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Approach to female urinary incontinence: Part 2: Surgical Management

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Introduction:
Part one of this article deals with the assessment and medical management of the disease. The following will delve into surgical techniques in the armamentarium of treatment for both urge and stress urinary incontinence.

1. Urge Urinary Incontinence (UUI):
The International Urogynaecological Association/International Continence Society (IUGA/ICS) joint report defines UUI as the state of involuntary loss of urine that is associated with urgency.[1] Overactive bladder is the clinical diagnosis based on patient symptomatology, namely increased daytime frequency and urinary urgency.[2] Behavioural and medical management is the mainstay of treatment for OAB. However, the fall off for use of the above techniques is high, due to the poor adherence to the adverse side effect profile of most anticholinergics. Other treatment modalities are discussed below.

1.1. Botox
Behavioural therapy remains first line for OAB, as recommended by the ICS.[3] Anti-muscarinic medication and the newer B_3 adrenergic receptors can be used in combination with behavioural therapy, but their use is limited in view of the side effect profile of the former and the cost and availability issues of the latter.

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Produced by the bacteria Clostridium Perfringens, Onabotulinumtoxin A inhibits the pre-synaptic release of acetylcholine in motor neurons. In addition, it decreases adenosine triphosphate (ATP) and substance P release and causes the down-regulation of capsaicin and purinergic receptors on afferent neurons.[4] It has long been approved for a number of ophthalmic and aesthetic procedures. In 2011, it was then approved for the use in the treatment of OAB. In the same year, a Cochrane review on the subject was published, finding that Botox is a suitable treatment for refractory OAB.[5] Subsequently, there have been multiple review articles published on the subject leading the American Urological Association and the Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (AUA/SUFU) to release a joint guideline stating that they consider BOTOX injections for OAB as third line options for those patients who have failed or are not suitable candidates for the first and second line medications outlined above. Exact dosages for the use of BOTOX in the literature vary, but the general consensus suggests 200u, and 300u for neurogenic OAB.

1.2. Neuromodulation:
Peripheral Neuromodulation:
The lower urinary tract is innervated by nerves arising in the lumbar, sacral and coccygeal regions of the spinal cord, specifically L2-S4. The posterior tibial nerve comprises part of the sciatic nerve that arises from L4 to S3. Other nerves which innervate the pelvis are the dorsal genital nerve (DGN) and the pudendal nerve. Peripheral neuromodulation attempts to stimulate these nerves and therefore effect a change in lower urinary tract symptoms. This can be performed in one of two ways: either by means of dermatomal stimulation, or by stimulating the nerve through the overlying skin.[6]

Posterior Tibial Nerve Stimulation (PTNS)
External intermittent neuromodulation such as PTNS sends electrical stimuli to the sacral nerve plexus via a 34-guage needle inserted at a 60 degree angle just above the medial aspect of the ankle. The current is titrated according to patient response. Patients typically receive twelve, thirty minute treatments on a weekly basis and thereafter treatment cycles may need to be repeated periodically.[6,7]

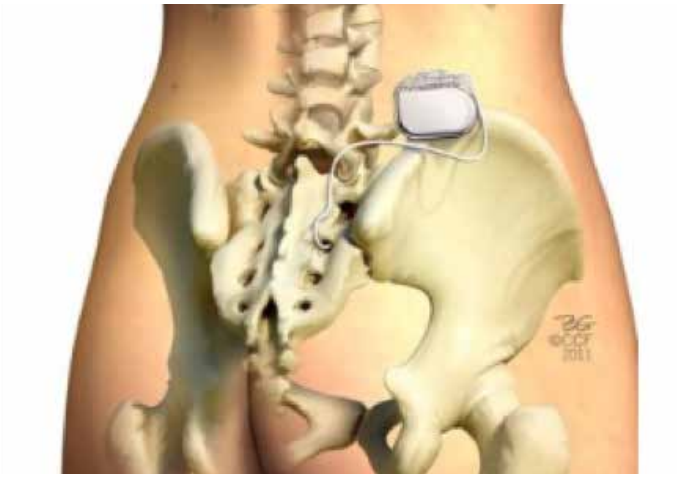
The modulatory effects of the PTNS on the impulses to and from the bladder have resulted in subjective symptomatic improvement in approximately 60% of patients, along with an objective improvement in frequency voiding chart parameters of up to 57% with, a good long term consistency. These results may be affected by some bias, as the patients receiving PTNS are also often the beneficiaries of regular visits and follow up, support groups etc, but compared to the sham treatment (placebo) improvement of 21% are still promising.[8] The clinician may consider PTNS in patients with OAB who have shown a poor response to antimuscarinics, or who are unable to tolerate the side effects of medical management.[6,7,8]

Figure 1. Posterior Tibial Nerve Stimulation device (from: www.ptns.com.au)

Sacral Nerve Stimulation (SNS)
While PTNS is inexpensive and minimally invasive, it can be a tedious treatment option. Therefore novel procedures with implants have been proposed.[8] Sacral neuromodulation works on a similar basis to peripheral nerve stimulation, but acts via direct stimulation of the sacral nerve to modulate the afferent and efferent impulses to and from the bladder. SNS is currently FDA approved for OAB (including refractory urge incontinence), Non-obstructive urinary retention, and fecal incontinence. Small case studies show some benefit of SNS in patients with spinal cord disease, lower motor neuron disease, and with pudendal nerve pain and female sexual dysfunction.[9] There is scant data on the clinical and urodynamic predictors of success in SNS, however, current guidelines recommend SNS for patients with recalcitrant urge incontinence who have failed other conservative measures of management.[7,10,11,12]

Given the fact that Botox and SNS are essentially recommended for the same clinical scenario it may be confusing for the clinician to decide between the treatment modalities. The Rosetta trial looked at the difference between SNS and Botox for patients with refractory OAB. Although Botox showed a small statistically significant benefit over SNS, this benefit is stated by the authors to be 'of uncertain clinical importance'. Additionally, any possible benefit must be balanced against the increased potential for urinary tract infections and the need for self-catheterisation.[13]

Figure 2. Sacral nerve stimulation device implanted above the buttocks (from: www. consultqd. clevelandclinic.org)



1.3. Other
Cystoplasty and urinary diversion:
Destructive procedures such as clam cystoplasty or urinary diversion are salvage measures for patients with severe refractory OAB, generally secondary to neurogenic detrusor overactivity, or for structurally contracted bladders which are poorly compliant and may be seen after infections such as TB, and fibrosis.[14]

2. Stress Urinary Incontinence (SUI):
SUI is defined as the 'involuntary loss of urine' on effort or physical exertion, or from sneezing or coughing.[11] Surgical treatment remains the mainstay of treatment for SUI in patients who have failed conservative management including lifestyle modification, physiotherapy, behavioural therapy and scheduled voiding.[15] Although a multitude of procedures for the treatment of SUI have been proposed, currently no ideal procedure in terms of cost, simplicity and ease of use, efficacy and morbidity has been found.[15]

2.1. Anterior repair
The 2017 Cochrane Review of 10 trials compared anterior vaginal repair and other interventions in women with urinary incontinence (SUI or mixed urinary incontinence). Such interventions included physiotherapy, bladder neck needle suspension, and open retropubic suspension. There were no trials comparing anterior repair with mid-urethral slings or laparoscopic colposuspension, which is unfortunate. The review found that anterior repair was less effective than open retropubic colposuspension procedures – the traditionally quoted 'gold standard' procedure for SUI, even in women with concurrent pelvic organ prolapse. However, the review culminated in an open-ended conclusion, stating that the lack of information on the comparative post-operative complications and morbidity associated with the two procedures did not allow for a final verdict on anterior repair for SUI.[16]

2.2. Retropubic Colposuspension (retropubic urethropexy)
The open colposuspension has been traditionally quoted as the gold standard for SUI. Of the various retropubic colposuspension procedures described historically, the Burch colposuspension and the Marshall-Marchetti-Krantz (MMK) have traditionally shown longer term success in the treatment of stress urinary incontinence. Of the two procedures, only the Burch Colposuspension is recommended by the 6th ICI in 2017.[10] The 2017 Cochrane review showed continence rates of up to 90% within a year of treatment with the open Burch colposuspension. This response decreases to approximately 70% overall continence after 5 years.[17] The colposuspension can be performed via open or endoscopic routes. For obvious reasons, laparoscopic colposuspension allows for improved recovery times, and looks like a promising alternative to open surgery, but the long

term data on efficacy and relative safety is lacking.[17]

2.3. Needle Suspension procedures:
Data shows that needle suspension procedures such as the Raz and Stamey procedures are not as effective as traditional colposuspension procedures, with an equivalent efficacy to anterior repairs (also no longer used to treat stress urinary incontinence).[11]

2.4. Sling procedures:
Traditional/Pubovaginal slings
AFS (autologous fascial sling) is the most widely evaluated biological sling and is an effective and durable treatment for SUI. Pubovaginal slings are slings placed at the bladder neck. Mesh has been previously used for these slings but generally fascia harvested from rectus or thigh is preferred.[18]The autologous fascial sling is the most extensively researched biologic sling and has found to be an efficacious and enduring modality for the treatment of SUI.[10]

Pubovaginal slings are versatile and can be used for primary SUI in the context of ISD, a hypermobile urethra, or in patients who are not candidates for mesh. They can also be used in recurrent SUI as a salvage procedure, for example in the case of a failed mid urethral sling. They are useful as an adjunct procedure during urethral and/or bladder reconstruction.[18]

Mid-urethral slings
The advent of the retropubic sling in the 1990's revolutionised the treatment of SUI. Mid-urethral slings have since then become the gold standard for stress urinary incontinence surgery, and they form the bulk of anti-incontinence surgery world-wide.[19]

The retropubic or transvaginal tape (TVT): The transvaginal or retropubic sling was designed by Ulmsten and introduced in 1996. Since then, it has shown good efficacy in the short and long term, including in patients with previous failed incontinence surgery, intrinsic sphincter deficiency, and mixed incontinence.[19] The TVT is associated with a slightly increased probability of visceral and neurovascular injury, although the overall risk of peri-operative complications is decreased with appropriate training and standardisation of method.[19]

The transobturator tape (TOT) was developed in an attempt to avoid the aforementioned complications of the TVT. Multiple studies have shown that the TOT and TVT have similar efficacy and safety on terms of SUI treatment. The increased risk of bladder injury associated with TVT must be balanced against the elevated risk of inguinal pain related to the insertion of the TOT.[19]

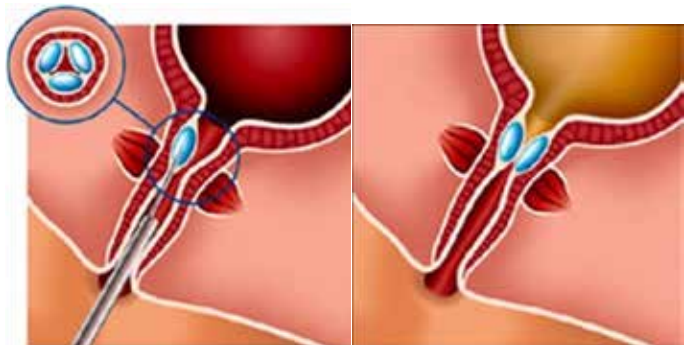
Figure 3. An example of a transobturator mid-urethral sling. Reproduced with the permission of Coloplast South Africa.

Single incision slings
Developed in an attempt to decrease the morbidity associated with mid-urethral slings, and allow an in-office incontinence procedure, single incision/mini slings have been available on the market since 2006. Trials reviewing the single incision slings are confounded by the fact that they review dissimilar slings in terms of make, several of which are no longer in production. Studies conclude that mini-slings are non-inferior to standard MUS in the short to midterm, with similar adverse effects apart from less pain, particularly in the short term.[11]

Figure 4. The Altis single incision sling. Reproduced with the permission of Coloplast South Africa.

2.5. Bulking Agents:
The mechanism of action of bulking agents is improved coaptation of the urethral sphincter thus increasing resistance to increased abdominal pressure. They are minimally invasive, can be used in fully anti-coagulated patients, can be performed in-office under local anaesthetic, and will not hinder the performance of subsequent procedures. These advantages should be balanced by the risk of failure, extrusion, and the need for repeat injections.[20]

Figure 5. Bulking agents are injected into the submucosal tissues of the proximal urethra by three to four opposing deposits until urethral coaptation is achieved. Reproduced with permission from Contura.



There is a lack of good quality evidence to aid the clinician in selection the correct patients for bulking agents but one might consider bulking agents in patients with stress urinary incontinence with a normal post-void residual who prefer to avoid mesh, or are fragile, with previous failed treatments, or previous pelvic radiotherapy.[20]

Currently in South Africa we have two available types of urethral bulking agents: Urolastic (available for academic trial centres) and Bulkamid. Clinical data pertaining to bulking agents is scanty and heterogenous. Comparative studies between the different agents are not available, and a 2017 Cochrane review found that there is insufficient evidence to

guide practice. Additionally, the review mentions that the discovery that placebo saline injection results in equivalent improvement in symptoms raises concerns about the actual mechanism of effect in bulking agents.[21] In a 2015 article, Pai and Al-Singary report on three year follow up of patients who underwent bulking with Bulkamid in Worthing Hospital in the United Kingdom. Local anaesthetic was used in the majority of cases, with a mean procedure time of 9 minutes, no adverse reactions, and no significant safety issues. At three months, 82% of patients reported improvement of subjective cure, with the satisfaction preserved at 38 month follow up, demonstrated in the VAS as well as the ICIQ scores.[22]

A 2016 systematic review by Kasi et al which included 8 studies (n= 767) found a significant reduction of the number of incontinence episodes/24 hours, number of ml/24 hour and significant improvement in quality of life at 1 year following treatment with Bulkamid2.[23]

2.6. Artificial Urinary Sphincter (AUS):
There is a paucity of good data with regards to the use of the artificial urinary sphincter in women.[11] There are few studies quoting actual efficacy rates, but with proper patient selection and adequate surgical expertise, efficacy in females is thought to be adequate, although durability in the long term is unproven.[11] Indications for use include female urinary incontinence are refractory stress urinary incontinence secondary to intrinsic sphincter deficiency in bladders with normal compliance and detrusor function. It works best in patients who are motivated and dexterous enough to use the pump.[24] The 6th ICI recommends that the use of AUS in females should be restricted to select individuals, after meticulous counselling focused on the possible need for revision, as well as the scarcity of long term, good quality data.[11]

2.7. Stem Cells:
Stem cell technology has been proposed for use in stress urinary incontinence for more than 10 years. Its use is not advised in patients currently other than in the setting of research or for clinical trials.[11]

Special considerations:
Previous epidemiological studies have suggested a higher prevalence of SUI in younger women, who tend also to be more physically active. However, it continues to play a significant role in incontinence in the elderly. Management of the condition has generally focused on middle aged women, with data pertaining to SUI at the extremes of age being limited. Robinson et al published a 2015 review of the albeit scanty data available on the treatment of SUI in the young (less than 40 years of age, pre-menopausal) and the elderly. They suggest that in the younger patient with SUI, cardinal concerns are the possibility of future child-bearing, as well as the safety and durability of any proposed anti-incontinence procedure. Treatment of elderly patients who may be frail or have multiple comorbidities may be centred around minimally invasive techniques with low complication rates and morbidity.[25]

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