

## PelviCenter – Treatment Basic Information

### 1. Urinary incontinence - Taboos, psychological stress and psychosocial consequences

The World Health Organisation (WHO) sees urinary incontinence as being one of the “last medical taboos.”<sup>1</sup> This view is corroborated by a Gallup International Association survey which found that incontinence is the second most embarrassing health problem after sexual performance issues, based on the likelihood of people discussing the issue with their doctor.<sup>2</sup> The term “taboo” was introduced into Western discourse by British explorer James Cook, who encountered it in Polynesia; it signifies things that may not be touched, or places that may not be entered. Today, we understand taboos as barriers established by moral convention, with generally no logical basis or rational explanation. Taboos are not questioned or discussed – they perpetuate themselves as off-limits. They are often denoted by subtle avoidance strategies – euphemisms or alternative words – in order to give the impression of distance from what has been said.

Although millions of people in Europe suffer from incontinence, only a small proportion of them talk about it. Everyone has heard about it – but no one knows anyone who actually suffers from it. And if a sufferer does try to talk about it, the usual response is embarrassed silence.

According to a survey conducted by the Women’s Health Coalition (WHC), most women affected by incontinence do not even tell a doctor. Young people in particular do not seek medical advice until the problem has become unbearable and symptoms can no longer be concealed. Many others are ashamed of their symptoms, convinced that incontinence is a normal part of the ageing process, and that treatment holds little promise of success.<sup>3</sup> Rather than seeking treatment, they use incontinence pants and pads in order to avoid damp underwear and other embarrassments. More nappies are used by old people than for babies and young children – a situation that the cellulose industry is only too pleased about.

Out of fear of their condition being revealed, many people do not even ask for the right products. They buy sanitary towels instead of safe, specially designed pads. This use of feminine hygiene products increases the risk of skin and bladder infections. Another common self-help strategy is deliberate limitation of the consumption of liquids, with the aim of reducing the frequency of urination. This leads to dehydration and reduced mental functioning and is dangerous in that it can contribute to the development of urinary tract infections and kidney stones.

One reason for the taboo is the cult of youth, which does not allow people to accept the realities of the age they have reached. Fixation on external appearance, beauty, fashion and an active lifestyle combine to form an unchallenged ideal that excludes all those who cannot live up to it. In addition, incontinence is not a socially acceptable condition like cardiovascular disease, allergies, osteoporosis and others that can easily be brought up in ordinary conversation.

People suffering from urinary incontinence live with constant anxiety – in fear of embarrassing incidents and of smelling of urine, and with a need to plan activities such as shopping with military precision, to make sure a toilet can be reached at a moment’s notice. When someone can no longer feel secure laughing, sneezing, dancing or doing sports in the company of others, social isolation becomes increasingly inevitable. Loss of job, anxiety about intimacy and sexuality, and even the break-up of the sufferer’s marriage or partnership are common, as logical consequences in a story with a pre-determined plot.

There is a lack of reliable data on the psychological stress associated with urinary incontinence and its socioeconomic impact. However, it is clear that the typical consequences include isolation and depression. According to one study, over a sixth of all women who suffer from incontinence also suffer from major (clinical) depression,<sup>4</sup> meaning that they are almost twice as likely as the normal population to suffer from this main form of the disorder. The degree of severity can be seen to correlate with the degree of incontinence.<sup>5</sup> Milder forms of depression are found in between 30% (minor) to 43% (major) of people with incontinence.<sup>6</sup>

<sup>1</sup> Voelker R. International group seeks to dispel incontinence “taboo”. *JAMA* 1998, Sep 16; 280: 11

<sup>2</sup> Gallup International Association, UK, sponsored by Pharmacia

<sup>3</sup> Dallosso HM et al. *BJU International* 2003 May; 91(7): 631-6

<sup>4</sup> Stewart et al. *Psychosomatics* 2006; 47: 147-15

<sup>5</sup> Melville JL et al. *Obstet Gynecol.* 2005 Sep; 106(3): 585-92

<sup>6</sup> Dugan E et al. *J Am Geriatr Soc.* 2000 Apr; 48(4): 413-6

Generally, self-esteem is also seriously affected in those suffering from incontinence. “Most female sufferers feel as dependent as small children and, at the same time, old, unattractive and lacking dignity.”<sup>7</sup> They no longer see themselves as adequate women and so avoid physical intimacy. The feeling of frustration and loss of control over one’s own body dominates the sufferer’s emotional life. At the same time the need to “keep a secret” prevents them from seeking outside help.<sup>8</sup> The decisive factors here are personality, lifestyle and experience, rather than the degree of severity of incontinence.

According to an assessment by a professional medical portal, the emotional significance of “weak bladder” is not really perceived by doctors. There is a double taboo at work, since doctors are just as enmeshed in the emotional issues.<sup>9</sup> Doctors’ behaviour reflects the feelings their patients have as well as the limits of their own perceptions. They are therefore often unable to enter into active discussion of the topic. In fact, incontinence is frequently “felt to be an intrusive, time-consuming distraction from other matters”, with modern therapeutic options for the condition viewed as inadequate.<sup>10</sup>

A conference of patient advocacy groups for incontinence in Geneva in connection with International Women’s Day in 2004 applauded the smashing of the incontinence taboo and appealed for change. However, despite the publication of a position paper signed by 13 of these organisations,<sup>11</sup> little has changed in the intervening period.

The objectives set forth then are now more pressing than ever:

1. Shatter the stigma of incontinence
2. Empower women with incontinence to seek help
3. Drive early diagnosis and treatment of incontinence
4. Maximise access and choice for women with incontinence
5. Regain quality of life for women with incontinence

An official representative of the conference, who is an incontinence sufferer herself, got to the heart of the matter with the following statement: “Urinary incontinence is the most embarrassing and distressing condition I, and many other women, have had to live with.” We can only hope that, by discarding prejudice and by bringing all of the available resources to bear on the issue, this undignified situation can be brought to an end. For this to happen, doctors, advocacy groups and health care policy-makers are all required to make a major contribution.

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<sup>7</sup> FOKUS 2004; 18(15)

<sup>8</sup> 16. Kongress der Deutschen Kontinenz Gesellschaft; press conference 12 Nov 2004, Hamburg

<sup>9</sup> 16. Kongress der Deutschen Kontinenz Gesellschaft; press conference 12 Nov 2004, Hamburg

<sup>10</sup> Moser J. Inkontinenz: Doppeltes Tabu als eigentliche Herausforderung. *Universimed* 7.3.2005

<sup>11</sup> Breaking Down the Last Medical Taboo – Speaking Up for the Silent Majority. Geneva, 6 Mar 2004

## 2. Transpelvic Magnetic Stimulation (TPM)

### **Taboos and side effects complicate effective therapy**

Almost one in every three women in Europe and the USA is affected by urinary incontinence. The standard therapy options (pelvic floor muscle training, medication, surgery) have not yet been successful in encouraging the majority of patients to seek medical treatment, for a variety of reasons.

The side effects of conventional anticholinergics are so strong that two-thirds of the patients break off treatment almost immediately. Only 20% of patients are still taking their medication after six months. Surgical procedures entail the usual operative risks, and patients are frightened. Pelvic floor muscle training is in all events important, but out of the question for a third of all patients, who do not have feeling in their pelvic floor. It also requires strict self-discipline (exercising 10-12 times a day for three to four months), and is only effective in combination with the use of a vaginal probe or biofeedback at the start of training.

Because of the associated taboos and psychological factors (shame, revulsion, fatalism), a large number of patients withdraw from work and social life, meaning that at least 60% of all incontinence sufferers continue to be without any support and go untreated.

### **Strengthening the muscles with high tech**

TPM uses electromagnetic induction, the principle behind nuclear resonance imaging, in much the same way that repetitive transcranial magnetic stimulation (rTMS) is used in the treatment of major depression. Magnetic fields are used to induce strong contractions of the muscles of the pelvic floor (levator ani) – stronger by far than those that can be achieved with pelvic floor muscle training. At the same time the nerves that control the urethral sphincter and the contraction of the bladder are stimulated. The results are recovery and improvement rates ranging from satisfactory to good – in some cases after only 18 treatment sessions.

67 studies and conference papers have been published at the time of writing that attest to the effectiveness of TPM in treating incontinence.

### **All-round effectiveness for a variety of indications**

TPM is effective for:

- Stress incontinence
- Urge incontinence/overactive bladder (OAB)
- Mixed incontinence (stress and urge incontinence)
- Faecal incontinence as a result of pelvic floor or sphincter weakness
- Pelvic pain and pelvic bladder syndrome
- Vaginal examination for pelvic floor muscle training
- Stress incontinence following radical prostatectomy/TURP

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**No embarrassing undressing**

Patients can remain fully dressed during TPM treatment. The rhythmic contractions of the muscles of the pelvic floor and buttocks in time with the magnetic field pulses are pleasantly stimulating, completely painless and without any unpleasant side effects. Occasional muscle stiffness is evidence that something is happening. Many female patients with “problem areas” in the region of the hips and buttocks also report an unexpected improvement in cellulite contours. Each treatment session lasts roughly 20 minutes.

**Impotence und orgasm ability**

Further applications are the treatment of erectile dysfunction (ED) and the improvement of orgasm ability. Parts of the pelvic floor merge into the penile shaft. The ischiocavernosus muscle causes a pumping compression of the deep artery of the penis, while at the same time pressure on the erectile tissue prevents the blood from flowing away through the veins. This results in a stronger erection and maintenance of the erection. The ability of the bulbospongiosus and constrictor vulvae muscles in the female to contract rhythmically plays an essential role in the ability to orgasm.

Studies of pelvic floor muscle training have shown marked improvement in cases of erectile dysfunction and considerable effects on female orgasm ability. TPM’s mode of action means that similar benefits may be obtained from magnetic resonance stimulation. This is important because an estimated three-quarters of all women suffer from sexual dysfunction.

**Scientific excellence**

TPM is the product of five years of intensive development work by Prof. Dr. Fischer AG and gbo Medizingerätetechnik AG. In design and operation it meets the most exacting requirements of medical practice.

**Side effects and contraindications****High efficacy with minimal limitations**

TPM is safe and has no unpleasant side effects. The treatment is contraindicated in combination with pregnancy, insulin pumps, cardiac pacemakers, shunt systems, epilepsies and ferrous foreign bodies. The metals and alloys used in repairing fractures and endoprosthesis, such as screws, plates and implants (titanium), are generally not ferromagnetic and hence no cause for concern.

### 3. Magnetic stimulation in the treatment of urinary incontinence

#### Current position

Magnetic stimulation in the treatment of incontinence was first presented in a conference paper delivered to the International Continence Society (ICS) in 1998. The method soon came to be known as “The Chair”. Using somewhat less intense magnetic fields than transcranial magnetic stimulation (TMS) to cause contractions of the pelvic floor, TPM has established itself as a serious option in the treatment of stress and urge incontinence. The therapy is clearly effective and without unpleasant side effects, and patients are not required to undress or use applicators. The difference as compared with the older technique of electrostimulation, which is principally of value as an aid to pelvic floor muscle training, is that it penetrates more deeply and is thus more effective.<sup>12</sup> A beneficial side effect appreciated by female patients is a potential smoothing of contours in problem areas of the buttocks and thighs.

#### 1. Epidemiology

Between 8 and 12 million people in Germany suffer from urinary incontinence,<sup>13</sup> which the ICS Standardisation Steering Committee defines as “involuntary loss of urine”. Depending on the sample group, the survey methodology and the age group, the proportion of the population suffering from the condition is in the range of 5-50%. There are estimates that one woman in three is affected,<sup>14</sup> which suggests that the subject is surrounded by taboos and that the number of unreported cases is high. An epidemiological study by respected journal BJU International puts the number of sufferers as high as 41% of all women.<sup>15</sup> Significantly, discharge letters from hospitals only mention urinary incontinence in 15% of the cases when it is present.

Sources agree that around 30% of over 70-year-olds are affected by urinary incontinence, which in 15-20% of the cases manifests itself in very distressing symptoms. The inadequacy of the existing definition of incontinence is clear – there is no way of distinguishing the different degrees of frequency, severity and duration of symptoms. A **Severity Index** has been developed in Scandinavia to help meet the justified desire for standardised information, but this has so far not been generally adopted.

Women are between two and four times as likely to suffer from urinary incontinence as men, though in advanced old age this difference tends to even out.

Feelings of shame, disgust and hopelessness are the main reasons why 60–95% of those affected fail to seek medical treatment.<sup>16</sup> As a result, in Germany there are an estimated 5–10 million patients who have not received adequate therapy and who because of taboos withdraw from their work and social life.

#### 2. Causes

Urinary incontinence can be caused by a number of factors:

##### a. Urge incontinence

*Urge incontinence, also described as “irritable bladder” or “unstable bladder”, is caused either by the detrusor muscle of the bladder or the bladder epithelium. It is a form of oversensitivity, which overrides the mechanisms that allow the bladder to fill. Uncontrollable and inappropriate detrusor muscle contractions (**detrusor instability**) lead to an involuntary emptying of the bladder even when it is only partly full.*

*It is an unwelcome accessory symptom of **overactive bladder syndrome (OAB)** in one third of the patients. OAB in the absence of an infection is generally accompanied by urge symptoms, frequent urination and the need to urinate during the night.*

*In the industrialised world 30% of women and 20% of men are affected by OAB. Urge incontinence accounts for fully **a fifth** of all cases treated.*

<sup>12</sup> Increase in bladder capacity by 16.3% (electrostimulation) versus 105.5% (magnetic stimulation). Yamanishi et al. Comparative study of the effect of magnetic versus electrical stimulation on inhibition of detrusor over-activity. *Urology* 2000; 56(5): 777-81

<sup>13</sup> Prevalence: 12% in thirty year olds, 25% in over 65s. Editorial, *Apothekenmagazin* 2006; 24(04): 68-69

<sup>14</sup> European Association of Urology (EAU): Thüroff et al 2005. Guidelines on Urinary Incontinence. ([www.uroweb.org](http://www.uroweb.org))

<sup>15</sup> Huskaar S et al. The prevalence of urinary Incontinence in women in four European countries.

*BJU International* 2004; 93: 324-330

<sup>16</sup> City of Vienna Health Survey 2003: Only 5% of women and 16% of men with urinary incontinence are receiving medical treatment.

### **b. Stress incontinence**

Stress incontinence is generally the result of loss of muscle tone and insufficient strength of the pelvic floor muscles (pelvic diaphragm). It is often a result of exhaustion, e.g., after many births or heavy physical labour, and symptoms often increase after menopause as oestrogen levels fall.

While the **internal** urethral sphincter is controlled autonomically by spiral muscles at the neck of the bladder, the **external** urethral sphincter is controlled voluntarily by several muscle bundles forming part of the pelvic floor, of which the most important is the levator ani muscle. Strains such as bending, laughing, running, coughing, lifting, etc. reduce muscle tone and lead to involuntary urination.

Stress incontinence accounts for about **half the cases treated**. It is the **commonest** form of incontinence in **younger** women (up to the age of about 50).

### **c. Mixed incontinence**

With increasing age, urge incontinence becomes the predominant form of incontinence in women, and in the case of a pre-existing stress incontinence develops into mixed form incontinence (urge incontinence combined with stress incontinence). Urge incontinence is the commonest form in men from the outset. Mixed incontinence makes up almost a third of all the cases treated.

## **3. Standard therapies**

Although the standard therapies for treatment of urinary incontinence (pelvic floor muscle training, medications, surgery) generally produce very satisfactory results, there is too little demand for treatment. Nonacceptance linked to lack of self-discipline, the side effects of medication and fear of surgery are clearly a problem.

### **a. Pharmacotherapy**

**Anticholinergics** against **urge incontinence** work by blocking the muscarinic M3 receptors in the smooth muscle responsible for contraction of the detrusor muscle of the bladder. This primarily affects the **efferent** leg of the reflex arc, which **causes the bladder muscle to relax**. However, since there are also many M3 receptors in the mucosa and submucosa of the bladder's mucous membrane, **afferent impulses are also blocked**. This explains why anticholinergics work even when the urge to urinate is imperative and are effective against sensory urge incontinence.

Rumoured success rates of 80% are far removed from reality, and refer principally to the entire OAB syndrome complex. Overall, some 50% of treated incontinence patients benefit from anticholinergics therapy, with the best results to be expected in cases of **overactive detrusor**.

The success rates for improvements in symptoms alone is in the range of 47.3–49.1% (10mg/5mg solifenacin),<sup>17</sup> 61–77.2% (tolterodin)<sup>18</sup>/16.8% remissions (4mg tolterodin)<sup>19</sup> and 7.5% (5mg oxybutynin)<sup>20</sup>/16.8% remissions (10mg oxybutynin)<sup>6</sup>/23% remissions (10mg oxybutynin).<sup>6</sup> However, a meta-analysis of 32 studies confirms only a low rate of significance.<sup>21</sup>

There is only marginal variation in the clinical efficacy of the different anticholinergics used. The main difference is in how well they are tolerated. The success rates are purchased at the expense of a very wide range of **side effects** in **64-79%** of patients using oxybutynin or tolterodin. Including the **new** anticholinergics with fewer side effects, an average of 20-30% of patients are affected by dryness of the mouth and 15-20% by constipation. The reason is that M3 receptors are responsible in the intestines for motility and in the salivary glands for the production of saliva.

Examples: Dry mouth 10.9% (5 mg solifenacin)/29% oxybutynin/22–33% and 27.1% tolteridin (10 mg),<sup>22</sup> constipation 5.3% (5 mg) and 12.9% (10 mg), impaired vision 4.5% (5 mg) and 4.7% (10 mg).<sup>23</sup>

Even with the **new** drugs, the failure rate for therapy is still an average of 30%.<sup>24</sup>

<sup>17</sup> Waag et al. *J Geriatr Pharmacother* 2006; 4(1): 14-24

<sup>18</sup> Takei M et al. *Int J Urol* 2005; 12(5): 456-64

<sup>19</sup> Diokno et al. *Mayo Clinic Proc* 2003; 78(6): 687-95

<sup>20</sup> Anderson et al. *J Urol* 1999; 161: 1809-12

<sup>21</sup> Herbison et al. *BMJ* 2003; 326: 841-3

<sup>22</sup> Armstrong et al. *Int Urol Nephrol* 2007; 39(4): 1069-77

<sup>23</sup> Maniscalco et al. *Clin Ther* 2006; 28(9): 1247-72

Since muscarinic receptors are also to be found in the stomach and the brain, gastro-oesophageal reflux disorders and impairment of cognitive functions are also not uncommon. For example, taking oxybutynin for three weeks can age the brain by 10 years.<sup>25</sup> Side effects generally lead to 5-10% of patients breaking off the treatment very quickly. After **six months**, apparently only **20%** of all patients are still being treated with medication.<sup>26</sup>

Anticholinergics are not effective against **stress incontinence**, but **antidepressants** (SSRIs) are used in their place. However, a meta-analysis revealed “no conclusive results showing obvious improvement in symptoms”.<sup>27</sup>

*Symptom improvements for duloxetine range between 54% (placebo 40%) with 80mg,<sup>28</sup> 37.2% (placebo 26.8%) with 40mg/44.3% (placebo 26.8%) with 80mg<sup>29</sup> and remission rates are 16.4% (placebo 15.1%) and 10.5% (placebo 5.9%).<sup>30</sup>*

If SSRI treatment is combined with pelvic floor muscle training, however, the results are improved.

In controlled studies 20% of patients (women) drop out, complaining of **side effects** such as nausea, dry mouth, tiredness, sleeplessness or constipation. Other side effects are increased sweating and reduced libido.

### **b. Surgery**

Surgery is a last resort treatment for **stress incontinence**, after conservative therapies have failed. Surgical interventions are thought to represent **fewer than 5%** of all cases treated, and the method of operation depends on the patient's anatomy and the functional details. In principle, the object of the surgery is to raise the neck of the bladder and the urethra. If the uterus is prolapsed, it is usually removed.

Depending on the anatomical differences from case to case, there is a wide range of operative procedures, with more than 100 variations.

***Needle suspension surgery** is indicated where the urethra is hypermobile or too short. Success rates are initially around 90% but fall to around 40% in long-term follow-ups. The unsatisfactory long-term prognosis means that this procedure is now only of secondary importance. Much the same is true for **slings**, which are used in cases of hypermobility or shortness of the urethra and are also associated with recurring incontinence. Success rates are initially around 90% but only around 60% in the long term. Transient urination problems occur with up to 50% of those operated on.*

*Burch **colposuspension** is indicated for all forms of stress incontinence caused by a hypermobile urethra and in cases of prolapse. The five-year success rate of 70% for first operations and 50% for relapses is relatively high,<sup>31,32,33</sup> but declines with the passage of time. It is considered to be the **standard surgical procedure** at present.*

*Intravaginal **sling** procedures, in which a specially developed ribbon of synthetic material is placed under the urethra in order to restore sphincter function, were introduced in the 1990s, and the **tension-free vaginal tape procedure (TVT)** has found widespread acceptance. The popularity of this “simple to teach and simple to learn”<sup>34</sup> procedure has increased the risk of operative and postoperative complications leading to loss of the bladder because of irreversible damage to the urethra, lethal peritonitis or damage to blood vessels of the pelvis. This should **not** be blamed on the procedure itself, but on the lack of experience on the part of the surgeons. According to a meta-analysis, the five-year success rate is relatively high, at **66%**.*

<sup>24</sup> 13 Van Kerrebroeck et al. *Urology* 57: 414-421

<sup>25</sup> Kay G et al. *Eur Urol* 2006; 50(2): 317-326

<sup>26</sup> *Deutsches Ärzteblatt* 2005; 102(37): A-2492/C-1990

<sup>27</sup> *Cochrane Database of Systematic Analyses* 2002; issue 3: CD003781

<sup>28</sup> Millard RJ et al. *BJU Int* 2004 Feb; 93(3): 311-8

<sup>29</sup> Norton et al. *Am J Obstet Gynecol* 2002; 187: 40-8

<sup>30</sup> Dmochowski et al. *J Urol* 2003; 170: 1259-63

<sup>31</sup> Peschers et al. *Deutsches Ärzteblatt* 2003; 100(50): A-3322/B-2764/C-2584

<sup>32</sup> Feyereisl et al. *Am J Obstet Gynecol* 1994; 171: 647-52

<sup>33</sup> Alcalay et al. *Br J Obstet Gynecol* 1995; 102: 740-5

<sup>34</sup> GYNECARE 2000 3 DÜR 01/00 1-2/2009: 8-12

*The lack of prospective random studies comparing traditional and new techniques is regrettable.*<sup>35</sup>

Another major, largely neglected set of side effects are a consequence of female anatomy: there is a risk of severing the nerves and vessels serving the genitals, which are in the immediate vicinity of the site of the operation. Following sling surgery in particular, women's sensations of warmth and vibration are diminished, which severely affects sexual sensitivity.<sup>36</sup>

#### **c. Physiotherapeutic pelvic floor muscle training**

One of the most successful and least costly therapy options for **stress incontinence** of **minor** or medium severity is pelvic floor muscle training. This strengthens the somatic periurethral and perivaginal muscles, although the precise effects are not yet fully understood.

The success rates for pelvic floor muscle training are comparatively high: 80% for first-degree stress incontinence and 50% for second-degree instances. However, the data do **not** generally distinguish between remission and permanent improvement. In initial training, 30% of the patients are not capable of clenching their pelvic floor muscles voluntarily. Voluntary contraction needs first to be trained, using **electrostimulation**, biofeedback or an intravaginal probe.

The disadvantage of this method is the relatively long treatment period of four months (2-32 weeks), with daily training at home every two hours (10-12 voluntary contractions each lasting 6–8 seconds) requiring **self-discipline**.

Success and recovery rates averaging 65–75% can only be expected if the therapy is administered correctly and under supervision (vaginal palpation/biofeedback).<sup>37</sup> There are no reliable data on the long-term effects of treatment. This form of therapy is of only minor interest in **urge incontinence**.

#### **d. Peripheral electrostimulation**

The object of electrostimulation is to stimulate the reflex arc via the pelvic nerve, which acts to inhibit the detrusor reflex. Simultaneous contraction of the pelvic floor is limited because penetration of the current is not deep enough, and the treatment is very wearing on the patient, because the pudendal nerve can only be reached with **vaginal, rectal or clitoral electrodes**. The resulting noncompliance means that success rates are correspondingly limited.

### **4. Magnetic stimulation therapy**

#### **a. Therapeutic mechanism**

Transpelvic magnetic stimulation (**TPM**) is based on Faraday's principle that a changing magnetic field (space or time variable) creates an electric current. Unlike electric fields, magnetic fields penetrate organisms almost without resistance. A conductive loop is used to generate a field that penetrates intervening tissue without resistance and induces a current deep in the perineum. The field distribution has the characteristic bell-shape.

*The shape of the bell is determined by the coil arrangement, with the intensity of the magnetic field highest at the apex and diminishing with increasing distance from it.*

Since the intensity of a magnetic field diminishes in proportion to the square of the distance from its source, the maximum penetration is approximately 9-10cm. The flux density is at least 0.4 tesla and the peak discharge (190 µsec) is approximately 10,000 tesla/sec.

With pulsations in the 10-50 Hz frequency range motor nerves and muscles inside the effective field are depolarised, resulting in a series of strong contractions of the striated muscle in the pelvic floor caused by the release of neurotransmitters at the neuromuscular junction. The stimulation of the afferent fibres of the pudendal nerves and the inhibitory fibres of the hypogastric nerve in the sympathetic nervous system has an added damping effect on the detrusor muscle.

#### **b. Treatment procedures**

The treatment parameters are derived from the experience gained from electrostimulation, and have been adopted into the methodologies of most studies. They call for ten minutes each of low and high frequency impulses (10 Hz/50 Hz), with total

<sup>35</sup> Schiefelbein F. et al. *Bayerisches Ärzteblatt* 2009; 1-2: 8-12

<sup>36</sup> Otto et al. *Aktuelle Urol* 2007; 38: 33-7

<sup>37</sup> AWMF online. Leitlinien Harninkontinenz. [www.uni-duesseldorf.de](http://www.uni-duesseldorf.de)



treatment time per session of 20 minutes. The whole course of treatment lasts six weeks, with two sessions per week. The length of the therapy is based on the minimum time required for effectiveness and the likelihood of the patient leaving the study prematurely.

Overall, there are clear indications that most patients fail to achieve the optimal level of success in this time. Since muscles need only 36-48 hours to regenerate, where compliance is satisfactory treatment sessions three times a week with either the **same** six-week course or a shorter one should be equally or indeed more effective.

### ***c. Modified treatment procedures***

Experience with electro stimulation suggests which frequencies are likely to be appropriate for modified TPM treatment procedures. Frequencies in the **5-10 Hz** range are likely to be useful in stimulating sympathetic reflexes (inhibition) in the treatment of **urge incontinence**. In contrast, **50-100 Hz** would be used to stimulate the pudendal nerve and make the urethral sphincter contract, meaning this frequency range is more suitable for treatment of **stress incontinence**.<sup>38</sup>

A study by Yamanishi et al. showed satisfactory urethral sphincter pressure and inhibition of bladder pressure starting at 20 Hz: 86% of the patients with stress incontinence and 75% of the urge incontinence patients showed improvement.<sup>39</sup> Differences in the probability of success could be related to a failure to apply experience from electro stimulation.

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<sup>38</sup> Fall. *Acta Obstet Gynecol Scand* 1998; 77 (supp 168): 16-21

<sup>39</sup> Yamanishi et al. *Urology* 1999; 54: 652-655