EDUCATIONAL REVIEW ARTICLE

Urogynaecology: a Review

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Introduction

In 1981 the Royal College of Obstetricians and Gynaecologists (RCOG) set out its paper on subspecialisation within the speciality. One of the four areas identified for subspecialisaion was urogynaecology. Until that time female patients with bladder problems tended to be dealt with by urologists, with or without a special interest in the area of female incontinence, but the RCOG's paper reflected the fact that more and more gynaecologists were taking an interest in this area. Looking after female patients in a gynaecological setting, dealing with bladder and other gynaecological problems together and the fact that many urogynaecology problems stem from childbirth seemed to make this a sensible move.

Twenty five years ago the fledgling urogynaecologists primarily dealt with the problems of urinary incontinence in the female. Many surgical procedures were on offer and urodynamic studies for all patients were the norm. Today, although the urogynaecologist deals with the problems of urinary incontinence, both stress and urge in nature, he or she is very likely to have a major role in the surgical management of prolapse, as well as dealing with the problems of anal incontinence, usually along with a colorectal colleague. In addition, close working with a urological colleague with a special interest in female incontinence has taken us closer to the holy grail of a 'pan pelvic floor surgeon'.

There have been many other changes over the last 25 years. Today we are far more aware of the importance of the quality of life of our patients and have the improvement of this as our main goal, rather than 'a good surgical result'. As will be seen tape surgery has revolutionised the surgical treatment of stress incontinence, and urodynamic studies tend to be used much more rationally. This review will focus on five areas of urogynaecology namely stress incontinence, prolapse surgery, overactive bladder, painful bladder syndrome and urodynamic studies.

Stress urinary incontinence (SUI)

This is defined by the International Continence Society as involuntary leakage of urine on effort or exertion, or on sneezing or coughing.[1] It occurs when bladder pressure is greater than urethral pressure, leading to leakage of urine during the above increases in abdominal pressure.

Pathophysiology

In a normal situation, the urethra can be prevented from leaking during rises in abdominal pressure by compression against the supporting "hammock" of pelvic fascia. If this layer becomes unstable the opposing force that causes closure is lost.[2]

SUI is therefore linked to pelvic floor weakness. The most important components of the pelvic floor are the levator ani muscles. These lie next to the arcus tendineus fasciae pelvis, which stretches between the pubic bone and the ischial spines. The anterior vaginal wall is united by the endopelvic fascia to the arcus tendineus. The normal function of these muscles is to squeeze around the vaginal, urethral and anal openings and lift them in and up. In order for continence to be maintained, there must also be a competent urethral sphincter.[2]

Risk factors for SUI include:

- **Age:** the prevalence of stress urinary incontinence increases steadily with increasing age.
- **Childbirth:** There is a link between increasing parity and urinary incontinence. Childbirth may result in pelvic floor laxity due to weakening and stretching of the muscles and connective tissue during delivery. Damage may also occur due to lacerations and episiotomies. Additionally, stretching of the pelvic tissues during vaginal delivery may damage the pudendal and pelvic nerves and can interfere with the ability of the striated urethral sphincter to contract effectively in response to increases in intra abdominal pressure or detrusor contractions.[1] Pudendal nerve function has been shown to be altered in women with stress urinary incontinence.[2]
- **Obesity:** The added weight of obesity (like pregnancy) may bear down on the pelvic tissues causing strain and weakening of muscles and nerves of the pelvic floor. Symptoms have been shown to improve after weight loss.[3]
- **Hysterectomy:** This is associated with an increase in urinary incontinence. The cause for this is unclear. It may be hormonal, or due to damage to nerves or musculofascial attachments of the bladder during the procedure.

Treatment

Physiotherapy

Physiotherapy is the first line treatment for incontinence caused by pelvic floor dysfunction, as it is the only treatment which does not cause harm.

Treatment involves muscle training using pelvic floor exercises, which are regular voluntary contractions and relaxations of the pelvic floor muscles. It aims to both improve urethral resistance and pelvic visceral support by increasing the strength of the voluntary pelvic floor muscle contraction, and to teach voluntary contraction of the muscles before increases in abdominal

pressure.[4] It may take six months to train muscles effectively, and women should be advised of this.

Biofeedback can be used as an adjunct to physiotherapy. It allows the patient to recognise the strength of an appropriate pelvic floor muscle contraction by verbal feedback during digital palpation, or electromyogenic feedback using vaginal electrodes.[4]

Cones can be inserted vaginally for short periods to produce contractions in an attempt to retain them. Patients exercise daily with increasing weights, retaining the cone for 10-20 minutes each time.[4]

In severe cases, electrical stimulation of the pelvic floor muscles can be used to provide induced contractions, improving strength and function.[4]

Cure or improvement rates of up to 60% have been noted after physiotherapy.[5,6] Kondo et al (2007)[7] followed up women with stress or mixed incontinence, and found that 39% of women were continent after eight years. Konstantinos et al[8] found that women were 23 times more likely to have improvement/cure with physiotherapy compared to no treatment.

Physiotherapy is therefore not curative in all women. Programmes cannot be successful in patients who cannot locate and properly contract their pelvic floor muscles. An instructor followed up training programmes is more effective than home exercise. It appears that the greatest benefit occurs in women with mild or moderate incontinence, although improvement is seen in those with severe symptoms.[8]

Pharmacological Management

If a woman has had no improvement with physiotherapy and is either not suitable or on the waiting list for surgery, she may benefit from treatment with Duloxetine, a combined serotonin and noradrenaline reuptake inhibitor used to treat moderate to severe SUI. The recommended dose is 40 mg twice daily.[5]

Blockade of serotonin and noradrenaline reuptake in the spinal cord stimulates pudendal motor neurons, increasing stimulation of urethral striated muscles in the sphincter, and enhancing contraction.[5,9] Duloxetine is hypothesised to improve SUI by increasing urethral closure pressure and electrical activity of the sphincter.

In a phase II study of Duloxetine versus placebo a significant decrease was seen in incontinence episode frequency on Duloxetine (64%) compared to placebo (40%).[10] There were also significant improvements in quality of life. A phase III study produced similar results.[11] Further studies have shown a synergistic effect of Duloxetine and pelvic floor physiotherapy,[12] and many units now have a protocol suggesting that Duloxetine should only be administered along with physiotherapy.

Adverse effects are related to increases in noradrenaline and serotonin, including gastrointestinal disturbances, dry mouth, headache, decreased libido and anorgasmia.[9,11] Nausea appears to be the most troublesome side effect.[10,12] In most cases it is mild to moderate and usually resolves within one week to one month.[12] In one study, adverse effects resulted in discontinuation in more than 10% of women.[12]

Other drugs which have been used for stress urinary incontinence include α adrenoceptor agonists and selective β_2 adrenoceptor agonists.[3]

Surgical Management

Historically, there are several different methods of treating stress urinary incontinence.

Anterior colporraphy is used to correct both incontinence and anterior vaginal wall prolapse. The bladder neck is elevated and supported by deep sutures placed on either side of it. These stitches are inserted into bladder muscle or into paraurethral tissue and the anterior portion of pubococcygeus. Continence after five years following this procedure has been variously reported between 45 and 87%.[1] However, it has a low risk of complications.

Stamey procedure – needles are used to place nylon sutures either side of the bladder neck. These sutures pass from the abdominal wall through peri-urethral tissue and rectus fascia before exiting back through the abdominal wall, elevating the bladder neck. This procedure has a cumulative failure with time,[1] probably due to poor fixation of sutures.

Marshall-Marchetti-Kranz - suturing the paraurethral and paravesical tissues to the periosteum or perichrondrium at the back of the pubic symphysis elevates bladder neck and trigone. This procedure is limited by the complication of osteitis pubis, which occurs in 2.5 % of patients.[1]

Open (Burch) colposuspension - bladder neck and base are elevated by suturing the upper lateral vaginal walls to the ileopectineal ligaments. This procedure is highly effective and appears to remain so with time.[1] It can also be completed laparoscopically. There are few randomised trials comparing laparoscopic with open colposuspension. Traditionally, this has been the surgery of choice, with a success rate of 85% after five years.[6] Complications following surgery are voiding disorder, detrusor overactivity and genitourinary prolapse.

Laparoscopic Colposuspension - the open procedure has been reproduced down the laparoscope, but only by specially trained minimal access surgeons. Cure rates were equivalent to the open procedure, but the technique has by and large been superceded by vaginal tape surgery.

Sling procedures using autologous or synthetic material have high efficacy rates that sustain in time. When using autologous material, strips from the anterior abdominal wall are placed in a sling under the bladder neck and cause urethral closure when the sling is stretched.

The above procedures which would have been in every urogynaecologists' armamentarium 15 years ago have been largely replaced by the newer procedures described below. The above procedures are sometimes still used if tape surgery fails.

TVT (Tension free (Transvaginal) tape) was first introduced in the mid 1990s, when the gold standard surgical treatment of stress urinary incontinence was Burch colposuspension.[13] The tape is inserted vaginally, provides midurethral support and exits suprapubically, being left under no tension. Cure rates of 94% are reported in those having TVT as a primary procedure.[14,15] Complications of the surgery include vascular and bladder injuries and bowel perforations although these are rare. These are related to penetration of the retropubic space. Infection rates post-operatively are thought to be around 5%, as is the rate of voiding difficulty and overactive bladder. Obturator nerve injury is rare, but can occur.[14]

In the short term, TVT has been shown to be as effective as colposuspension for the treatment of primary stress incontinence.[16]

Operative complications are more common with TVT although these are almost always minor, but colposuspension is associated with more post-operative complications and longer recovery. There is no apparent difference between the two for objective cure of urodynamic stress incontinence, with cure rates ranging from 74-84%. There may also be an association between colposuspension and prolapse of vaginal vault and posterior vaginal wall.[17] TVT therefore appears to have a lower morbidity rate and an equal or superior efficacy compared to colposuspension.[16]

Newer suburethral tape procedures include the ***transobturator tape (TOT)***, which is suspended under the urethra through the obturator and puborectalis muscles. An incision is made in the vaginal wall and the paraurethral tissue is dissected from the vagina, making a tunnel out to the obturator foramen. The tape is passed from the thigh fold through the obturator foramen from outside to inside and brought round through the vaginal incision. Costa et al[18] found that 80.5% of women were completely cured after undergoing TOT.

TOT has the advantage over TVT of avoiding blind entry into the retropubic space, therefore reducing the risk of damage to the internal organs.[19] Bladder perforation, the most common complication occurring during the TVT procedure, is significantly reduced with TOT.[14] Complications following TOT include voiding difficulty, moderate pain or discomfort in the thigh folds, and, uncommonly, adductor brevis myositis[20] and perineal cellulitis.[21]

A modification of the TOT procedure is to pass the tape from the obturator foramen from inside to out, known as TVT-O. This is thought to further reduce damage to the urethra and bladder.[14]

The earliest TOT used a micro porous multi filament tape that had a high rate of erosion into the vagina. Both TOT's and TVT-O now use monofilament, macroporous, polypropylene mesh, which erodes much less frequently. In a retrospective cohort study of all women who had suburethral tension free vaginal TOT procedure for the management of SUI over 36 months (both TOT and TVT-O), 5.1% of women had tape erosion overall, but the rate for the 'new' tapes was 1.9%, with the older now obsolete tapes as high as 7.3%.[19] Symptoms of erosion include vaginal discharge, bleeding, partner reporting painful intercourse and groin pain. The problem tended to be defective vaginal wall healing rather than true tape erosion. Erosions appeared to be higher with TOT than TVT-O.[19] The extruding portion of tape requires removal, however most patients remain continent.

The newest surgical treatments for stress urinary incontinence are modifications of the TVT system. They have a shorter sling and do not require any exit points. The sling is fixed in the urogenital diaphragm, resulting in a retropubic fixation, or in the obturator internus muscle.[22] Initial results suggest symptom improvement of up to 87%, but further long-term follow up is required.[22,23] A new MiniArc single incision sling system is also currently undergoing clinical trials.

Pelvic Organ Prolapse (POP) is the descent of intrapelvic organs such as the uterus, bladder, urethra and rectum due to deficiencies in pelvic support. It usually develops over a number of years. POP occurs in up to 50% of parous women,[24] with incidence increasing with age.[25,26]

Pathophysiology

Prolapse of the anterior vaginal wall may affect the urethra (urethrocele), and the bladder (cystocele).

A rectocele is formed by a rectovaginal hernia. An enterocele is formed by a prolapse of the rectouterine pouch through the upper part of the vaginal vault. Uterine prolapse may occur separately from vaginal wall prolapse, but more commonly, they occur together.

Pelvic organ prolapse may be asymptomatic, but symptoms can include vaginal bleeding, back or lower abdominal pain, obstructive constipation, "heavy" genitalia and urinary symptoms.[25]

Risk factors for pelvic organ prolapse include vaginal delivery, chronic lung disease (due to persistent cough and increases in abdominal pressure),[27] menopause,[25] hypoestrogenism, obesity, connective tissue disorders, constipation and heavy lifting.[24] In addition, vaginal vault prolapse occurs in between 0.2 and 45% of patients after hysterectomy.[28]

Treatment

Medical

Minor degrees of prolapse are common after childbirth, and should be treated with pelvic floor exercises or a pessary. Pessaries are also in women who are unsuitable for surgery, for treatment of vaginal wall and uterine prolapse. Types of pessary include ring and shelf. Pessaries should be replaced every 4-12 months.[29]

Surgical

The lifetime risk of surgery for pelvic organ prolapse is 11 %.[30] Pelvic floor repair, normally used to describe anterior or posterior colporraphy, has been the established treatment for pelvic organ prolapse for the last century.

Anterior colporraphy is used to treat cystocele, and consists of surgical excision of excess vaginal wall tissue, and buttressing of pubocervical fascia. If there is coexisting stress incontinence, the urethrovesical angle is reconstructed by placing buttressing sutures, known as Kelly's sutures, under the bladder neck.[29]

Posterior colporraphy for rectocele involves reconstruction of the pelvic floor, reapposition of the levator muscles and excision of redundant vaginal skin.

Treatment for uterine prolapse is vaginal hysterectomy, with or without repair of the vaginal walls. If reproductive function is to be preserved, the uterus can be saved by excising the cervix, suturing the cardinal ligaments in front of the cervical stump, and suturing vaginal skin over the stump. This is known as a Manchester or Fothergill repair.

Vault prolapse occurring after hysterectomy can be treated by sarcocolpoplexy, which involves suspending the vaginal vault from the anterior longitudinal ligament of the sacrum using synthetic mesh. Alternatively, sacrospinous ligament fixation can be undertaken. This involves placing a stitch from the vaginal cuff to the sacrospinous ligament, either unilaterally or bilaterally. The main complication is injury to the pudendal nerve bundle.[31] Newer techniques include posterior intravaginal slingplasty, which involves creating a "new" uterosacral ligament using polypropylene tape.[31]

Due to a high incidence of recurrence with conventional floor repair, mesh augmented pelvic floor repair is now being used increasingly. Recurrence of prolapse after surgical correction is common,[26] with 29% of women requiring a second operation within five years.[30] This may be due to the use of weak native tissues in classic pelvic floor repair.[32]

Meshes are used with the aim of improving tissue strength and support. Types of mesh used are synthetic biocompatible meshes (eg polypropylene) or biological meshes (eg porcine dermis or bovine pericardium meshes).[24] Meshes can also be either absorbable or non-absorbable.

Meshes are available in "mesh repair kits", marketed as a minimally invasive technique for pelvic floor repair. They use monofilament, low weight, macroporous polypropylene meshes to reinforce the pubocervical and rectovaginal fascia.[30] The surgical technique involves the blind insertion of trocars into the obturator foramen, ischiorectal fossa, ileococcygeus muscle and sacrospinous ligament. Most meshes have three parts, which are placed between bladder and vagina, through each obturator foramen and between the rectum and vagina.[32]

Meshes have been associated with an increased risk of complications, due to both method of insertion and because they are foreign bodies. In a retrospective, multicentre study of 329 women who underwent surgical management of pelvic organ prolapse using mesh repair kits,[30] operative complications included bladder and rectal injuries and vascular damage. Cystoscopy is recommended to ensure no damage has occurred intra-operatively after completion of the surgery. Post-operative complications included voiding dysfunction, perineal haematoma, vaginal adhesions, buttock pain, dyspaerunia and vaginal erosion. There was one severe case of necrotising fascitis.

Other reported complications are adhesions, chronic severe pain, dyspareunia, erosion or rejection of the mesh, and mesh related infections.[24] Infection after use of a vaginal polypropylene mesh has been reported in up to 8% of cases.[24] Erosions have been reported to occur in up to 24% of cases.[24,30]

Therefore, although mesh repair kits are associated with low recurrence and low morbidity rates, some of the uncommon complications are serious and potentially life threatening and these repairs should therefore only be carried out by specialists.

As of yet there is little evidence comparing the outcome of repair by mesh to standard pelvic floor repair. Early studies have shown that women with vaginal vault prolapse treated with mesh had cure rates of 82.5% compared to 66% in patients treated with anterior and posterior colporraphy.[33] However, more research is required in this area before meshes can become standard practice.

Overactive bladder (OAB)

The International Continence Society has defined OAB as: 'Any disturbance of bladder function that leads to urgency, with or without urge incontinence, usually with frequency and nocturia.'[36] This term replaces all previous terminology including 'detrusor instability/overactivity/hyperreflexia' or 'hypocompliant bladder'. Not everyone accepts this term, however it does deal in symptoms and not urodynamic diagnoses, which the author believes is a good thing. OAB is extremely common affecting about one in five females over 40 years of age [37,38] and can be very disabling with a significant impact on sleep and on quality of life. Frequencies, urgency, urge incontinence and nocturia are the commonest symptoms.

Treatment should start with conservative treatment and this usually includes two distinct approaches: lifestyle interventions and bladder retraining. These can be given by the general practitioner (GP) or practice nurse, but in practice the time and experience these require mean it is probably better to involve a trained continence advisor or clinical nurse specialist.

Lifestyle interventions

Lifestyle changes should include:

- Lose weight if BMI >30;
- Stop smoking;
- Drinking enough. This may seem counter-intuitive, but many people with OAB over-restrict the amount of fluid they drink, increasing the risk of bladder irritation. Drink enough water to keep the urine straw-coloured;
- Cut down alcohol and restrict caffeine. These drinks should constitute no more than a third of the total daily fluid intake;
- Avoid fizzy drinks;
- Review medications – patients should never stop or have their prescribed drugs stopped or switched without discussing it first with their GP;

Bladder retraining

This physical therapy is another common non-pharmacological intervention in the management. The objectives are to retrain the bladder to "hold on". The best results are achieved when done under the supervision of a continence nurse or specialist physiotherapist. Examples of bladder retraining techniques are:

- Distraction techniques, or doing something that requires concentration;
- Sitting on a hard seat or across a tightly rolled towel;
- Pelvic floor squeezes;

These interventions can help up to three out of four people and are the only available treatments with no side effects. If these fail then medical therapy should be prescribed. The mainstays of medical treatment are the anti muscarinics.

Six anticholinergic or antimuscarinic agents are currently licensed for treatment of OAB in the UK:

- Oxybutynin (Lyrinal XL, Ditropan, Kentera))
- Darifenacin (Enablex)
- Solifenacin (Vesicare)
- Tolterodine (Detrusitol and Detrusitol XL)
- Trospium (Regurin)
- Propiverine (Detrunorm)

Controversially NICE guidelines have advocated immediate release Oxybutynin as the first line treatment, purely on a cost basis. The majority of patients however will not be able to tolerate the side effects of this, and all of the drugs in the above list have their place, there being little to choose between them in the available literature. The best estimate of the effectiveness of anti muscarinics is that on average about 50% of patients will have up to 50% improvement. Side effects remain the big problem, but given that if drug therapy fails, further treatments for OAB are either very serious or unlikely to be effective, therefore one must ensure that all of the above drugs have been tried before abandoning medical treatment.

If medical treatment fails then all of the treatments below have a place, but a further discussion of these is out with the scope of this article.

- Sacral nerve root stimulation (Neuro-modulation)
- Electrical stimulation
- Botulinum Toxin A injections

- Detrusor myectomy
- Augmentation cystoplasty

Urodynamic Investigations

Of the more advanced tools employed in secondary care the gold standard investigation is conventional urodynamic studies (UDS), involving filling and voiding cystometry with or, more commonly without the use of radiological screening. It should be pointed out however, that it is not mandatory and indeed NICE does not recommend performing these investigations prior to commencing anti muscarinic therapy, or prior to a first surgical treatment for stress incontinence. In the authors practice UDS are only performed when a patient fails to respond to conservative treatments or a sustained trial (usually three months) of different drug treatments, when there are symptoms suggesting bladder outlet obstruction, or where surgery is being considered.

The aims of UDS in these circumstances are

- To diagnose stress incontinence
- To confirm a diagnosis of OAB and assess its' severity
- To exclude a reduced functional bladder capacity
- To exclude a hypersensitive bladder
- To assess the presence of bladder outflow obstruction

Uroflowmetry and filling and voiding cystometry are the standard tests used for diagnosis, with video urodynamics or ambulatory urodynamics being reserved for those patients with complicated problems or in whom there is a mismatch between patients symptoms and the results of conventional UDS.

Flexible cystoscopy should be performed where there is suspicion of bladder pathology i.e. where there are symptoms of haematuria or recurrent infections, or in the assessment of patients with a hypersensitive bladder or bladder pain where a hydrodistension may prove therapeutic.

Painful bladder syndrome

This term has superseded the term interstitial cystitis to highlight the fact that many patients may have significant symptoms, and respond to treatment, without the classic cystoscopic findings of inflammation and ulceration.

This group of patients can be very disabled by their condition and can be very difficult to cure. Severe frequency (up to half hourly) and pain on bladder filling are the commonest symptoms.

Treatment consists of hydrodistension at the time of cystoscopy, Pentosan polysulphate (Elmiron), or bladder installations with either Rimso (an anti inflammatory) or Cystistat (a mucopolysaccharide).

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