Using focused ultrasound to treat localized fat

Experiência no uso do ultrassom focado no tratamento da gordura localizada em 120 pacientes

ABSTRACT

Introduction: There are several techniques for the treatment of the body’s contour. The vast majority, however, are not very effective. We report our experience in the use of focused ultrasound in the treatment of localized fat in 120 patients.

Methods: 120 patients underwent 2 or 3 focused ultrasound sessions with 4-week intervals. The abdomen, hips, thighs, dorsum and infragluteal fold were the treated areas.

Results: After treatment, there was an average reduction of 4.95, 4.88 and 3 cm in the circumference of the abdomen, hips and thighs, respectively.

Conclusion: Focused ultrasound is a safe, effective and well tolerated procedure for remodelling areas of the body.

Keywords: ultrasonic therapy; subcutaneous fat; lipolysis.

INTRODUCTION

Several non-surgical and minimally invasive techniques have been developed in attempts to replicate the efficacy of liposuction. Treatments such as radiofrequency, infrared light, non-focused ultrasound, and mesotherapy have become popular for their relative safety and cosmetic effect in the transitory improvement of cellulite and body contour. However, most results obtained are modest and the reduction in the circumference is only temporary. Moreover, multiple sessions combined with a maintenance program are necessary, limiting the use of those treatments.

In medicine, ultrasound can be used as a diagnostic tool or as a therapeutic modality. UltraShape™ (UltraShape Inc, Yoqneam, Israel) uses ultrasound in a therapeutic way. Non-invasive ultrasonic energy can be transmitted to the tissue in two ways: focused and non-focused. In the latter, the skin and subcutaneous tissue are exposed in equal extension. Due to the attenuation of the ultrasound wave, the signal’s energy fades with distance; therefore, the skin is exposed to the maximum intensity of energy. In comparison, the use of focused ultrasound
allows the concentration of energy on a precisely focused deep volume of the subcutaneous tissue to promote lipolysis. This system uses mechanical energy (non-thermal) to break up fat cells; neighbouring structures (skin, lymph and blood vessels, muscles and nerves) are not damaged, due to the different susceptibilities to the mechanical stress induced by the ultrasound.\(^1\)

Previous clinical studies carried out in Israel, Europe and Japan 1 demonstrated that the lipolysis promoted by UltraShape™ is a non-invasive, safe and painless procedure to achieve corporal remodelling in areas of the abdomen, thighs and hips; additionally, results obtained were measurable and definitive after a single treatment.

The objective of this study is to demonstrate the clinical results obtained in patients treated with focused ultrasound and evaluate the efficacy and safety of multiple treatments using this method.

**METHODS**

This retrospective study of 120 patients (17 men and 103 women) was carried out at a private clinic from January to October 2007. All patients underwent a physical examination, including body weight, height and measurement of circumferences using a tape supplied by the company that kept the tension standard among the measurements (Figure 1). The measurements were obtained at a fixed distance from the ground, in the same place, at the same pressure on the skin. Many patients had more than one area treated, with a total of 153 areas treated. The minimum thickness of the pinching area (the distance between the surface of the skin and the subcutaneous tissue) was 1.5 cm. Treated areas included the abdomen (72), hips (46), thighs (30), dorsum (1) and infragluteal region (4). The body mass index varied from 19 to 24. Patients with tattoos or scars in the treatment areas, and patients with active illnesses, neoplasia, terminal or serious hepatic disorders or hyperlipidemia (total cholesterol ≥ 300 or triglycerides ≥ 500 mg/dl) were excluded.

Photographic evaluation – using constant parameters, illumination and positioning – was carried out immediately before the sessions and one month after the last session.

The system uses fixed parameters of frequency (200 ± 30 kHz) and an acoustic intensity output of 17.5 W/cm\(^2\). The company supplied an oil to be used to ensure appropriate acoustic contact between the skin and the transducer. A video tracking system was used to guide the transducer’s movement on the area being treated, ensuring that each location is treated only once and that each energy pulse is delivered immediately adjacent to the previous pulse, promoting a complete and uniform coverage of the region. All treated areas underwent a second session, and 43 had a third session. The interval between sessions was four weeks. All patients were instructed to maintain a healthy lifestyle with a balanced diet, low in saturated fat.

**RESULTS**

The average reduction in circumference after three sessions was 4.95 cm, 4.88 cm and 3 cm for the abdomen, hips and trochanteric regions, respectively. The infragluteal and dorsum regions achieved a single session, with an average reduction in circumference of 2.35 cm and 2.6 cm, respectively. The per-session average reduction in circumference is presented in Table 1.

During the treatments, seven patients lost weight (2 kg on average). In those patients, the average reduction in circumference was more significant (3.3 cm and 3.5 cm in the hips and abdomen, respectively). Eight patients presented an average weight gain of 1.7 kg; nevertheless there was an average reduction in circumference of 1.3 cm and 1.4 cm in the abdomen and hips, respectively.

In this study, the results did not vary significantly by area treated. The dorsum and infragluteal areas presented better results; however only five patients were treated, with a single session each. Although more than 80% of the patients considered their results satisfactory, 10 patients did not present improvement. Before and after photographic evaluations of the treatment demonstrate significant reductions of localized fat in the treated areas (Figures 2 to 5).

Seven patients reported transitory pain during the treatment, mainly related to the proximity to osseous regions (such as the ribs and iliac crest). One female patient presented blisters due to technical problems with the transducer, which healed in one week.

**DISCUSSION AND CONCLUSION**

The focused ultrasound system UltraShape™ was the first developed to reduce located fat in a non-invasive manner. It produces visible and durable results, particularly in patients who want to avoid or cannot have surgery. The company received the

<table>
<thead>
<tr>
<th>Treatment area</th>
<th>1st session</th>
<th>2nd session</th>
<th>3rd session</th>
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<tbody>
<tr>
<td>Abdomen</td>
<td>1.76 cm</td>
<td>2.54 cm</td>
<td>4.95 cm</td>
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<tr>
<td>Flanks</td>
<td>1.43 cm</td>
<td>2.03 cm</td>
<td>4.88 cm</td>
</tr>
<tr>
<td>Trochanterica</td>
<td>1.84 cm</td>
<td>2.73 cm</td>
<td>3 cm</td>
</tr>
<tr>
<td>Infragluteal</td>
<td>2.35 cm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dorsum</td>
<td>2.6 cm</td>
<td>-</td>
<td>-</td>
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</tbody>
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Figure 1 - Measurement of the circumference with tape supplied by the company, which allowed the standardization of the tension among the measurements.
European Community’s approval for the equipment in July 2005, and in 2009, it was being used in 57 countries, with more than 100,000 treatments performed. In vivo studies in pigs demonstrated that the equipment promotes the selective destruction of fat immediately beneath the dermis, which assumes the appearance of multiple small pores. The breaking down of fat cells, surrounded by vessels and intact nerves, was histologically confirmed. After the rupture of the fat cells, the content (mainly composed of triglycerides), remains dispersed in the interstitial space, and is transported through the lymphatic system up to the liver. Theoretically, those triglycerides are slowly metabolized by the endogenous lipase for fatty acids and glycerol. The fatty acids are transported to the liver, where they are processed in similar way to fatty acids in the diet. There have been no reports of increased serial lipids in clinical studies involving UltraShape™.

The results obtained are compatible with those demonstrated in the literature. In 2007, Moraga and colleagues reported an average reduction in circumference of 3.95 ± 1.99 cm after three sessions in the abdomen, hips, thighs, knees and breast regions (n = 30). Teitelbaum and others demonstrated an average reduction in circumference of 2 cm after a single session in the abdomen, hips and thighs in a multicentric study with 137 patients. The lesser reductions in the trochanteric region (compared to the abdomen and hips) is perhaps related to the greater presence of fibrosis in that region, which hamper the performance of the focused ultrasound.

The treatment was well tolerated, with only 6% of patients reporting discomfort during or after the sessions. Hematomas and ecchymoses were not found in the study, demonstrating that the device does not disturb blood vessels.

This study demonstrated that the use of focused ultrasound is a safe, effective and well-tolerated procedure for body remodelling. This technology can be a non-invasive alternative to conventional liposuction for patients with a small to moderate amount of localized fat who are not candidates for surgical treatment.

REFERENCES