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REVIEW PAPER

A comparison of sacral neuromodulation vs. transvaginal electrical stimulation for the treatment of refractory overactive bladder: the impact on quality of life, body image, sexual function, and emotional well-being

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Abstract

Overactive bladder syndrome (OAB) is defined by the presence of urinary urgency, with or without urge incontinence, usually accompanied by an increase in urinary frequency and nocturia in the absence of urinary tract infections (UTI) or other diseases. The overall prevalence of OAB symptoms in the female population is reported to be 16.6% and increases with advancing age and menopause. The aetiology of OAB is not fully understood and is likely to affect a heterogeneous population of patients due to changes to their central and peripheral nervous systems. Although OAB is frequently associated with female sexual dysfunction (FSD), its real impact on sexual function in women has been evaluated only in a few studies. The first line of treatment for OAB includes behavioural modification and physical therapy, either as monotherapies or in combination. Many patients who have not had success in managing their symptoms with more conservative therapies may decide to resort to third-line treatments for refractory OAB. These treatments include neuromodulation therapies, particularly transvaginal electrical stimulation (TES) and sacral neuromodulation (SN). The aim of this short commentary is to provide an overview of the effectiveness of these treatments and of their impact on quality of life, body image, sexual function, and emotional well-being.

Key words: overactive bladder syndrome, transvaginal electrical stimulation, sacral neuromodulation, menopause, quality of life, sexual function.

Overactive bladder syndrome (OAB) was first described in 1996 and is defined by the presence of urinary urgency, with or without urge incontinence, usually accompanied by an increase in urinary frequency and nocturia in the absence of urinary tract infections (UTI) or other diseases [1-3].

Symptoms of OAB are also common to interstitial cystitis/painful bladder syndrome (IC/PBS) [4]. However, we can distinguish these diseases by the presence of urinary incontinence in patients with OAB and pelvic pain in patients with IC/PBS [4, 5]. Furthermore, OAB often occurs concomitantly with pelvic organ prolapse (POP) with a significant impairment of the quality of life of women affected [6-9]. It has been underlined that OAB symptoms improve after treatment of POP [10-17].

In addition, there seems to be a significant association between anterior and/or fundal leiomyoma and OAB. For this reason, the presence of uterine leiomyoma should be taken into account in women affected by overactive bladder [18-21].

Bladder dysfunctions are also common after radical hysterectomy and radiotherapy for the treatment of gynaecological cancer [22-27]. Therefore, urinary symptoms should always be evaluated in cancer patients [27, 28].

Recently, a possible relationship between postpartum depression and symptoms of overactive bladder in postpartum women was hypothesised. Postpartum depression is a common complication of childbirth, and a number of studies have underlined a link between

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this condition and urinary symptoms [29-31]. Although it is difficult to establish the cause and/or effect relationship between the two conditions, the simultaneous presence of depression and urinary incontinence is associated with a worsening quality of life in affected women [30, 31].

The aetiology of OAB is not fully understood and is likely to affect a heterogeneous population of patients due to changes to their central and peripheral nervous systems [32]. The overall prevalence of OAB symptoms in the female population is reported to be 16.6% and increases with advancing age and menopause [33-36]. In this regard, the signs of menopause may be closely associated with a higher prevalence of OAB and more severe symptoms [37, 38]. Furthermore, many women in menopausal age who suffer from this condition wait for years before undergoing treatment because of the lack of knowledge and shame associated with these symptoms [39].

The pathophysiology of OAB is complex and incompletely understood. The detrusor muscle is activated by the parasympathetic nervous system through the nerves originating at S2, S3, and S4 level [40]. The impulse is transmitted through acetylcholine (ACh), which acts a mediator on the muscarinic receptors, namely its action on the M3 subtype is the main cause for the contraction of the muscle tissue of the bladder. However, recent research has shown the role of the urothelium and the suburothelium in the perception of sensorial stimuli, and numerous pathological variations of expressed receptors have been reported in sufferers with OAB [41].

Several studies have underlined that OAB drastically reduces quality of life because of its negative influence on many aspects of patients' lives, including social, physical, and psychological well-being, and work productivity [42-45]. Moreover, both sexual desire and the capacity to reach an orgasm through penetration are impaired in female patients with OAB, thus affecting their sexual health [46, 47]. Not surprisingly, many papers have reported that urinary symptoms can cause a huge psychological burden, likely to affect mental and sexual health through the production of negative emotions [47-52]. Although OAB is frequently associated with female sexual dysfunction (FSD), its real impact on sexual function in women has been evaluated only in a few studies [42, 45-56]. In this regard, one of the most frequently used questionnaires in the literature to evaluate sexual dysfunctions related to different diseases is the Female Sexual Function Index (FSFI) [57-60]. Data obtained through the use of this instrument underline that much more women with OAB report sexual dysfunction than the general, healthy female population without urinary symptoms [54, 55]. Moreover, in postmenopausal women, there is an association between severity of OAB symptoms and worsening sexual function, mainly in the domains of arousal, lubrication, orgasm, and pain [47, 61-64]. In this regard, the studies by Zhu *et al.* [38] and Hakimi *et al.* [39] confirm that women in menopausal age with OAB report lower scores in all sub-domains of sexual function than women who do not suffer from OAB. Furthermore, OAB is associated with a reduced frequency of sexual intercourse during menopause [39].

Nevertheless, further studies on this topic are needed in order to better understand the effects of OAB symptoms on sexual function and to improve sexual health in the affected women.

The first line of treatment for OAB includes behavioural modification and physical therapy, either as monotherapies or in combination [65, 66]. First-line medical therapies are usually associated with a second-line of treatment of anticholinergics and β-3 agonists, before potentially considering invasive surgical treatments such as urinary diversion [66]. However, these medications are often characterised by lack of efficacy, poor compliance, low patient satisfaction, and side effects [67-69]. For these reasons, many patients who have not had success in managing their symptoms with more conservative therapies may decide to resort to third-line treatments for refractory OAB [70]. These treatments include neuromodulation therapies, particularly transvaginal electrical stimulation (TES) and sacral neuromodulation (SN) [67, 69, 70].

TES is a conservative treatment option, described more than 40 years ago, which allows the use of a surgical approach later, if necessary [71, 72]. With TES, after attaching a sensor with electrodes in the vagina, the muscles of the pelvic floor are activated through a painless electric current [73, 74]. Different frequencies result in different outcomes. Pelvic floor muscles (PFMs) can be activated with frequencies between 35 and 40 Hz, while at 5-10 Hz the effects spread also to the detrusor muscle. Based on results from randomised clinical trials, a frequency of 50 Hz has been recommended for patients with Stress Urinary Incontinence (SUI) and a frequency of 10-20 Hz for urge urinary incontinence (UUI). The device is applied transvaginally, and treatment sessions are run daily for a course of about 4-12 weeks and last about 15 to 30 minutes at the highest intensity that the patient is able to endure. Cure and clinical improvement rates vary between 60% and 80%, and no harmful side effects have ever occurred [75-77]. Being a conservative treatment, TES is often recommended in cases of mild or moderate cases of UUI; in addition to this, new research has been suggested using TES also for treating FSD, but its efficacy still needs to be shown [78-80]. In this regard, Giuseppe *et al.* [81] evaluated 37 women with UUI (23 of them also suffering from FSDs) using a voiding diary and FSFI before and after three months of TES. The results of this study showed a significant improvement of sexual function in

the 23 women with UUI and FSD after three months of TES [81]. Moreover, several studies underline the effectiveness of a combined rehabilitative approach for the treatment of FSDs associated with UUI, where electrical stimulation is applied together with biofeedback, pelvic floor muscle exercises, and vaginal cones [82, 83].

The mode of action of TES involves increasing the contraction of the sphincter on the urethra, and the strength of the PFMs to hold the pelvic structures [84].

The resulting muscle hypertrophy could also exert a passive mechanical pressure on the urethra, thus helping to improve symptoms in SUI. When PFMs are stimulated trough TES, the short bust of electricity could induce reflexes to induce the contraction of para- and peri-urethral muscles and the inhibition of the detrusor activity [85]. The inhibitory reflex also improves the bladder storage. To benefit from these effects, patients with UUI need to have an intact peripheral neuronal pathway to the PFMs [81].

For women in whom more conservative treatments fail, the next option is SN, the lowest invasive procedure that allows the avoidance or postponement of major interventions [70]. Tanagho and Schmidt were the first to report the use of this procedure in 1988, where the implant of an electrode in the S3-S4 sacral foramen allowing to provide ongoing stimuli to the sacral nerves, thus improving urinary symptoms [85]. During the procedure, an electrode is placed percutaneously via the S3 foramen, which provides low-amplitude electrical stimulation to the S3 nerve root and results in changes to bladder storage function [86, 87]. The mechanism of action of SN is not fully understood. The most well-accepted hypothesised mechanism is that the effects of SN derive from stimulation of the alpha myelinated afferent fibres and unmyelinated C fibres in the S3 and S4 pelvic and pudendal nerve roots that affect the micturition reflex [87, 88]. Several studies have underlined that SN also affects the activity in the brain [70]. The resulting effect of central neuromodulation in several areas has been demonstrated with both positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) [89].

Efficacy of SN has been demonstrated in literature in both short and long term [87]. Improvement in urinary symptoms from SN reported in case series and randomized ranges from 64% to 88% [70]. Refractory OAB symptoms can be improved by up to 50% with SN, as a few RCTs have shown [90-92].

Regarding sexual function of women treated with SN, the data available in literature seem to highlight a positive effect of SN on sexual function of women with pelvic floor disorders, even if actual evidence is still insufficient to definitely confirm the effectiveness of this procedure for the treatment of FSDs [93, 94].

In conclusion, both TES and SN seem to be viable treatment options for patients with refractory overactive bladder. However, further studies are needed in order to better understand the effectiveness and limits of these therapies and their impact on quality of life, sexual function, and psychological well-being.

Disclosure

The authors report no conflict of interest.

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