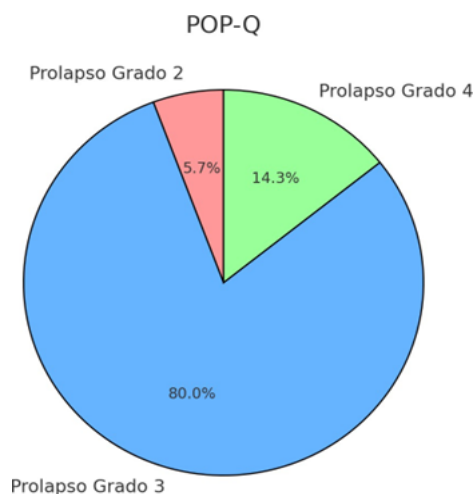


Figure 1. Stages of POP

Prior to definitive POP surgery, it was important to verify each patient's continence using various tests. To this end, the urethral hypermobility test and the provocation test were used as key tools for functional and diagnostic evaluation.

In the urethral hypermobility test, of the 35 patients evaluated, 9 (25,7 %) had normal or negative results, and 26 (74,3 %) had positive results.

In the provocation test, all patients (100 %) had negative results. This test was performed with manual reduction of the prolapse using either a pessary or a gauze swab.

Colpohysteropexy to the sacrospinous ligament with harpoons + anterior colporrhaphy (AC) + posterior colporrhaphy (PC) was the most common combined approach, used in 19 (54,3 %) patients.

The procedures performed are described in figure 2, along with their numbers.

Colpohisteropexia al ligamento sacroespinoso con arpones + CA + CP	19
Colporrafia anterior (CA) + colporrafia posterior (CP)	10
Colposacropexia abdominal con malla	1
Colporrafia anterior (CA)	1
Colporrafia posterior clásica	1
Colporrafia posterior (CP)	1
Colpocleisis	1
Histerectomía vaginal con arponaje al LSE (sin malla)	1

Figure 2. Surgeries performed

In the postoperative follow-up of the 35 patients who underwent POP repair surgery, the results were evaluated at three different check-ups: immediately, on the tenth day, and on the 40th day. At the immediate check-up, 34 of 35 (97,1 %) were completely asymptomatic and well, while 1 (2,9 %) had some degree of minor complication.

At the 10-day check-up, the following results were observed: 2 (5,7 %) had de novo stress urinary incontinence, 1 (2,9 %) had de novo urge urinary incontinence, and another patient (2,9 %) had a positive provocation test despite not reporting incontinence.

The remaining 31 (88,6 %) were completely continent and asymptomatic.

At the 40-day follow-up, 3 (8,6 %) had occasional, imperceptible urine leakage, while 4 (11,4 %) reported de novo stress urinary incontinence. The remaining 28 (80 %) were completely continent and symptom-free.

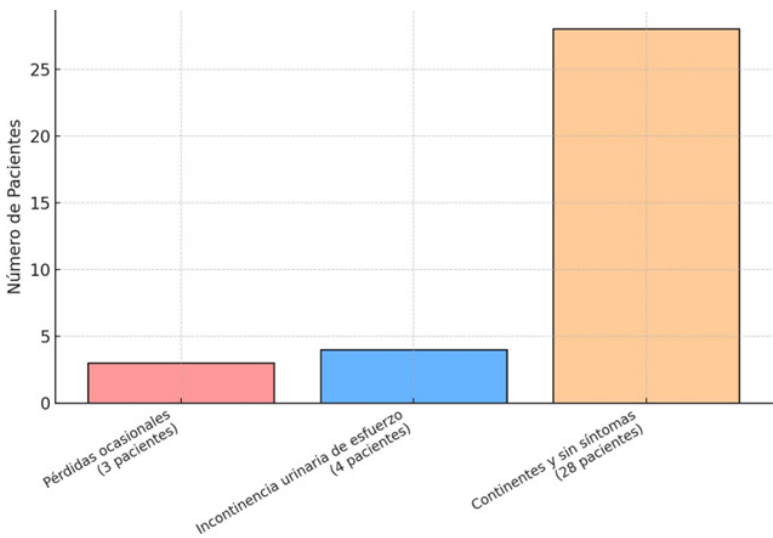


Figure 2. Distribution of results at the 40-day follow-up

Age differences were observed using Student's t-test between patients who developed de novo SUI and those who did not (64,2 [DE=5,9] vs. 59,7 [DE=8,9] years; $p=0,0047$).

The same test showed that there were no significant differences between patients who developed de novo SUI and those who did not in the number of pregnancies (2,75 [SD = 0,5] vs. 2,64 [SD = 1,01]; $t = 0,356$).

The test was also used to evaluate differences in the highest birth weight among patients with de novo SUI and those without de novo SUI after POP surgery (3 562,5 kg [SD = 453,4] vs. 3 725,1 kg [SD = 381,8]; $t = -0,684$).

In the analysis of urethral hypermobility and provocation tests, the association between the results and the onset of de novo SUI was evaluated. The results indicate that:

- Urethral Hypermobility Test: No statistically significant relationship was found with the onset of de novo SUI ($p = 0,109$).
- Provocation Test: There is a significant relationship between the provocation test and the onset of de novo SUI ($p = 0,014$).

Diagnostic performance metrics for the urethral hypermobility test:

- Sensitivity: 75 %
- Specificity: 25,8 %
- Positive Predictive Value (PPV): 11,5 % Negative Predictive Value (NPV): 88,9 %

Diagnostic performance metrics for the provocation test:

- Sensitivity: 0 % (no patients who developed de novo SUI were identified).
- Specificity: 100 % (all patients who did not develop de novo SUI were correctly identified).
- Positive Predictive Value (PPV): 0 % (no positive test results).
- Negative Predictive Value (NPV): 88,6 % (high probability that a negative result is correct).

CONCLUSIONS

Pelvic organ prolapse (POP) is one of the main reasons for urogynecological consultation, affecting up to 50 % of the population over 50 years of age.

Surgical procedures to correct advanced stages of POP can cause urinary dysfunction, which is related to the presence of de novo urinary incontinence.

This study addressed the ability of preoperative urodynamic diagnosis in patients with POP to identify occult stress urinary incontinence (OSUI). This condition affects up to 36,5 % of patients with advanced POP, according to the literature reviewed. The research, conducted at the Sanatorio de la Mujer de Rosario, included 35 patients aged between 40 and 90 years (mean age: 60,1 years) with POP in stages II, III, and IV, with stage III predominating in 54 % of cases.

The results of this research were compared with those of international studies. In our study, the frequency of de novo SUI after POP repair surgery was 11,4 % (4 out of 35 patients), compared to a study conducted in Spain by López Díez et al., published in 2014, which showed a prevalence of de novo SUI after surgery of 27,7 %, which was higher than in our study.

This finding suggests that approximately 1 in 9 patients may experience this postoperative complication, consistent with reports in the literature on POP surgery.

In another study by Khayyami Yasmine and colleagues in 2020, they found that the overall risk of de novo urinary incontinence after POP surgery was 15 %, which is slightly higher than in our study.

On the other hand, studies were found with lower prevalence, such as that by Hemikaa Devakumar in 2017, which studied 274 patients undergoing POP surgery and reported an overall incidence of de novo SUI of 9,9 %.

This result reflects a failure rate in test prediction, particularly in older women (mean age: 64,2 years in the group with complications versus 59,7 years in those without complications, $p=0,0047$). This suggests that older patients are more likely to develop de novo SUI after surgery, which is relevant when assessing preoperative risk factors in this group of patients.

Moosavi et al. reported in 2020 that age over 60 was the most significant risk factor for de novo SUI.

The Student's t-test, which tested whether there were differences in the number of pregnancies between patients with de novo SUI and those without, yielded a t-value of approximately 0,356, indicating a small difference in the mean number of pregnancies between the two groups.

In other words, the results indicate that there are no statistically significant differences in the number of pregnancies between patients with de novo SUI and patients without de novo SUI.

Among the possible risk factors was the weight of newborns exceeding 4,000 kg. Although the groups have different mean weights, there is no significant difference in the highest birth weight between the groups, according to preliminary calculations.

However, the urodynamic study, with its specific tests such as urethral hypermobility, showed a sensitivity of 75 % and a specificity of 25,8 %. In contrast, the provocation test was highly specific (100 %) but had zero sensitivity for identifying cases that developed de novo SUI.

The diagnostic performance metrics for the urethral hypermobility test showed that the test is quite good at correctly identifying patients who will develop de novo SUI (high sensitivity), but has a low ability to identify those who will not develop it (low specificity). Furthermore, the probability that a positive result actually indicates de novo UEI (PPV) is low, while the probability that a negative result is correct (NPV) is high.

Diagnostic performance metrics for the provocation test showed that it had zero sensitivity, as it did not detect any cases of de novo SUI. However, it is completely specific in confirming that a patient will not have the condition.

Therefore, the urethral hypermobility test is most useful for identifying patients at risk of developing de novo UEI. However, its low specificity limits its usefulness due to a high false positive rate. On the other hand, the provocation test is highly specific, but it does not correctly identify patients who will develop the condition.

In clinical practice, the urethral hypermobility test may be more appropriate for patients in whom it is crucial to rule out de novo UUI with a reliable negative result.

The provocation test, although highly specific, lacks sufficient sensitivity to serve as the sole diagnostic tool.

These findings underscore the need for a more comprehensive preoperative evaluation. In addition, they justify considering concomitant prophylactic procedures in patients with high-risk factors, such as advanced age and severe stages of POP, to improve surgical outcomes and reduce the incidence of complications related to urinary continence.

In this study, preoperative diagnosis of occult stress urinary incontinence (OSUI) using urodynamic studies was effective in 89 % of cases, preventing the onset of de novo urinary incontinence in most patients undergoing pelvic organ prolapse reconstructive surgery. However, 11 % of patients developed this postoperative complication, highlighting the limitations of the method in identifying certain high-risk cases.

Limitations

This study has some limitations that should be considered when interpreting the results. First, the sample size was small, which could limit the generalization of the findings to a larger population. Second, this is a single-center study, meaning the data come from a single institution. Finally, data collection was retrospective.

This study evaluated the ability of preoperative urodynamic testing to diagnose occult stress urinary incontinence (OSUI) in patients with pelvic organ prolapse (POP) undergoing reconstructive surgery. The results showed that its use reduced the incidence of de novo urinary incontinence in 89 % of patients, confirming its relevance in preoperative evaluation.

However, limitations in its diagnostic accuracy were identified, particularly in elderly patients and those with severe POP. Urethral hypermobility showed a sensitivity of 75 % but low specificity (25,8 %), while the provocation test was highly specific (100 %) but lacked sensitivity.

It was observed that a significant percentage of continent women with POP did not present SUI in the urodynamic evaluation, thus avoiding unnecessary surgical treatments. However, 11,4 % of patients developed de novo stress urinary incontinence after surgery.

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