

Mixed urinary incontinence: international urogynecological association research and development committee opinion

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Abstract

Background and aim The definition as well as the treatment of women with mixed urinary incontinence (MUI) is controversial. Since women with MUI are a heterogeneous group, the treatment of MUI requires an individual assessment of the symptom components: stress urinary incontinence, urinary urgency, urgency urinary incontinence, urinary frequency, and nocturia. The purpose of this paper is to summarize the current literature and give an evidence-based review of the assessment and treatment of MUI.

Methods A working subcommittee from the International Urogynecological Association (IUGA) Research and

Development (R&D) Committee was formed. An initial document addressing the diagnosis and management of MUI was drafted based on a literature review. After evaluation by the entire IUGA R&D Committee, revisions were made, and the final document represents the IUGA R&D Committee Opinion on MUI.

Results This R&D Committee Opinion reviews the literature on MUI and summarizes the assessment and treatment with evidence-based recommendations.

Conclusions The diagnosis of MUI encompasses a very heterogeneous group of women. The evaluation and treatment requires an individualized approach. The use of validated questionnaires is recommended to assess urinary incontinence symptoms and effect on quality of life. Conservative therapy is suggested as a first-line approach; if surgery is contemplated, urodynamic investigation is recommended. Women undergoing surgical treatment for MUI need to be counselled about the possibility of persistence of urinary urgency, frequency and urge incontinence even if stress urinary incontinence is cured.

Summary This R&D Committee Opinion reviews the literature on MUI and summarizes the assessment and treatment with evidence-based recommendations.

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Keywords Mixed urinary incontinence · IUGA research & development committee opinion

Abbreviations

IDO	idiopathic detrusor overactivity
IES	Intravaginal electrical stimulation
QOL	quality of life
MUI	mixed urinary incontinence
MUCP	maximum urethral closure pressure
OAB	overactive bladder
PFMT	pelvic floor muscle training
POP	pelvic organ prolapse
PVR	post-void residual
RCT	randomized controlled trial
SNRI	serotonin norepinephrine re-uptake inhibitor

SUI	stress urinary incontinence
TVT	tension free vaginal tape
UUI	urgency urinary incontinence
UI	urinary incontinence
USI	urodynamic stress incontinence

Introduction

Mixed urinary incontinence (MUI) is defined by the International Urogynecological Association (IUGA) and the International Continence Society (ICS) standardized nomenclature as “the complaint of involuntary leakage of urine associated with urgency and also with exertion, effort, sneezing or coughing” [1]. This implies the coexistence of both stress urinary incontinence (SUI) and urgency urinary incontinence (UUI) [1]. The IUGA and ICS definition of MUI is quite limiting especially with regard to evaluation of treatment outcomes. It relies on complaints of SUI and UUI and not on objective evaluation of incontinence by urodynamic investigation or a stress test. Furthermore, the definition does not include overactive bladder (OAB) symptoms which are “characterized by the storage symptoms of urgency with or without UUI usually with frequency and nocturia” [1]. In the evaluation of women with MUI, it is important to assess for, and treat, not only SUI and UUI, but also the symptoms of urgency, frequency, and nocturia since these also significantly affect quality of life (QOL).

MUI could also be defined urodynamically when both idiopathic detrusor overactivity (IDO), is witnessed in association with loss of urine in the absence of increased intra-abdominal pressure *and* urine loss is seen with increased intra-abdominal pressure but without increased detrusor pressure -urodynamic stress incontinence (USI) in the same woman during urodynamic testing [2]. Thus, the exact definition of MUI is still problematic and women with MUI represent a very heterogeneous population [2].

In a literature search of population-based studies in English, the median prevalence of female urinary incontinence (UI) was 27.6 %, with the most common type SUI in 50 %, MUI in 32 %, and UUI in 14 % [3]. When women older than 54 years were surveyed as part of the Nurses' Health Study cohort in the USA, increasing age was associated with steadily increasing risk of MUI, but not SUI [4]. In addition, UI symptoms worsened with time [4].

In two separate studies, Brubaker et al. [5, 6] evaluated the incidence of MUI as well as response to treatment using validated questionnaires and multichannel urodynamic testing to assess for SUI, UUI, and OAB symptoms. The incidence of MUI varied widely from 8.3–96.4 % depending on how MUI was defined, the severity of urge symptoms and frequency, and whether or not DO was present in addition to SUI or UUI

symptoms. More importantly, the different definitions of MUI did not correlate with treatment outcome. The authors concluded that the current definition of MUI does not adequately categorize clinically relevant subgroups and that MUI should be better defined in broader categories. For research reporting, MUI subcomponents of stress and urgency UI as well as OAB symptoms should be described separately rather than as a single dimension. Several categories have been proposed, including MUI stress predominant and MUI urgency predominant. However, even these categories can be subdivided to include women with and without DO, with and without complaints of UUI, and those with frequency and urgency but without UUI, all in combination with symptoms of SUI with or without USI [2, 5, 6].

A recent review reported that the epidemiology of MUI is difficult to characterize, surgical intervention is controversial, and the current body of evidence supports use of conservative therapy as initial treatment [7]. Since women with MUI are a heterogeneous group, the treatment of MUI requires an individual assessment of the symptom components: SUI, urgency, UUI, frequency, and nocturia.

The purpose of this paper is to present the opinion of the Research and Development (R&D) Committee of the International Urogynecological Association (IUGA) regarding the diagnosis and management of MUI, based on current literature review. A working subcommittee was formed, and each of the members (authors) was commissioned to review and summarize findings related to a specific domain related to MUI using electronic search methodology including, but not limited to, PubMed and Medline. Initial drafts were then circulated among the members, and relevant discussions held during a special conference at the 2013 annual IUGA meeting in Dublin, and later through electronic mail communication. Drafts were continuously updated until a consensus was reached regarding all sections of the manuscript.

Evaluation of mixed urinary incontinence (MUI)

Clinical assessment of women with MUI begins with general evaluation, urinary symptom assessment including the onset date of each separate symptom if recalled, frequency-volume diary, symptom questionnaires, quality-of-life assessment, and inquiry about history of pelvic or vaginal surgery [8, 9]. Validated questionnaires are helpful to gather this data. The Questionnaire for Urinary Incontinence Diagnosis (QUID), containing six questions, has been validated for the diagnoses of SUI, OAB, and MUI, and is a very useful tool [10]. Another validated simple-to-use tool, especially in primary-care settings, is The Stress/Urge Incontinence Questionnaire [11]. By asking the patient to recall the number of SUI and UUI episodes she experienced during the preceding week, a presumptive diagnosis of UI type could be readily reached.

Physical examination includes general, abdominal, and pelvic examinations. The general examination includes ascertaining body mass index; abdominal examination checks for masses; pelvic examination evaluates urogenital atrophy, urethral mobility, and pelvic organ prolapse and assesses pelvic floor muscle tone. Women should perform a stress test (cough and strain) to diagnose stress incontinence. It is important to assess voluntary pelvic floor muscle function tone at rest as well as on voluntary contraction by vaginal or rectal examination.

Investigation begins with urinalysis, with or without urine culture, to exclude infection [8]. Post-void residual (PVR) urine volume should be assessed in women with MUI to rule retention which may aggravate both SUI and UII.

Urodynamic studies (UDS) are useful in women with MUI to diagnose the type of incontinence. The presence of idiopathic detrusor overactivity (IDO) is likely to influence the choice of treatment [8] and be predictive of the treatment outcome of MUI [9, 12]. The UDS findings, however, are not often correlated with the clinical symptomatology of the urgency component [9]. In a large questionnaire-based survey followed by routine urodynamic testing to determine the predominant component of MUI, DO was detected in 64 % of women with urgency predominant MUI and also in 46 % of those with equal severity of stress and urgency incontinence [13]. The effect of urodynamic IDO on the treatment outcome of MUI has mainly been evaluated following surgical intervention. Several pre-operative urodynamic parameters were also tested for their ability to predict post-operative outcome, mainly persistent OAB symptoms particularly after mid-urethral sling surgery [9]. In a small retrospective series with short-term follow-up of tension-free vaginal tape (TVT), significantly higher pre-operative opening detrusor pressure was observed in patients with persistent OAB symptoms post-operatively than in those without these symptoms. A high pre-operative opening detrusor pressure, therefore, may be predictive of post-operative IDO after TVT in women with MUI [14]. In a larger study, the presence of pre-operative IDO and low maximum urethral closure pressure (MUCP) were found to be two independent risk factors in a multivariate model for treatment failure of UII following different sling procedures (TVT, SPARC, TOT) in women with MUI [15]. In a similar study, the specific pre-operative urodynamic predictors of persistent post-operative IDO in this group of women using logistic regression were low maximum cystometric capacity, IDO volume, MUCP and maximum urinary flow rate [16]. In the largest prospective cohort study to date with a mean follow-up period of 50 months, coexistent IDO increased by two-fold the risk of both persistent urgency (OR 2.04, 95 % CI 1.39–3.01) and UII (OR 1.86, 95 % CI 1.18–2.93) following different mid-urethral sling procedures in women with MUI [17].

In women with MUI and anterior pelvic organ prolapse (POP), almost 33 % were found to have IDO on pre-operative cystometry in one study [18]. Although MUI patients were more likely to experience postoperative urgency after surgical repair of prolapse than those with pure SUI, pre-operative urodynamic IDO was not predictive of this complication.

Most of the published studies on the role of urodynamic investigations in women with MUI have limitations. First, distinction is rarely made between women having surgery for primary or recurrent MUI. Secondly, most studies are retrospective, uncontrolled, and include small numbers of participants with short-term follow-up. Clinically important confounders such as patient demographic factors, previous or concurrent non-surgical treatment, type of surgical procedure, operative technique used, and surgeon's expertise cannot therefore be accounted for. The well established limited reliability of the urodynamic diagnosis of IDO because of low inter-observer agreement on the interpretation of diagnostic criteria and standardization of measurements should also be carefully considered. In women with MUI scheduled for surgical intervention, cystometry and uroflowmetry are recommended for basic evaluation to diagnose IDO and voiding dysfunction, particularly in those who have associated POP [8]. More sophisticated testing such as complete, multichannel urodynamic evaluation, may be required depending on the clinical presentation. Patients with urgency predominant MUI or MUI associated with anterior POP should be counselled about the risk of persistent urge symptoms after surgery, regardless of urodynamic diagnosis [9].

The value of urodynamic evaluation in women with MUI who will not be treated by surgery is less clear. In two large community-based studies, urodynamic parameters were not predictive of the outcome of either pharmacological therapy or behavioural treatment of MUI [19, 20]. Urodynamic testing in this group of women, therefore, should be based on clinical judgment.

Summary

1. The diagnosis of MUI is based on symptoms preferably gathered by validated questionnaires, and the documentation of SUI by cough stress test.
2. UDS is useful to document USI, and assess for the presence of IDO. UDS is most valuable in the preoperative counselling of MUI patients, as the presence of IDO and/or low MUCP may increase the likelihood of persistent OAB symptoms after sling procedures/surgical treatment of MUI.
3. In non-surgical patients with MUI, the decision to perform UDS is based on clinical judgement.

Conservative treatment options for MUI

Non-surgical, non-pharmaceutical treatment

a. Behavioural/Lifestyle Modification

Behavioural modifications are generally safe, inexpensive, and by themselves may offer a significant improvement in symptom severity and QOL. Basic behavioural techniques such as caffeine and fluid restriction, management of constipation, and counselling about voiding frequency were found, when used in combination, to significantly reduce UI of unspecified type in one randomized controlled trial (RCT) [21]. A prospective study of over 65,000 women revealed a significant association between the amount of caffeine intake and severity of incontinence [22]. In a separate subanalysis of the same study population, total fluid intake was not associated with risks of incident SUI, UUI, or MUI [23]. The effect of caffeine, as well as fluid intake, has been inconsistent among studies, making a recommendation against caffeine consumption and limiting fluid intake as a treatment for MUI empirical at best. Judicious limitation of fluids in the evening hours may assist in decreasing nocturnal urine production and subsequent nocturia and nocturnal enuresis.

Other lifestyle modifications, such as weight loss and exercise, may also result in improvement of MUI symptoms. The association between obesity and UI has been documented in epidemiological studies [24]. Weight loss of 5–10 % of body weight leads to a significant improvement in UI [25]. Among all non-pharmacological treatment options for MUI, weight loss in overweight and obese women remains the treatment of choice as it is associated with the most consistent outcome. Exercise may also result in improvement of MUI symptoms. Multidimensional exercise twice weekly for 3 months was shown in a RCT to significantly improve urine leakage rates in all types of UI, including MUI, among elderly women, with favourable results maintained at 7 months' follow-up [26].

b. Pelvic Floor Muscle Training/Biofeedback/Bladder training/Electrical stimulation

Pelvic floor muscle training (PFMT) is the most commonly used conservative treatment for women with UI. The Cochrane database of systematic reviews provided support for the widespread recommendation that PFMT be included in first-line conservative treatment plans for women with stress, urgency, or MUI [27]. This requires perseverance and is therefore dependent on patient motivation and compliance, as results are positively affected by longer treatment duration. The review evaluated PFMT in 14 trials involving 836 women and concluded that PFMT was better than no intervention for

the treatment of MUI [27]. A better outcome is described with pure SUI compared to MUI. Admittedly, interpretation of the results is limited by considerable variation in duration and technique of interventions used, study populations, and outcome measures.

There is evidence that adding biofeedback to PFMT may provide further benefit in treatment of MUI [28]. Whether this is partially due to more frequent encounters with health professionals remains unknown.

Bladder training, also known as scheduled voiding or bladder drill, was found to improve MUI symptoms, without necessarily affecting urodynamic parameters when measured [29]. Persistence of long-term improvement is unclear. Most trials, however, evaluated bladder training as an adjunct to other behavioural modification strategies. Furthermore, this conservative approach was often compared to heterogeneous treatment modalities, and studies included women with different types of UI [29].

The literature on electrical stimulation for MUI is scarce. Intravaginal electrical stimulation (IES) using frequencies below 12 Hz stimulates the pudendal nerve, which may inhibit the detrusor muscle and reduce involuntary contractions as well as working in a passive way by helping patients to become conscious of pelvic muscles contractions [30, 31]. However, the few RCTs available demonstrate conflicting results of the effect of IES in reducing UI in patients with MUI [32–35]. Currently, IES cannot be recommended as first-line therapy.

c. Vaginal Continence Pessaries

Pessaries appear to be an acceptable treatment option for SUI and MUI in that most women are willing to consider the option, and half of those successfully fitted continue use for at least 6 months [36]. A RCT comparing continence pessary, behavioural therapy, and combined treatment in women with SUI (46 %) and MUI (54 %) found at 12 months' follow-up approximately 60 % without bothersome UI in those still using a pessary, versus 63 % with behavioural therapy and 41 % with combined treatment [37].

d. Acupuncture

Limited data suggest a possible role for acupuncture in the treatment of OAB and MUI. Several observational studies support acupuncture as a potentially successful treatment of urinary urgency, UUI, and MUI [38, 39]. Two small RCTs of short duration found “bladder specific” acupuncture to be superior to sham acupuncture [40, 41]. The lack of standardized methodology and the limited data preclude the routine recommendation of acupuncture for treatment of MUI, especially as there were no significant changes in the scores of QOL measures.

Summary

1. The mainstays of conservative therapy of MUI are behavioural and lifestyle modifications in conjunction with pelvic floor muscle training and biofeedback. Weight loss in overweight and obese women is associated with the most consistent outcome.
2. In the short term, subjective cure rates can be up to 40 % but the challenge is sustaining this in the long term.
3. When counselling women about non-pharmacological non-surgical treatment options for MUI, healthcare providers should take into account: i) the predominant type of incontinence, ii) the realistic feasibility of the treatment and iii) the patient's willingness to engage in such therapy considering each patient's unique circumstances.

Pharmacotherapy for MUI

Drug strategy

As MUI has been regarded as two coexisting disorders (SUI/UII), it is accepted that women with MUI may respond better to combination therapy focusing on the predominant symptom(s) [42]. Medical treatment strategies consist of estrogen in postmenopausal women, drugs addressing only SUI, those addressing only UII, and those with a theoretical dual action on both conditions.

a. Estrogen in Postmenopausal Women

A recent Cochrane review assessed 34 trials using different combinations of estrogen types, dosages, duration of treatment, and length of follow-up in postmenopausal women [43]. Systemic administration of estrogens seemed to worsen UI compared to placebo. However, vaginal estrogen seems to improve UI with less urgency and frequency. There is lack of evidence regarding the best estrogen formulation, duration of vaginal estrogen treatment, or the effect of long-term therapy.

b. Antimuscarinics

Few studies investigated the comparative effectiveness of antimuscarinics specifically on MUI as most have studied subgroups of patients with MUI within larger populations with OAB. Antimuscarinics have been shown to result in a favourable response on MUI [44] and there is good evidence to support the use of oxybutynin, tolterodine, solifenacin, and fesoterodine in MUI as well as in OAB [12]. Transdermal oxybutynin has been shown to significantly improve symptoms in patients with MUI [45]. Tolterodine was found in

placebo-controlled RCTs to significantly improve symptoms and QOL of women with MUI [46, 47]. This was further confirmed in the MERIT study [48], which randomized 854 women with urgency-predominant MUI to 4 mg extended-release (ER) tolterodine or placebo for 8 weeks and found a median reduction in incontinence episodes of 77 % in patients undergoing active treatment. Similar results were found in pooled subgroup analyses of studies on solifenacin [49, 50] and transdermal oxybutynin [51]. In a prospective, randomized study with solifenacin (5–10 mg), 1,041/2,696 women (39 %) with urgency-predominant MUI achieved median reductions in incontinence episodes of 82 % (5 mg) and 94 % (10 mg) versus 64 % placebo [50]. Fesoterodine has been shown to produce similar efficacy to tolterodine in a recent double-blind RCT of 654 patients [52]. Side effects, especially dry mouth, are frequent with antimuscarinic therapy, and long-term adherence to therapy is poor [53].

c. Sympathomimetics

Mirabegron is a selective β_3 -adrenoceptor agonist that may represent an alternative treatment option instead of antimuscarinics for patients with OAB. Initially approved for use in Japan in 2010, mirabegron is now available in many countries and has been shown to decrease frequency, urgency and the number of incontinence episodes [54]. A favourable efficacy/safety profile makes mirabegron an attractive treatment choice, especially in those intolerant to antimuscarinic side effects [54]. At the time of writing of this article, no data exists regarding its use in MUI.

d. Selective Serotonin Norepinephrine Reuptake Inhibitor

Duloxetine, a selective serotonin norepinephrine re-uptake inhibitor (SNRI), was the first drug treatment for SUI and is the only medication with regulatory approval by the European Commission to treat SUI. In a randomized, placebo-controlled, double-blind clinical trial of 588 women with MUI who received either duloxetine 80 mg daily or placebo, incontinence episodes were significantly more reduced with duloxetine (60 %) than with placebo (47 %), and the reduction was seen in both UII and SUI episodes [55]. Decreases were significantly greater for patients with stress-predominant MUI, whether diagnosed by symptoms alone or qualified by invasive urodynamic investigations. Similar findings were reported in elderly women with stress predominant MUI [56]. Side effects, especially nausea, were very frequent with duloxetine. Long-term persistence with duloxetine for UI is poor [57, 58].

Imipramine is a tricyclic antidepressant with dual action as an antimuscarinic and SNRI. Despite the lack of robust data, imipramine has been used in MUI with variable success rates [59].

Summary

- 1) Antimuscarinics can be offered to women with urgency-predominant MUI and duloxetine to women with stress-predominant MUI. Patients should be counselled regarding side effects with both medications and appropriate follow-up should be offered, as long-term compliance is poor.
- 2) Vaginal estrogen use may improve UI, as well as OAB symptoms in postmenopausal women.

Surgical management of MUI

Discussion of the surgical options for MUI includes surgical procedures for SUI as well as IDO.

Current surgical procedures for SUI, upon failure of conservative measures, include midurethral tape slings, including retropubic, trans-obturator and single incision tape slings.

- Burch colposuspension
- Pubovaginal sling
- Urethral bulking agents
- Artificial urinary sphincter.

On the other hand, current surgical procedures for IDO, upon failure of conservative measures, include:

- Botulinum toxin “A” bladder wall injection
- Sacral neuromodulation
- Percutaneous tibial nerve stimulation.

Order of surgical management

No published studies were found to assess whether it is better to start with surgical management of SUI or DO.

Combined approach

Two small studies with short-term follow-up compared bladder denervation procedures in addition to tension-free vaginal tape-obturator (TVT-O) sling against TVT-O sling alone for MUI [60, 61]. The two studies had conflicting results regarding improvement in the cure of incontinence with the addition of the denervation procedure as compared to sling only. However, QOL parameters related to frequency, urgency, and nocturia improved significantly in the combined treatment group as compared to sling only. The small numbers and relatively short duration of follow-up, in addition to the rather uncommon denervation procedures, preclude making any recommendations.

Surgical continence operation

The only published studies comparing various surgical procedures for SUI in women with MUI relate to the use of retropubic and trans-obturator mid-urethral tape slings.

Mid-urethral tape slings

Cure of UI following mid-urethral slings is less frequent in women with MUI than in those with pure USI [62–65]. Cure of SUI is similar to that in patients with pure SUI, but urgency symptoms persist in about 30–70 % [63, 64]. Women with urgency predominant MUI have even lower cure [64–66]. A multiple logistic regression analysis, carried out as part of a retrospective review of over 1,000 patients with a mean follow-up duration of 50 months following a variety of mid-urethral slings, reported MUI as an independent risk factor for surgical failure [67].

A meta-analysis evaluating retropubic TVT and trans-obturator tapes in patients with MUI showed no significant difference in overall subjective cure of SUI and urinary urgency, frequency and UUI between the two sling types [62]. A prospective non-randomized study compared tension-free vaginal tape retropubic (TVT-RP) and tension-free vaginal tape-obturator (TVT-O) slings for urodynamically proven MUI [66]. At 12 months' follow-up, there was no significant difference in symptoms between the two groups, but the absence of IDO was more common in the patients who had TVT-RP sling (48.5 % vs. 22.7 %, $p=0.014$). A retrospective case-control study comparing TVT-RP and TOT slings for MUI showed significantly more patients requiring repeat continence surgery after TOT sling than after TVT-RP sling (10/34 (29.4 %) TOT vs. 0/34 after TVT-RP (0 %), odds ratio 10.1, 95 % CI 2.6–38.2) [67].

Burch colposuspension

Like mid-urethral slings, Burch colposuspension is reported to yield good cure and improvement rates in SUI ranging from 90 % [68] to 57 % [69] in a number of case series, and significantly lower cures in patients with MUI [70]. Other studies have suggested that MUI did not significantly affect the outcome of Burch colposuspension [71, 72], though it was noted to be associated with storage symptoms [71]. One study reported disappearance of IDO in 67 % following Burch colposuspension for MUI [69]. A further study reported a 2.5 times higher likelihood of UUI cure following Burch colposuspension in patients with MUI in whom the onset of stress incontinence predated the onset of UI [73]. The possibility of worsening UUI following surgical treatment is important, as UUI is known to carry a more significant effect on QOL than SUI [74].

Pubovaginal sling

A single study reported no significant difference in cure of SUI in patients with MUI compared to patients with USI alone [75]. However, increased episodes of urgency and UI were associated with failure of pubovaginal slings. Another study reported significantly less improvement in QOL following pubovaginal sling insertion in patients with MUI, as compared to patients with pure SUI [76].

Urethral bulking agents

One study reported a subjective response rate of 64 % at 24 months following polyacrylamide hydrogel (Bulkamid®) injection, with no significant difference in efficacy between patients with SUI and patients with MUI [77].

Artificial urinary sphincter

No studies were found reporting the value of artificial urinary sphincter in patients with MUI.

Surgery for IDO in women with MUI

No published studies were found comparing various surgical procedures for IDO in patients with MUI.

No studies were found reporting the outcome of botulinum toxin A bladder wall injection in patients with MUI as such, though one study suspected that the inclusion of patients with MUI may have lowered their success rate at 4 weeks [78].

No studies were found reporting the outcome of percutaneous tibial nerve stimulation or sacral neuromodulation in patients with MUI.

Summary

- 1) Midurethral tape slings are the most frequent surgical management of SUI in patients with MUI. The retropubic route may have a better success rate than the trans-obturator route.
- 2) Surgical treatment of SUI with midurethral tape slings, Burch colposuspension or pubo-vaginal slings in women with MUI results in cure or improvement of urinary urgency, frequency, and urge incontinence in 30–70 %.
- 3) The diagnosis of MUI is an independent risk for failure to cure UI following surgery for SUI, as OAB symptoms persist in a significant proportion of women. Patient counselling is vital as UI is associated with a more significant effect on QOL than SUI.
- 4) Surgical management of DO, such as botulinum toxin, peripheral tibial nerve stimulation, and sacral neuromodulation, has not been adequately evaluated in patients with MUI.

Conclusions

- IUGA/ICS standardized nomenclature defines MUI as “the complaint of involuntary leakage of urine associated with urgency and also with exertion, effort, sneezing or coughing”. This definition, however, does not capture all of the symptoms frequently experienced by this heterogeneous group, such as ones related to OAB.
- The evaluation of women with MUI requires an individualized approach. Use of validated questionnaires is beneficial to assess for type of urinary incontinence and effect on QOL.
- Urodynamic investigation in the nonsurgical patient is optional. When surgery is contemplated, assessment should include stress test to document SUI, cystometrogram to evaluate for DO, and uroflowmetry and PVR to exclude voiding dysfunction and retention, especially in women with anterior POP.
- Treatment of MUI requires an individualized approach based on the patient’s symptom components and their effect on her QOL, examination, and findings on urodynamic investigation when performed.
- The current body of evidence supports use of conservative treatment, including non-surgical, non-pharmaceutical and pharmaceutical therapy as initial treatment. Conservative treatment requires patient compliance, and this is the limiting factor for long-term success.
- Among all conservative treatment options for MUI, weight loss in overweight and obese women remains the treatment of choice as it is associated with the most consistent outcome.
- Behavioural therapy, PFMT with or without biofeedback, vaginal continence pessaries, and acupuncture all have little risk with subjective cure of 40–50 % of patients in the short term.
- Vaginal estrogen improves OAB symptoms and UI in postmenopausal women, while systemic estrogen worsens UI.
- Antimuscarinics have been shown to reduce UI episodes in women with MUI, especially in those with urgency predominant symptoms; however, adherence to long-term use of anti-muscarinics therapy is limited by their side effects.
- Mirabegron, a selective β_3 -adrenoceptor agonist with a favourable side-effect profile may provide an alternative to antimuscarinics for OAB treatment in women with MUI; however, there are no studies of this drug class in women with MUI.
- Duloxetine, a selective serotonin norepinephrine re-uptake inhibitor, reduces UI episodes in women with MUI, with greatest effect in those with SUI-predominant MUI; however, long-term use is poor secondary to side-effects.

- Surgical treatment of MUI with midurethral tape slings, Burch colposuspension or pubovaginal slings results in cure or improvement of urinary urgency, frequency and UUI in 30–70 %, and SUI approximately 80–90 %. The most common surgical treatment of MUI, and the one that has the most data, is the mid-urethral tape sling. The retropubic route may have a better success rate than the trans-obturator route in the resolution or improvement in DO and OAB.
- IDO and high pre-operative opening detrusor pressure, as well as low MUCP, could be predictive of persistent OAB symptoms and IDO after mid-urethral sling procedures, with a potentially more devastating effect on QOL.
- In patients with MUI, there is no sufficient data evaluating the surgical management of IDO component, such as botulinum toxin, peripheral tibial nerve stimulation, and sacral neuromodulation.

Disclaimer This Committee Opinion was developed by the IUGA R&D Committee. The information is designed to aid practitioners in making decisions about appropriate urogynecological care and should not be construed as dictating an exclusive course of treatment or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources and limitations unique to the institution or type of practice.

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