



## Evaluation of the effectiveness of electromagnetic field technology in the treatment of urinary incontinence

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### Como Citar:

PERDIGÃO, Natchely Estefane Vieira; SERAFIM, Grazielle Maia Alves; MARINHO, Bruna Caroline de Jesus; GONÇALVES, Jennifer Moreira. Evaluation of the effectiveness of Electromagnetic Field technology in the Treatment of Urinary Incontinence. Revista Sociedade Científica, vol.7, n. 1, p.3966-3976, 2024. <https://doi.org/10.61411/rsc202462417>

DOI: [10.61411/rsc202462417](https://doi.org/10.61411/rsc202462417)

Área do conhecimento: Ciências da Saúde.

Palavras-chaves: Urinary incontinence; pelvic floor; electromagnetic field.

Publicado: 31 de agosto de 2024.

### Resumo

Urinary incontinence (UI) is a significant health condition that affects many people, especially women, negatively impacting their quality of life in physical, social, economic, sexual and psychological terms. Defined by the International Urinary Incontinence Society (ICS) as any involuntary loss of urine, UI can be classified into three types: stress urinary incontinence (SUI), which occurs with increased abdominal pressure; urge urinary incontinence (UUI), associated with the urgent sensation of urinating; and mixed urinary incontinence (MUI), a combination of SUI and UUI. In this context, the aim of this study was to identify the improvement in urinary incontinence after 8 sessions of treatment with electromagnetic field technology. This is a retrospective, descriptive and quantitative study, based on the information contained in the medical records and questionnaires of the patients evaluated in the Research and Development Sector of Contourline Equipamentos Médicos e Diagnósticos Ltda, based in the city of Sete Lagoas-MG, between July and October 2023. 12 female patients were treated, with an average age of 34.4. The results showed that Electromagnetic Field technology is capable of safely and effectively treating patients with UI. The treatment was effective, with the majority of participants (90%) experiencing a significant reduction in the frequency or even elimination of urine leakage episodes.

### 1. Introduction

Urinary incontinence (UI) is a significant health problem that affects a large number of individuals in different age groups, and is more common in women [1]. As well as being a multifactorial problem, it can also have negative effects on individuals' quality of life (QoL), in the physical, social, economic, sexual and even psychological spheres, causing episodes of anxiety and depression [2].



UI is defined by the International Urinary Incontinence Society (ICS) as any involuntary loss of urine. With this in mind, for a more assertive treatment, the ICS recommends that UI be defined in an even more specific way, exemplifying important details such as type, frequency of occurrence, severity and effect on personal hygiene [3]. Based on its etiology and pathophysiological mechanisms, there are three types of UI: stress urinary incontinence (SUI), urge urinary incontinence (UUI) and mixed urinary incontinence (MUI). SUI occurs when urine loss occurs at the same time as, or after, an increase in abdominal pressure, such as when coughing, sneezing, laughing intensely or when doing physical activity. UUI occurs when urine loss precedes or is accompanied by the urgent sensation of urinating. In addition, when there is a combination of both of the above, there is SUI [4].

In general, the mechanism of urinary continence is related to the pelvic floor muscles (PFM). The pelvic skeletal muscles act as a support base for the bladder, urethra and other pelvic organs, thus ensuring that the ideal pressure continues to close the urethra and preventing the involuntary escape of urine. Thus, when the PFM is weakened, the pressure balance is affected, which can lead to UI [5]. The PFM are located in the middle layer of the pelvic floor and are segmented into different layers, called the deep layer, the middle layer and the superficial layer. These have different functions, with the deep and middle layers being related to continence mechanisms and the superficial layer being primarily related to sexual functions [6].

Although many people don't consider UI to be a worrying condition to seek medical attention for, its diagnosis is very important, so that the ideal treatment for each condition can be established. Since surgical procedures are not only expensive, but also invasive and consequently bring with them some risks such as adverse effects from anesthesia, pain after the procedure and even possible infections, non-invasive procedures such as electromagnetic field technology have stood out as an option for the



treatment of UI, since they do not require downtime, i.e. the patient can return to their normal activities without the need for a recovery period [7].

HIFEM - High Intensity Focused Electromagnetic - is an advanced muscle stimulation technology that uses high-intensity focused electromagnetic fields to induce muscle contractions. The HIFEM field non-invasively penetrates the skin without causing electrothermal damage, reaching the deepest muscle layers. Through the neuromuscular tissue, the induced electrical currents depolarize neuronal cells and initiate action potentials, which then cause selective, high-intensity non-voluntary muscle contractions, known as "supramaximal" contractions [8].

To effectively achieve MAP, several contractions must be performed correctly. HIFEM technology differs from other conventional therapies in that it can produce thousands of supramaximal contractions in a single session. The high intensity of the electromagnetic field ensures that the stimuli to the PFM occur properly, with the same intensity and repetitions throughout, without the patient straining [9].

Therefore, urinary incontinence is a condition that affects many individuals around the world, causing negative effects on the quality of life and physical, psychological and social well-being of individuals. In view of this, amidst so many therapies in contemporary times, electromagnetic field technology has been used as a therapeutic method for the treatment of urinary incontinence, thus avoiding the need to carry out invasive procedures. In this context, the study aims to analyze the degree of improvement of the Electromagnetic Field for the treatment of urinary incontinence.

## 2. **Methodology**

### 2.1 **Type of Study**

This is a retrospective, descriptive and quantitative study. It was based on the information contained in the medical records and questionnaires of the patients evaluated in the Research and Development Sector of Contourline Equipamentos Médicos e Diagnósticos Ltda, based in the city of Sete Lagoas, Minas Gerais. This



study was approved by the Research Ethics Committee of Faculdade UNIFEMM under protocol number 6.903.931.

## 2.2 **Procedures**

The data was collected between July and October 2023, using a self-administered questionnaire prepared by the researchers on the subject in question and two other self-administered questionnaires, but validated and known as the International Consultation on Incontinence Questionnaire - Short Form (ICIQ SF) and the Pelvic Floor Distress Inventory-20 (PFDI-20). The volunteers underwent 8 sessions of electromagnetic field technology (HIFEM), twice a week, lasting 30 minutes per session, using the XTônus equipment - Applicator/Assent for treatment of pelvic floor muscles, from Contourline Equipamentos Médicos e Diagnósticos Ltda.

Women aged between 18 and 55 years who showed signs of stress, urgency, or mixed urinary incontinence were included in the study, while those with conditions such as pelvic organ prolapse; pregnancy; presence of a cardiac pacemaker or other internal electronic devices; presence of metal implants in the lumbosacral spine, pelvis, or hip joints; or an intrauterine device with metallic components were excluded.

First, an anamnesis form was filled out, in which the patient was asked about her health history and daily habits, such as water intake and urination habits, symptoms of urinary loss and factors that could influence this, such as gestational history, for example. At the end of the anamnesis, the three self-response questionnaires were applied. The one developed by the researchers was applied at the beginning, after the 4th session and at the end of the treatment. It contained specific questions about intimate health and finally questions about urine loss itself, such as its frequency, when it occurs and how long it lasts. The ICIQ-SF, on the other hand, is a self-administered, simple and brief questionnaire made up of four questions that assess the frequency, severity and impact of urinary incontinence. Each answer scores a point, and the combined scores indicate the impact that urinary loss has on the patient's life; the higher



the score, the worse the patient's quality of life. In addition, the PFDI-20 is a questionnaire designed to assess the discomfort and impact of pelvic floor disorders on a patient's daily life, which is a shorter version of the Pelvic Floor Distress Inventory (PFDI). Both questionnaires were applied before and at the end of treatment.

### 2.3 Data analysis

The data collected was recorded in tables in the Excel® 2013 program to create graphs for analysis and interpretation. The result of the descriptive statistical analysis of the data involved transforming absolute values into percentages for a clearer comparison between the conditions before and after treatment.

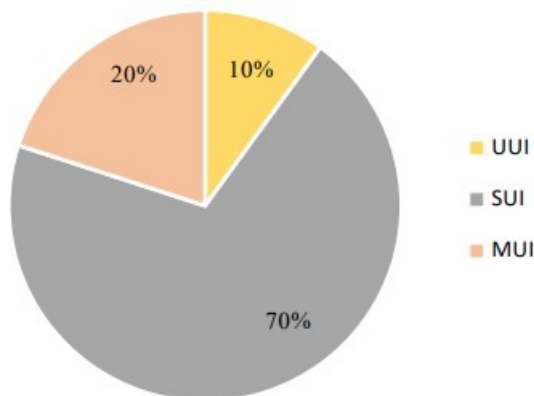
## 3. Results

The study consisted of 12 medical records of volunteers evaluated in the Research and Development Sector of Contourline Equipamentos Médicos e Diagnósticos Ltda, based in the city of Sete Lagoas, Minas Gerais, between July and October 2023. Of these, 2 were excluded because they did not contain all the data filled in.

Of the total sample of 10 medical records, the average age of the women evaluated was 34.4 years ( $\pm 5.73$ ), 60% of them with a median of 1-2 pregnancies (table 1). With regard to the type of UI, SUI was the most frequent among the volunteers (70%, figure 1). As for the severity of urinary leakage, the majority had leakage in drops (80%).

**Table 1** - Characteristics of the patients assessed by the Urogynecological Anamnesis.

Characteristics	N
Age (years)	34.4 ( $\pm 5.73$ )
Number of pregnancies	1-2
Active sex life (%)	90%
Loss of urine occurs:	In drops: 80%;
	In jet: 20%.
Episiotomy (%)	0%



**Figure 1** - Type of urinary incontinence identified by the ICIQ-SF. ICIQ-SF = International Consultation on Incontinence Questionnaire - Short Form; SUI = Stress Urinary Incontinence; SUI = Urge Urinary Incontinence; MUI = Mixed Urinary Incontinence.

The volunteers underwent 8 HIFEM sessions and noticed significant improvements immediately afterwards, 60% (6) on a scale of 0 - 10, defined the degree of improvement as greater than 5, 30% (3) defined the degree of improvement as between 3 - 5 and 10% (1) defined the degree of improvement as 1 (figure 2).

The decrease in the frequency of urine loss was significant in the participants' condition. A large proportion suffered from high frequency urine loss, 50% (5 out of 10) had daily episodes and a significant proportion, 40% (4 out of 10) had moderate loss, occurring on average every two days. After treatment, this frequency was drastically reduced, with 70% (7 out of 10) of the participants reporting only 1 episode of urine loss per week, 20% (2 out of 10) no longer losing urine and only 10% (1 out of 10) continuing to lose urine up to twice a week (figure 3).

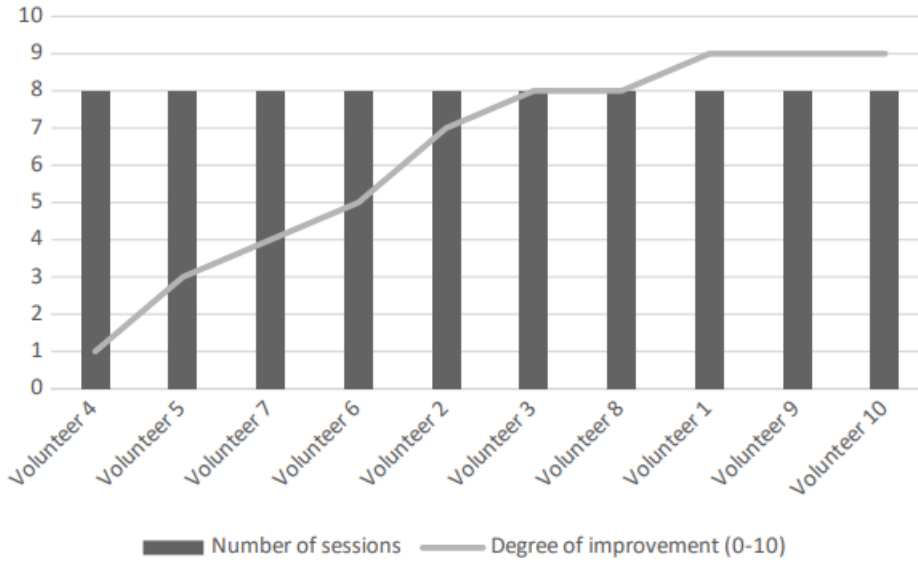
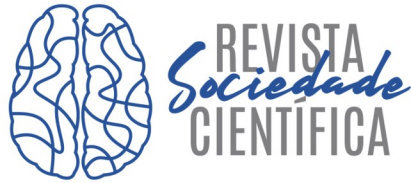


Figure 2 - Relationship between the number of sessions and the degree of individual improvement of each volunteer on a scale of 0 to 10.

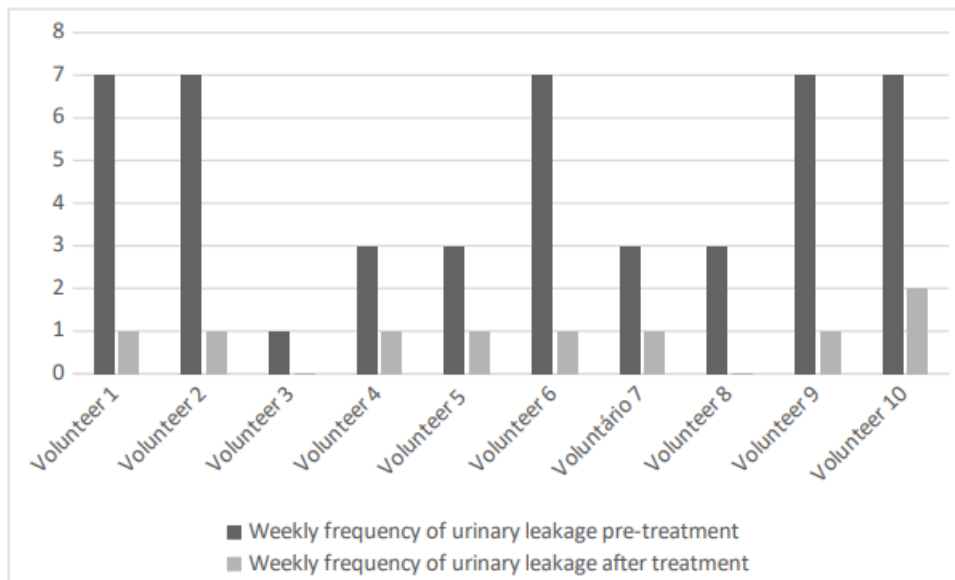


Figure 3 - Relationship between the weekly frequency of individual urinary leakage of each volunteer before and after treatment.



#### 4. **Discussion**

Electromagnetic field technology has proven to be a promising and effective approach for the treatment of urinary incontinence (UI). The retrospective study, based on the analysis of medical records of volunteers treated between July and October 2023, revealed significant results on the effectiveness of this non-invasive method.

The high intensity and frequency of the stimuli ensure adequate activation of the pelvic floor muscles (PFM), with each contraction being performed evenly and repetitively, whereas regular exercise can be less effective due to the difficulty patients have in maintaining the consistency of the contractions. In addition, Radzimińska et al. point out that regular exercise tends to take longer, with several studies indicating a treatment duration of 12 weeks or more, whereas with a duration of 4 weeks the patient receives treatment with HIFEM technology [9].

Our results correspond to the improvement reported in other studies, which ranged from 50-90% [11]. However, the exact comparison of various treatment modalities and results across the literature is wide-ranging, due to the variety of standardized or non-standardized methods of assessing UI, as well as the patient's self-assessment or quality of life. Previous studies also vary in terms of methodology and number of patients and groups, which can influence the final results and conclusions. Presumably, these circumstances are responsible for the diversity of results already published [12, 13].

Among the methods for assessing urinary incontinence (UI), the validated ICIQ-SF self-response questionnaire is the most commonly used tool. Studies [5, 10] have also used the ICIQ-SF to measure the severity, frequency and impact of urinary incontinence on patients' quality of life.

#### 5. **Final considerations**

This study demonstrated that Electromagnetic Field technology is capable of safely and effectively treating patients with Urinary Incontinence (UI). The results show





that the 8-session treatment was effective, with the majority of participants (90%) experiencing a significant reduction in the frequency or even elimination of urinary leakage episodes.

As a result, there has been a considerable improvement in the patients' quality of life, with no major adverse effects reported and no pain, indicating that this is a viable and beneficial treatment for other individuals with the same or similar conditions.

## 6. **Declaration of rights**

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