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Electromagnetic stimulation to improve muscle tone in the abdomen and lower limbs: an objective assessment with Magnetic Resonance Imaging

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Abstract

In this research study, Magnetic Resonance Imaging (MRI) was used to assess the results after the electromagnetic stimulation procedure in 10 patients presenting fat excess in the abdominal and lower limbs areas. Indeed, it proved to be an easy and non-invasive way to make a quantitative evaluation of the improvement progress. Four measures in the lumbar region (L2-L5) were taken to evaluate the improvement after the treatment. A significant improvement of +19,93% in muscle thickness was registered in the infraumbilical region followed by a +17.27% in the supraumbilical area. In the lower limbs, the most relevant increase was seen in the quadriceps (Vastus Medialis, +20,45%) and inner thighs (Gracilis, +22,59%). In conclusion, MRI gave us the possibility to assess the improvements after the conclusion of the treatment cycle. Electromagnetic stimulation is confirmed to be a valid and non-invasive strategy to reduce body fat in the abdomen and lower limbs area.

Keywords: Flat Magnetic Stimulation; Magnetic Resonance Imaging; Non-invasive Body Fat reduction; Abdomen; Lower limbs

Abbreviations: MRI: Magnetic Resonance Imaging; FMS: Flat Magnetic Stimulation

Introduction

Many people these days are always on the go and don't have time to dedicate themselves to a rigorous diet or frequent exercise. They frequently look for a quick fix that works just as well as a traditional workout to improve their body shape, whether it's by losing extra fat or toning their muscles. Because of this, the demand for non-invasive cosmetic treatments has increased quickly, and since 2012, the number of non-invasive operations performed has increased by almost 200% [1].

For example, in the US, the number of procedures performed more than doubled between 2012 and 2016 [2]. Tissue laxity and localized subcutaneous fat deposits in the abdomen and lower limbs are the most prevalent areas treated in both sexes. For this reason, the demand for aesthetic procedures trying to improve these conditions has sensibly risen in the last decade [3]. For example, techniques such as lasers, surgery, and medical methods, have been introduced because less invasive compared to surgical strategies [3,4]. Between these, microwaves are one of the newest laser technologies that have shown promise in body contouring [5-7]. It improves subcutaneous adipose tissue in the abdomen and lower limbs without causing side effects or requiring a long recovery period.

Moreover, microwaves can target the underlying muscles, therefore the abdomen does appear toned. In recent times, body shaping technology utilizing the electromagnetic stimulation field has demonstrated encouraging outcomes. By directly activating the motor neurons that innervate the muscles, this application diverts the peripheral and central nervous systems and permits muscle contraction, which directly affects abdominal laxity and flaccidity. Specifically, the technology used in this study is the Flat Magnetic Stimulation (FMS), which can make a muscle passively contract without brain involvement. It is employed in muscle rehabilitation and muscle training to build muscle strength. Due to the limited effect that magnetic stimulation has on cutaneous

receptors, it also avoids the subjective pain experience that is commonly associated with electrostimulation. The depth the magnetic field can reach is up to 7 cm. Deep motor neuron activation and broad, deep muscular contractions can indeed be achieved with magnetic stimulation [8].

In this research study, to assess the research progresses, it was decided to use Magnetic Resonance Imaging (MRI). Indeed, it has already been used in several research studies that proved it to be an easy and non-invasive way to make a quantitative evaluation of the improvement after electromagnetic stimulation procedure [9].

Case Reports

Ten patients presenting fat excess in the abdominal and lower limbs area (see Table 1 for details) were treated with the FMS device called Schwarzy (DEKA M.E.L.A., Florence, Italy). The system is a medical device that is a tool for muscle toning. [7,8,10] Using up to two pads applied to a specific body area, the device's FMS technology allowed the patients' lower limbs and abdomen to move without requiring brain participation.

Table 1: General information about study population. The treated area, gender, age, and circumference and plica measurements are reported.

Treated area	GENDER	AGE	Circumference [cm]		Plica [cm]	
			Baseline	2-month FU	Pre	2-month FU
Abdomen	F and M	60,5±19,0	103,0±5,6	100,5±+9,1	3,5±0,7	2,7±1,7
Inner thigh	F	46,6±4,6	52,0±2,4	53,5±1,0	3,75±0,2	3,55±0,5
Quadriceps	F	63,5±16,0	55,5±1,9	55,2±1,7	4,5±0,6	4,0±0,0

Therefore, the patients received treatment for 8 sessions, twice a week, for 4 weeks and two months of follow-up. The Muscle "Strength 1" procedure was applied for the initial sessions. Then the "Strength 2" was used. They are characterized by sequential repetitions of muscle contraction at a frequency of 20-40Hz and resting phases, with the only difference in the pulse pattern between the protocols. [11] MRI (MAGNETOM Sola, Siemens Healthcare GmbH, Germany) clinical pictures were acquired at baseline, before the beginning of the first treatment, and 2 months, after the conclusion of the treatment cycle (see Figure 1).

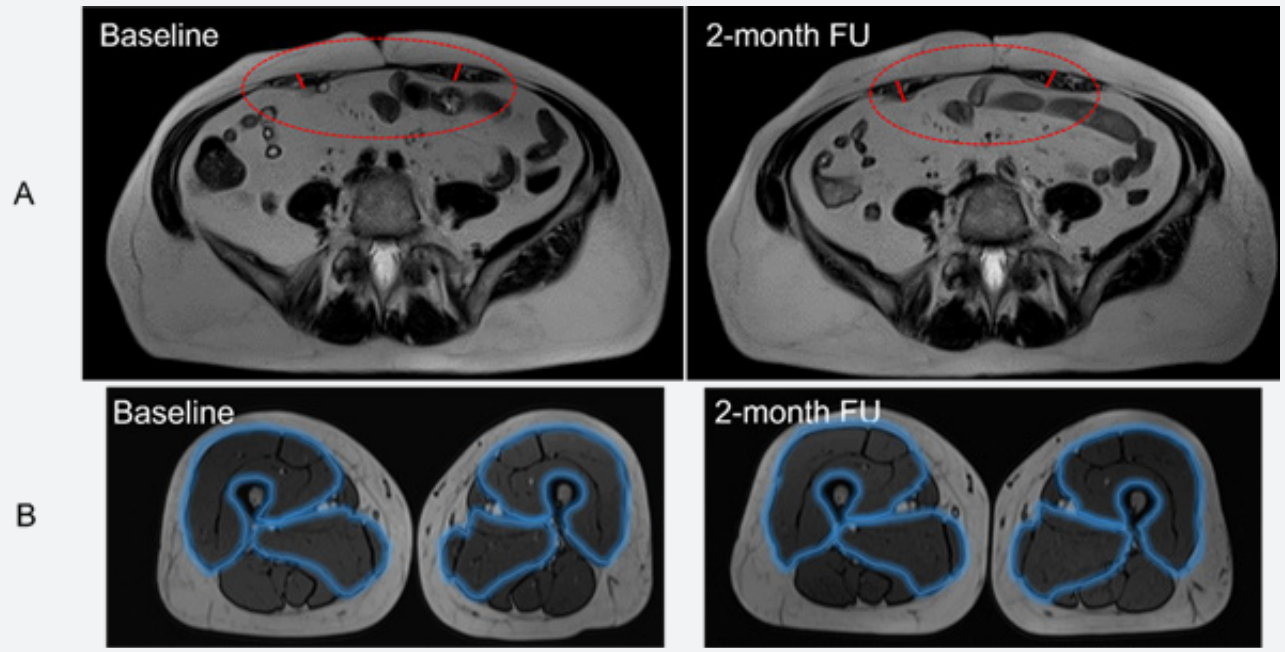

Figure 1: Example of Magnetic Resonance Imaging (MRI) of the abdomen (A) and the lower limbs (B). Horizontal plane view. Pictures were taken before treatment (baseline) and after 2 months from the last session (2-month FU). A) With red circles are enlightened the abdominal muscles stimulated by the treatment. B) The "U-Shaped" outlined areas coincide with the quadriceps muscles while the others identify the inner thigh muscles.

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Four measures in the lumbar region (L2-L5) were taken to evaluate the improvement after the treatment (L2-L3: supraumbilical; L3-L4: umbilicus; L4-L5: infraumbilical; L3-L4: umbilicus-trasverso regions). A significant improvement of +19,93% in muscle thickness was registered in the infraumbilical region followed by a +17.27% in the supraumbilical area (see Table 2 and Figure 1). A similar improvement trend can be found in the lower limbs. Indeed, the most relevant increase was seen in the quadriceps (Vastus Medialis, +20,45%) and inner thighs (Gracilis, +22,59%) (see Table 2 and Figure 1).

Table 2: Abdomen and lower limbs muscle thickness (mm) measurements before treatment (baseline) and after 2 months from the last session (2-month FU). In the abdomen, they were taken in the lumbar region (L2-L3: supraumbilical; L3-L4: umbilicus; L4-L5: infraumbilical; L3-L4: umbilicus-trasverso). In the lower limbs, they were taken in different and specific areas (Rectus Femoris, Vastus Lateralis, Vastus Intermedius, Vastus Medialis, Gracilis, Adductor longus, Adductor magnus).

Area baseline		Muscle thickness (mm)	Muscle thickness (mm)	Percentage (%)
		2-month FU		
Abdomen	L2-L3: supraumbilical	10,13±1,5	11,88±0,83	17.27%
	L3-L4: umbilicus	11,39±1,89	12,52±1,64	+9,92%
	L4-L5: infraumbilical	10,00±1,08	12,00±1,17	+19,93%
	L3-L4: umbilicus-trasverso	18,78±4,61	19,86±4,47	+5,75%
Lower Limbs	Rectus Femoris	14,66±2,88	17,34±2,65	+18,27%
	Vastus Lateralis	20,70±1,53	23,48±1,60	+13,44%
	Vastus Intermedius	15,97±1,97	18,24±3,41	+14,22%
	Vastus Medialis	19,36±2,54	23,33±2,77	+20,45%
	Gracilis	9,14±0,80	11,20±1,44	+22,59%
	Adductor longus	18,83±1,08	20,43±1,10	+8,48%
	Adductor magnus	37,05±2,15	39,46±0,46	+6,51%

Discussion

Regular physical exercise and a proper diet that emphasizes the consumption of fiber and protein over sugar, salt, and carbs are crucial. A healthy lifestyle does not, however, necessarily result in a more attractive belly or legs, particularly in patients who have experienced abrupt weight shifts [12]. For example, after having their abdominal fat removed, patients with weak abdominal muscles may not always be happy with how they look due of swelling and flaccidity around the abdominal wall. Thus, the issue of muscle flaccidity caused by a decrease in muscle and aponeurotic tension and an increase in intra-abdominal pressure cannot be resolved by removing extra fat. With these premises, we set out to assess the effectiveness of flat magnetic stimulation (FMS). Our findings were based on our previous scientific experience [6,13].

Previously, [8] already demonstrated with ultrasounds that FMS was effective in the toning of muscles in the abdominal area. Indeed, the results of the MRI scans reported in this research demonstrated that non-invasive FMS technology application to the abdomen area and lower limbs can result in simultaneous modifications to the interested muscle tissues. Indeed, two months following their last treatment, patients' appearances improved visibly both in the abdomen and tights area. Differently from most treatment strategies that try to decrease the subcutaneous fat layer (by surgery or non-invasive means), FMS is addressed to build up the muscle component. For example, currently, a physical exercise regimen is one of the most common non-invasive approaches to strengthen the core muscles. In a 30-minute session, the examined device induces about 20,000 pulses using FMS technology. Such a high frequency of nerve stimulation causes voluntary supramaximal muscular contractions. Having to adjust to this overload of tension, the muscles adapt by thickening and strengthening. [9] reported that many studies on high-intensity muscle training have demonstrated that adipose tissue next to the contracting muscle undergoes a lipolytic reaction [9].

In conclusion, MRI gave us the possibility to assess the improvements after the conclusion of the treatment cycle. FMS confirmed to be a valid and non-invasive strategy to reduce body fat in the abdominal and lower limbs area.

References

1. Katz B (2023) Concomitant use of radiofrequency and high intensity focused electromagnetic field energies for full-body remodeling: MRI evidence-based prefatory trial. J Cosmet Dermatol 22(1): 193-199.
2. The American Society for Aesthetic Plastic Surgery (2019) The American Society for Aesthetic Plastic Surgery's Cosmetic Surgery National Data Bank: Statistics 2018. Aesthet Surg J 39(Suppl_4): 1-27.

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DOI: 10.19080/GJARM.2024.07.555716

3. Kream EJ, Jones VA, Tsoukas MM (2022) Balancing medical education in aesthetics: Review and debate. Clinics in Dermatology 40 (3): 283-291.
4. Bernstein D, Farberg AS, Khorasani H, Kriegel D (2017) Noninvasive Body Contouring: Literature Review and Summary of Objective Data. J of Skin 1(1): 18-31.
5. Bonan P, Marini L, Lotti T (2019) Microwaves in body sculpting: A prospective study. Dermatologic Therapy 32(2): e12782.
6. Nisticò SP, Bonan P, Coli F, Verdelli A, Fusco I, et al. (2022) A New Protocol to Treat Abdominal Subcutaneous Fat Combining Microwaves and Flat magnetic stimulation Bioengineering (Basel) 9(5): 182.
7. Negosanti F, Cannarozzo G, Zingoni T, Leone A, Fusco I (2022) Is It Possible to Reshape the Body and Tone It at the Same Time? Schwarzy: The New Technology for Body Sculpting. Bioengineering (Basel) 9(7): 284.
8. Leone A, Piccolo D, Conforti C, Pieri L, Fusco (2021) I Evaluation of safety and efficacy of a new device for muscle toning and body shaping. J Cosmet Dermatol 20(12): 3863-3870.
9. Kinney BM, Lozanova P (2019) High intensity focused electromagnetic therapy evaluated by magnetic resonance imaging: Safety and efficacy study of a dual tissue effect based non-invasive abdominal body shaping. Lasers Surg Med 51(1): 40-46.
10. Fragassi M, Comito A, Fusco I, Pieri L, Pennati BM, et al. (2023) Flat Magnetic Stimulation as A New Frontier Technology for Stimulating Body Metabolism and Promoting a Healthy Lifestyle. Rehabil Med 7(3): 555711.
11. Zingale F, Pennati BM, Comito A, Fioriti F, Fiorini S, et al. (2023) A New Electromagnetic Technology as a Strategy to Help the Recovery of the Anterior Cruciate Ligament Injury in Athletes: A Pilot Study. Glob J Addict Rehabil Med 7(3): 555713.
12. Mozaffarian D (2016) Dietary and Policy Priorities for Cardiovascular Disease, Diabetes, and Obesity: A Comprehensive Review. Circulation 133(2): 187-225.
13. Mezzana P, Pieri L, Leone A, Fusco I (2021) Schwarzy: The new system for muscle toning and body shaping. J Cosmet Dermatol 20(8): 2678-2680.

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