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Review

Uterine myomas and lower urinary tract dysfunctions: A literature review

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ABSTRACT

Different types of urinary symptoms associated with myomas are reported, including urinary incontinence or dysuria. They are rarely investigated in patients and their prevalence is not well known. While myomas are the first reason to perform hysterectomy in France, few studies have evaluated the impact of surgical treatment in women with urinary symptoms. Our objective was to conduct a review of the literature regarding urinary symptoms associated with myomas and the impact of their treatment on these symptoms. We reviewed articles indexed in MEDLINE dealing with urinary symptoms and myomas, and published until September 2018.

The prevalence of urinary symptoms in women with uterine myomas is highly variable depending on whether the authors are interested in symptoms or urodynamic results. The most frequently reported urinary symptoms are urgency (31–59%), dysuria (4–36%) and stress urinary incontinence (SUI, 20 80%). While some studies have found the anterior location of myomas and the size superior to 5 cm as a risk factor for UI, other studies have not found a correlation between myomas topography and symptom scores.

The treatments of uterine myomas seem to have an impact on women's urinary symptoms. Although hysterectomy is considered as a risk factor for pelvic floor disorders, the removal of the uterus may sometimes improve or cure urinary symptoms. Most authors also found a significant improvement in urinary symptom scores after myomectomy and myomas embolization. More studies are needed to clarify the impact of myomas treatment on urinary symptoms.

Contents

Introduction

Uterine myomas are the most common benign pelvic tumors, affecting 25–30% of women during their genitally active period [1–3]. Risk factors include age, family history, and ethnicity. Multiparity, advanced age for the pregnancy and smoking appear to be protective factors [4–7].

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Myomas may be responsible for various functional symptoms (meno-metrorrhagia, pelvic pain, constipation and urinary symptoms) [8] or may be a source of infertility. Even though myomas are asymptomatic in nearly 50% of cases, they represent the first cause of hysterectomy for benign pathologies (about 2/3 of cases) [5]. Urinary symptoms associated with myomas are rarely investigated in patients, and the prevalence of these symptoms is not well known.

Surgical management of myomas includes operative hysteroscopy, myomectomy or hysterectomy; the choice depends on the number, the size and the location of myomas. To date, few studies have evaluated the impact of surgical treatment in this population.

Our objective was to conduct a review of the literature regarding urinary symptoms associated with myomas and the impact of their treatment on these symptoms.

Methodology

This review was conducted by consulting the Medline database until September 2018. Articles published in English and French were searched with the following the key words: urinary incontinence, stress urinary incontinence, myomas, surgical treatment. Randomized controlled trials were sought first; however, in the absence of such data, articles of lower scientific evidence levels have been retained. In all, we have retained 18 articles including 3 reviews of literature, 3 case-control studies, 1 cross-sectional study, 1 cohort study and 3 prospective observational studies.

Epidemiology of the relationship fibroids-urinary disorders

Different types of urinary symptoms associated with myomas are reported, including stress urinary incontinence (SUI, occurring during physical activity or exertion), urgency urinary incontinence (UUI, sudden strong urge to urinate that is hard to stop), pollakiuria, nocturia, acute urinary retention or dysuria.

Many factors have been associated with an increased risk of urinary incontinence such as age, factors related to pregnancy and childbirth, menopause and obesity. The impact of uterine diseases such as myomas is less studied. In addition, the different types of symptoms are often poorly differentiated in the studies, making their exact prevalence unknown.

For example, a cross-sectional study of 78 women having surgical management of symptomatic uterine myomas (mean volume of 672 +/- 714 cm3) found a prevalence of nocturia of 91%, followed by urgencies (59%) and urinary incontinence (45 to 54%). The authors used the validated Bristol Female Lower Urinary Tract Symptom-Scored Form (BFLUTS-SF) questionnaire administered before surgical intervention. Uterine volume and BFLUTS-SF subscale scores or symptoms were compared. There was a significant association between the size of myomas and the severity of lower urinary tract disorders ($p = 0.017$) with a higher dysuria score for anterior myomas compared with those from other locations (2.84 +/- 3.30 versus 1.30 +/- 2.07 respectively, $p < 0.01$) [9]. Intra-mural location also appeared to be correlated with a higher severity of urinary symptoms. These results remained significant after adjusting for age, parity and body mass index (BMI).

Ekin et al. [10] compared 145 patients with anterior myomas (exposed group) to 94 women with a normal-appearing uterus (unexposed group). Mean age [41.9 +/- 9.2 vs 43.9 +/- 6.2 years], parity, previous caesarean section and BMI did not differ between groups. The exposed group was divided into 2 subgroups: 5 cm anterior myomas and > 5 cm anterior myomas. The authors showed that the prevalence of SUI was 31.9% in the unexposed group, 56% in the subgroup of women with 5 cm anterior myomas and 80% in the group of women with anterior myomas > 5 cm ($p = 0.0001$). The prevalence of UUI was not significantly different between the 3 groups ($p = 0.571$). The prevalence of mixed urinary incontinence (MUI, combination of SUI and UUI) increased from 10.9% to 25.3% and 31.4% in the unexposed group, the subgroup of women with 5 cm anterior myomas and the group of women with anterior myomas > 5 cm ($p = 0.01$). The UDI-6 score was significantly higher in the presence of myomas and even higher with the increase in myomas size. The Incontinence Impact Questionnaire (IIQ-7), which assesses the impact on the quality of life of urinary disorders, was significantly higher in the exposed group ($p < 0.001$) and significantly more severe in the group of women with anterior fibroids > 5 cm ($p = 0.001$).

Cvach et al. [11] evaluated the results of urodynamic examinations before and after surgical treatment of a pelvic mass (ovarian cyst or fibroma > 7 cm) in women with urinary disorders. Of the 29 patients included, 25 (86%) had a preoperative urodynamic evaluation, which was normal in 40% of cases (10/25), and showed SUI in 32% of cases (8/25). SUI was associated with detrusor overactivity (DO) in 12% of cases (3/25), bladder hypersensitivity was found in 8% of cases (2/25), DO alone in 4% of cases (1/25), dysuria in 4% of cases (1/25) and SUI associated with dysuria in 4% of cases (1/25). These urodynamics data differed from the symptoms described by the patients: while 36% of the patients reported voiding difficulty, urodynamics reported dysuria in only 4% of cases. Of the 12 women describing SUI before their surgery, 3 had persistent SUI (25%), and only 1 required the use of sub-urethral tape (8%). Myomas surgery therefore treated SUI in 75% of cases (9/12).

Physiopathology

Uterine myomas are benign monoclonal tumors arising from the smooth muscle cells of the myometrium. Although pathogenesis of leiomyomas is not well understood, genetic predisposition, environmental factors, steroid hormones (estrogen and progesterone), and growth factors (Epidermal Growth Factor, Insuline-like Growth Factor, Platelet-Derived Growth Factor) may play a role in the formation and growth of uterine myomas. As they grow, they remove connective tissue and can cause a compressive symptomatology on organs around [4,5].

Growth of a leiomyoma in the broad ligament can result in obstruction of the bladder outlet and paravaginal obstruction, resulting in urinary retention [12].

Andrada et al. [13] hypothesize that vesical hyperactivity associated with myomas could be due to the bladder compression increasing the proprioceptive signal leading to pollakiuria and urgencies.

Some authors explained SUI by the fact that the increase in abdominal pressure at stress would lead to a forward movement of the myomas. Myomas would then “hit the bladder” and increase the bladder pressure suddenly causing urinary leak. An epidemiological study conducted by Dragomir et al. in the United States [14] included 836 patients. The prevalence of SUI increased from 46% in the absence of myomas to 51% in case of myomas. The difference in prevalence adjusted for age, ethnicity, BMI and parity differed by 7.4% [CI 95% = 0.4–14.3] between women with and without myomas. However the size of the uterus, the anterior localization of the fibroid, and the size $\geq$ 4 cm were not found to be risk factors for SUI.

Finally, dysuria can be associated with urethral obstruction caused by the position of the myomas [13,15].

Effects of myomas treatments on urinary symptoms

The choice of treatment in case of myomas depends on the symptoms, the number and the size of the myomas, as well as

women's desire for pregnancy. CNGOF Clinical Guidelines were published on the subject in 2011 [16].

The purpose of medical treatments will be to reduce the functional signs associated with myomas (pain and bleeding) or to make them accessible to surgical treatment. In case of asymptomatic myomas, there is no need to consider medical treatment.

In case of surgery, conservative treatment will be reserved for women with a medium or long term pregnancy plan or wishing to keep their uterus for personal beliefs. Hysteroscopic resection is possible for submucosal myomas less than 4 cm with a posterior wall of security greater than 5 mm. For interstitial and subserosal myomas, laparoscopic myomectomy can be performed if the number of myomas does not exceed 3 and the maximum diameter of the largest myoma does not exceed 8 cm. Beyond 3 fibroids and/or myomas larger than 8 cm, laparotomic myomectomy will be indicated.

Radical treatment which consists in performing a total (or subtotal) hysterectomy by vaginal, laparoscopic or laparotomic route is reserved for women who have no desire for pregnancy.

Uterine myoma embolization is an alternative to surgery for women who do not wish to undergo surgery. Currently, there is no recommendation on the number or size of myomas that can be embolized due to lack of data. It is not recommended to embolize a single submucosal fibroid or a single subserosal myoma and for women who are planning pregnancy, because of the lack of sufficient studies exploring the implications for future fertility.

a) **Effect of medical treatments on urinary symptoms**

Among the large number of studies evaluating the efficacy of selective progesterone receptor modulators (SPRMs) in the management of myomas, none included the effect of this treatment on urinary symptoms.

There is also no specific study of the natural course of urinary symptoms in postmenopausal women with uterine myomas. However, estrogen deficiency is known to be a source of urinary symptoms, which makes the analysis of the symptoms difficult in this population.

b) **Effect of surgical treatments (myomectomy, hysterectomy) on urinary symptoms**

Hysterectomy has always been considered as a risk factor for pelvic floor disorders (including genital prolapse and UI) [17–19]. It is currently still difficult to answer this question because we do not have sufficient scientific evidence and the results of the studies are divergent (heterogeneous methodology and many biases). Therefore, it seems essential to conduct a detailed preoperative examination to detect UI and define its type. The presence of SUI or MUI before hysterectomy can lead to a concomitant treatment of UI by suburethral sling. However, the indication of hysterectomy (large myomous or adenomyotic uterus) may be partly responsible for the urinary symptoms experienced by the patient. In some cases, removal of the uterus may be sufficient to improve or cure urinary symptoms.

Very few studies have investigated the impact of myomas management on urinary symptoms. There is some evidence in the literature suggesting that surgical treatment of fibroids can improve UI symptoms.

A cohort study conducted in Sweden on 16,182 patients who had a hysterectomy for benign disease between 2006 and 2013 studied risk factors for de novo postoperative UI and factors associated with postoperative remission of UI [20]. Among these patients, 4751 (29% of the total cohort) had urinary incontinence before surgery and 2152 women had their urinary symptoms improved after surgery (13% of the total cohort). The authors showed that a uterine weight > 300 g (OR 1.98 ; 95% CI [1.69–2.33]), a BMI < 25 kg / m^2 (OR 1.22 ; 95% CI [1.01–1.47]), a hysterectomy for prolapse (OR 2.25 ; CI 95% [1.60–3.18]), or for myomas (OR 1.33 ; 95% CI [1.09–1.62]) and the absence of preoperative urgency (OR 1.51 ; 95% CI [1.29–1.76]) were associated with a higher rate of postoperative UI remission. When comparing hysterectomy technics, the authors showed a decrease in the UI remission rate after vaginal hysterectomy compared with abdominal hysterectomy (OR 0.70 ; 95% CI [0.57-0.87]). Uterine weight was not compared between these groups.

In the study by Cvach et al. [11] on the impact of surgical treatment of pelvic mass (ovarian cyst or fibroma > 7 cm on ultrasound) on urinary disorders, patients completed questionnaires on urinary symptoms (UDI-6, Urogenital Distress Inventory) and quality of life (IIQ-7), a micturition calendar over 3 days. Some of them benefited from an urodynamic examination. All of these data were obtained before and 3 months after the surgery. Patients were included if they had lower urinary tract dysfunctions defined by: pollakiuria, urgency, nocturia, urgency or stress urinary incontinence, dysuria. These symptoms should be present "frequently" according to the patients to justify inclusion. The surgery consisted of excision of the pelvic mass, no incontinent cure surgery or prolapse cure could be performed. The pelvic mass was a myoma in 75.9% (22/29), an ovarian cyst in 13.8% (4/29) or the combination of 2 in 10.3% (3/29) cases. The average volume of the dominant myoma was 306 cm3. Unfortunately, the localization of these myomas was not known in 75.9% of cases, they were anterior in 16% of cases, fundic in 8% of cases and posterior in 4% of cases. Surgery consisted of a myomectomy in 17.4% of cases (5/29), a hysterectomy (laparotomy or laparoscopic approach) or an adnexectomy for ovarian mass in 76% of cases (22/29) without distinction in this subgroup. The main complaint was dysuria in 36% of the cases followed by urgency in 31% of cases, SUI in 20.7% of cases, and MUI in 13.7% of cases. There was no statistical association between the severity of symptoms and the volume of myomas. After the surgery, there was a significant improvement of the UDI-6 score: 32.9 to 11, a difference of -21.9 points (95% CI [16.2–27.4] ; $p < 0.0001$). The IIQ-7 score also changed from 25.4 to 8.7. The correlation coefficient between myomas volume and improvement in the UDI-6 score was at limit of significance but low ($r = 0.35$; $p = 0.077$), it was also not significant for the quality of life score. The average number of SUI episodes decreased from 0.5 to 0.1 ($p = 0.01$). The authors could not conclude whether the surgical technique (myomectomy or hysterectomy) modified the impact on symptoms or quality of life because their numbers were insufficient. Out of the 25 women who had urodynamics, the diagnosis of SUI was made in 12 patients (48%), only 3 of them still had SUI after surgery (12%) and only one required a sub-urethral sling (4%).

Altman et al. [21] have also prospectively evaluated the effect of myomas surgical management (vaginal or abdominal hysterectomy) on urinary symptoms: 120 patients were evaluated at 6 months and 1 year, and uterine weight was obtainable in 63 patients (mean weight 450 g in the abdominal cohort and 126 g in the vaginal cohort). At 6-months, there was a decrease ($p < 0.05$) in urinary symptoms in women who had abdominal hysterectomy, but this was not sustained after 12 months. There were no significant changes in episodes of SUI in the vaginal cohort at 6 or 12 months of follow-up. The urinary frequency was reduced in both cohorts. No significant difference was found for urgency or dysuria. However, in this study the surgical management by myomectomy was not evaluated.

c) **Effect of myomas embolization**

A prospective observational study about 57 patients undergoing embolization for symptomatic myomas assessed the impact of

fibroid embolization on lower urinary tract dysfunctions and women's quality of life [22]. Women completed a 2-day voiding schedule and answered urinary symptom questionnaires including UDI-6 and quality of life questionnaires (the IIQ-7, the Pelvic Organ Prolapse/Urinary Incontinence Sexual Function Questionnaire PISQ-12 and the Uterine Fibroid Symptom Health-Related Quality of Life Questionnaire UFS-QoL) before treatment and 3 months after embolization. Patient satisfaction was assessed after intervention with the validated questionnaire PGI-I (Patient Global Impression of Improvement). There was a significant decrease in the UDI-6 score of 23.33 points (44.7 before embolization versus 21.37 after embolization, $p < 0.0001$). There was no significant change in UDI-6 sub-scores for UUI, SUI or dysuria. The quality of life related to UI was improved (the IIQ-7 score improved from 21.42 to 6.40, $p < 0.001$). The authors also described an improvement in the PISQ-12 score (score assessing sexual function associated with urinary symptoms). Analysis of the voiding schedule showed a significant decrease in the number of diurnal and nocturnal micturition reducing from 7.68 to 5.89 ($p < 0.0001$) and from 1.26 to 0.61 ($p < 0.0001$), respectively. But the number of UI episodes was not significantly reduced after embolization (0.50 to 0.38, $p = 0.57$). In multivariate analysis the UDI-6 score was not significantly correlated with the uterine volume, the size and the location of the dominant myoma and the presence or not of a bladder compression by the fibroid on the MRI, before and after embolization. However, no post embolization MRI was performed.

To understand the lack of correlation between the topography of the myomas and urinary symptoms, the authors used the hypothesis developed by Arleo et al. [23] who described a case of urinary retention in a woman with an enlarged leiomyomatous uterus improved after embolization. They concluded that the hyper vascularization of fibroids may be responsible for the equivalent of "vascular flight" for the bladder causing the symptoms. The embolization overcoming this shunt, the bladder recovered a better vascularization. For them, hypervascular myomas steal or shunt blood from the surrounding pelvic organs, thus creating a state of relative chronic hypoxia around them. Relative chronic ischemia of the pelvic organs can produce organ dysfunction and related symptoms. Therefore, in theory, reversal of this relative ischemia of the pelvic organs after embolization may account for some improvement in myoma-related symptoms, especially just before significant shrinkage in myoma or uterine mass.

Conclusions

This literature review shows that myomas and their treatment seem to have an impact on the urinary tract. However significant data are still missing to demonstrate a direct link between myomas and urinary incontinence. The search for lower urinary tract dysfunctions using validated questionnaires in women consulting for a myomatous uterus should be systematic to assess more precisely the prevalence of urinary disorders associated with myomas.

While some studies have found the anterior location of fibroids and the size superior to 5 cm as a risk factor for UI, other studies have not found a correlation between myomas topography and symptom scores. However, these studies have shown an improvement after surgical treatment in the short term. It would be interesting to assess this impact in the longer term.

Declarations of interests

None.

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