Predictors of stress urinary incontinence in women

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Abstract

Introduction and objectives. The aim of this study is to highlight predictors or predisposing factors of stress urinary incontinence (SUI) in order to help clinicians during their treatment decisions and establish a preventive strategy to decrease the incontinence rate among women.

Materials and methods. We performed a retrospective study over a period of 3 years (January 2012-December 2014) in Mureș County Hospital, Clinic of Urology. We examined 113 women with urinary incontinence and we established the following diagnosis: stress urinary incontinence in 68 cases (60%), urge urinary incontinence in 26 cases (23%) and mixed urinary incontinence in 19 cases (17%). The selection criteria for this study were female patients diagnosed with stress urinary incontinence having indication of surgical treatment (transobturator tape- TOT). We included in this study 24 patients admitted in the hospital.

Results. Regarding the distribution of the patients depending on age group we observed that SUI was predominant in the 60-69 years age group (12 cases), followed by 70-79 years (6 cases), 50-59 years (4 cases) and 40-49 years (2 cases). The mean age was 64.25±8.25 (standard deviation) years old with extremities between 41 to 46 years old. For the statistical analysis we applied Fisher’s test, Chi-square test and unpaired test and we compared the group having SUI with a group of 47 patients without the disease. We analyzed the data and we observed that increased age, pregnancies, vaginal delivery, menopause, body mass index (BMI), diabetes and hysterectomy represents risk factors for SUI and that there is a significant relation between SUI and those factors, p<0.05. Statistically, we found no relation between caesarian, urinary tract infections, genital prolapse, neurological diseases and SUI, p was insignificant.

Conclusions. Stress urinary incontinence is frequent in middle age women. Multiple predictors like age, pregnancy, vaginal delivery, menopause, high body mass index, hysterectomy had been found to be associated with SUI. Recognizing these predisposing factors, we can develop in time prevention techniques which can reduce the development and progression of symptomatology in SUI.

Keywords: diabetes, risk factor, menopause, pregnancy, stress urinary incontinence, vaginal delivery, hysterectomy

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Introduction

Stress urinary incontinence (SUI) is defined as involuntary loss of urine from the urethra on effort, exertion, sneezing or coughing in the absence of involuntary detrusor contraction. (3)

Urinary incontinence has a significant negative impact on social functioning and quality of life to many individuals so that it is important to underline the most important risk factors involved in development of this condition. It may occur as a result of a number of abnormalities. Although rarely life threatening, the symptoms may seriously influence the physical, psychological and social wellbeing of affected individuals (1).

Through the most important risk factors that can cause stress urinary incontinence we can mention: the pregnancy, labor and vaginal delivery, instrumental delivery and birth weight, body mass, physical function, menopause, age, genetic component or just inherent connective-tissue weakness. (3)

All of these factors can cause physiopathologic changes in the muscular and fascial structures of the pelvic floor and lead to pelvic support defects and possibly pelvic floor dysfunction. (2) Pregnancy and childbirth are considered being major contributors for stress urinary incontinence in females. Although the precise etiology of SUI in pregnancy is unknown, it has been hypothesized to be caused by either hormonal or mechanical changes. Many peripartum factors have also been found to increase the risk of postpartum urinary incontinence. These include factors related to obstetric trauma (vaginal delivery, forceps delivery, episiotomy) (6)

The physiopathology behind menopause and development of urinary incontinence is not well understood. The presence of estrogen receptors have been demonstrated in lower urinary tract. Cardozo et al., in a systematic review of 11 randomized controlled trials (RCTs) involving different types and routes of administration of estrogens concluded that local estrogen therapy improves micturition frequency during day and night, urgency, incontinent episodes, first sensation to void, bladder capacity. (7)

Objective

Our aim is to highlight predictors or predisposing factors of stress urinary incontinence in order to help clinicians during their treatment decisions and establish a preventive strategy to decrease the incontinence rate among women.

Materials and methods

We performed a retrospective study over a period of 3 years (January 2012 - December 2014) in Mureș County Hospital, Clinic of Urology. We examined 113 women with urinary incontinence and we established the following diagnosis: stress urinary incontinence in 68 cases (60%), urge urinary incontinence in 26 cases (23%) and mixed urinary incontinence in 19 cases (17%). The selection criteria for this study were female patients diagnosed with stress urinary incontinence having indication of surgical treatment (transobturator tape-TOT). We included in this study 24 patients admitted in the hospital.

The investigation protocol used for the selection of the cases consisted of:

- History (questionnaires, surgery, medication, associated pathology for urinary incontinence or im-
paired detrusor contractility)
- Physical examination
- Abdominal ultrasound included post-void residual urine determination
- Urinanalysis and urineculture
- Gynecologic examination
- Urodynamic investigations (uroflowmetry and/or pressure-flow study)

The collection of the data was based on the patient's physiological and pathological history.
We started the patient's evaluation with a complete medical history and physical examination.
Physiological history gave us information regarding age of menopause, number of pregnancies, labor, vaginal delivery or caesarian
Pathological history revealed details regarding type and severity of urinary incontinence, the existence of risk factors, the existence of other conditions like diabetes, neurological pathology, history of stroke, constipation, depression, sexual activity, obstetric history (stress urinary incontinence surgery, prolapse symptoms or surgery, hysterectomy), medication.
Concerning the symptomatology all the patients complained about the involuntary loss of urine on effort, exertion, sneezing, coughing or laughing.
Also we used the ICIQ-UI short form questionnaires to quantify the patient's symptoms and quality of life and micturition diaries to quantify the micturition frequency, voided volume and frequency of loss of urine episodes.
Clinical examination included the abdominal examination, perineal and digital examination of the rectum and vagina. Cough test revealed stress urinary incontinence and urethral mobility was assessed digitally. Overweight or obesity were established by body mass index (BMI) which was calculated using body weight and height.
Urinanalysis was performed to identify an urinary tract infection.
The diagnosis was completed by abdominal ultrasound and urodynamic investigations.
Statistical analysis was performed using the MedCalc Software, Version 12.5.0.0. Data were considered as nominal or quantitative variables. Nominal variables were characterized using frequencies. Quantitative variables were tested for normality of distribution using Kolmogorov-Smirnov test and were characterized by median and percentiles (25-75%) or by mean and standard deviation (SD), when appropriate. A chi-square test was used in order to compare the frequencies of nominal variables. Quantitative variables were compared using t test, Mann-Whitney test. The correlation between quantitative variables was assessed using Spearman’s rho, when appropriate. Multivariate analysis was carried out using linear regressions. We used as dependent variable the stress urinary incontinence. We included as independent variables the data for diabetes and neurological diseases, pelvic surgery. The level of statistical significance was set at p<0.05.

Results
From total of 113 patients examined, 68 (60 %) were diagnosed with stress urinary incontinence. We included in this study 24 women (21%) with stress urinary incontinence who accomplished the inclusion criteria.
Regarding the distribution of the patients depending on age group we observed that SUI was predominant in the 60-69 years age group (12 cases), followed by 70-79 years (6 cases), 50-59 years (4 cases) and 40-49 years (2 cases). The mean age was 64,25+/-8,25 (standard deviation) years old with extremities between 41 to 46 years old.
Following we analyzed the risk factors for SIU (Table 1). For the statistical analysis we compared the group having SIU with a group of 47 patients without the disease.
We applied Fisher’s test to compare if there is a relation between the age and SUI, p value was significant (p=0,003). Also we calculated Odds ratio =8,14 with a confidence interval between 1,7-38,7, so that increasing age represents a 8,14 times risk factor in development of SUI.
Majority of the patients reported between 1-4 pregnancies 22 cases, 1-3 vaginal delivery in 19 cases and caesarean in 6 cases. Pathological history and clinical examination established the existence of menopause in 22 cases, genital prolapse in 7 cases, diabetes in 12 cases, history of cerebrovascular disease in 5 cases, obstetric surgical history (partial or radical hysterectomy) in 9 cases, history of repeated urinary tract infections in 9 cases.
Concerning the existence of pregnancies like a risk factor in development of SUI, we applied Fisher’s test and we observed that p was significant, p=0,002, odds ratio was 8,88 with a confidence interval between 1,8-42,1. Also we observed that there is a strong relation between vaginal delivery and existence of SUI, p=0,009, and vaginal delivery represents a risk factor
in development of SUI, odds ratio was 4.7 with a confidence interval between 1.4-16.1. The relation between caesarean and SUI was insignificant, \( p=0.7 \), odds ratio was 1.2 (confidence interval: 0.3-3.9), so that in our study, caesarean didn’t represent a risk factor.

Menopause was found in majority of the cases (22 patients). We applied Fisher’s test that revealed a statistical relation between menopause and SUI (\( p=0.01 \)). Also after we calculated the Odds ratio which revealed that patients with menopause have 6.23 times higher risk to develop SUI than patients without menopause. Confidence interval was (1.3 to 29.8).

Regarding the body mass index (BMI) we observed that the majority of the patients were overweight or obese (19 cases) and normal weight in 5 cases. The mean value of BMI was 27.8±4.1 (standard deviation). We applied Fisher’s test which revealed that the obesity is a risk factor in development of SUI (\( p=0.005 \)). Odds ratio was 5.13 with a confidence interval between 1.6-16.0.

We observed that 12 of the patients reported diabetes. We applied Chi-square test that revealed a statistical relation between diabetes and SUI (\( p=0.01 \)). Odds ratio was 3.70 with a confidence interval between 1.2-10.7. The results demonstrate that patients with diabetes have 3.7 times risk in development of SUI compared with patients without this disease.

9 of the patients reported obstetric surgical history like partial or radical hysterectomy. We applied Chi-square test that revealed a statistical relation between obstetric surgery and SUI (\( p=0.01 \)). Odds ratio was 4.1 with a confidence interval between 1.2-13.4. The results demonstrate that patients with hysterectomy have 4.1 times risk in development of SUI compared with patients without obstetric surgery.

We applied Fisher’s test which revealed no relation between history of urinary tract infections and development of SUI, \( p=0.98 \), Odds ratio was 1.05 (confidence interval: 0.3-2.9).

Seven of the patients had genital prolapse associated with SUI. In these cases we observed that there is no relation between the existence of genital prolapse and SUI, \( p=0.2 \), Odds ratio was 2.3 (confidence interval: 0.7-7.7).

Five of the patients had history of neurologic diseases (cerebrovascular accident). We observed that there is no relation between the history of cerebrovascular accident and SUI, \( p=0.2 \), Odds ratio was 2.2 (confidence interval: 0.5-8.5).

### Table 1: Statistical analysis of risk factors in stress urinary incontinence

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Odds Ratio</th>
<th>Confidence interval</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8.14</td>
<td>1.7-38.7</td>
<td>0.003</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>8.88</td>
<td>1.8-42.1</td>
<td>0.002</td>
</tr>
<tr>
<td>Vaginal delivery</td>
<td>4.7</td>
<td>1.4-16.1</td>
<td>0.009</td>
</tr>
<tr>
<td>Caesarian</td>
<td>1.2</td>
<td>0.3-3.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Menopause</td>
<td>6.23</td>
<td>1.3-23.8</td>
<td>0.01</td>
</tr>
<tr>
<td>BMI</td>
<td>5.13</td>
<td>1.6-16.0</td>
<td>0.005</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.7</td>
<td>1.2-10.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Obstetric surgery</td>
<td>4.1</td>
<td>1.2-13.4</td>
<td>0.01</td>
</tr>
<tr>
<td>Urinary tract infections</td>
<td>1.05</td>
<td>0.3-2.9</td>
<td>0.98</td>
</tr>
<tr>
<td>Genital prolapse</td>
<td>2.3</td>
<td>0.7-7.7</td>
<td>0.2</td>
</tr>
<tr>
<td>Neurological disease</td>
<td>2.2</td>
<td>0.5-8.5</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**Discussions**

The disease has a negative impact on the patient’s quality of life. Most of the patients reported the absence of sexual activity, loss of urine affects their social and professional activity, daily comfort and hygiene.

The age of the patients was increased and most of them reported the existence of menopause. Also they had other associated diseases like diabetes, history of cerebrovascular accident, history of obstetric surgeries like partial or radical hysterectomy, urinary tract infections, genital prolapse and others.

Concerning the distribution of patients on age group, we observed that the existence of SUI increases with age. If in the age group between 40-49 years we had only 2 patients, the majority of them were find in the 60-79 years age group, 18 patients with the predominance of 60-69 age group. Statistical analysis demonstrated a relation between SUI and increased age. This fact can be due to numerous changes in urinary tract physiology caused by other diseases outside the urinary tract or stuctural changes of urinary tract related with age. Data from our study revealed that increased age represents 8.14 times risk factor in development of SUI comparative with young group.

Only 2 patients with SUI were nulliparous, 22 patients reported between 1-4 pregnancies, majority of them, 17 cases reported 2 or 3 pregnancies. In this study the pregnancy was the major risk factor (odds ratio was 8.88) for SUI comparative to group control.

Vaginal delivery was reported by the majority of the patients (19 cases), 5 of them reported both vaginal delivery and caesarian and only 1 patient had a single caesarian. The statistical analysis demonstrated that patients with history of vaginal delivery have 4.1x
risk in development of SUI comparative with the nulliparous or patients that gave birth by caesarian. The statistical relation between caesarian and SUI was insignificant (p=0.7) and Odds ratio proved that in this study, caesarian is not a risk factor for SUI. However the risk in development of SUI was significantly higher after multiple vaginal births, suggesting that elective caesarian section reduces this risk. Using pelvic floor muscle training in prevention or treatment of SUI in postnatal period has positive effects.

Menopause was reported in majority of the cases (22 patients). Statistical analysis proved that postmenopausal women have a high risk in development of SUI comparative to group control. Local administration of estrogen therapy improves micturition frequency during day and night, urgency and incontinent episodes. (7)

Body mass index (BMI) was calculated using high and weight. According to the WHO we considered overweight, BMI value equal or more than 25 and obesity, a BMI value equal or more than 30. We observed that majority of the patients were overweight or obese (19 cases) and only 5 had normal weight. Statistical analysis proved that a high BMI represents also a risk factor for SUI comparative to normal BMI value. Obesity and abdominal fat can produce an increased pressure over the abdominal wall, abdominal muscle, bladder and connective tissue that support the urethra causing SUI.(2) Weight loss has been shown to improve the symptoms of SUI (12).

Pathological history of the patients revealed the existence of diabetes in 12 cases. In our study the results demonstrated that patients with diabetes have a 3.7x risk factor in development of SUI than patients without the disease.

Obstetric surgical history (partial or radical hysterectomy) was reported in 9 cases. The statistical result demonstrated that the hysterectomy increases the risk of SUI development.

Some of the patients had more than one associated risk factors.

Urinary tract infections (UTI) were found in 9 cases. Five of the patients reported history of neurological disease (stroke). Statistical analysis didn’t reveal any relation between UTI or neurological diseases and development of SUI.

After the clinical examination, 7 of the patients had genital prolapse. Statistically we didn’t find any relation between the genital prolapse and SUI.

Conclusions
Stress urinary incontinence is frequent in middle age women. Multiple predictors like age, pregnancy, vaginal delivery, menopause, high body mass index, diabetes and hysterectomy had been found to be associated with SUI.

Recognizing these predisposing factors, we can develop in time prevention techniques which can reduce the development and progression of symptomatology in SUI.

Acknowledgement: “This paper was published under the frame of European Social Found, Human Resources Development Operational Programme 2007-2013, project no. POSDRU/159/1.5/S/133377”.

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