

# Mechanism of Action

There are a number of non-invasive techniques, with various mechanisms of action, for reducing localized subcutaneous adipose tissue. Cryolipolysis produces cold-induced apoptosis of adipocytes, while thermal approaches include radiofrequency (RF) energy, which triggers apoptosis of fat cells, and high-intensity focused ultrasound (HIFU), which causes coagulative necrosis and cell death. <sup>1-3</sup>

The UltraShape Power system (Fig. 1) works by emitting acoustic waves of focused ultrasonic energy ( $200 \pm 30$  KHz frequency) that converge into a confined focal volume underneath the skin, thereby, targeting only subcutaneous fat at a controlled depth. Unlike traditional ultrasound technology, UltraShape Power's energy transmits pulsed ultrasound, allowing control over temperature elevation. Fat destruction occurs instantly, selectively and by exerting a non-thermal effect, using mechanical energy to produce cavitation, leading to fat cell lysis without an effect on the surrounding nerves and connective tissue. <sup>4,5</sup>

Figure 1: UltraShape Power System



## UltraShape Power Transducer

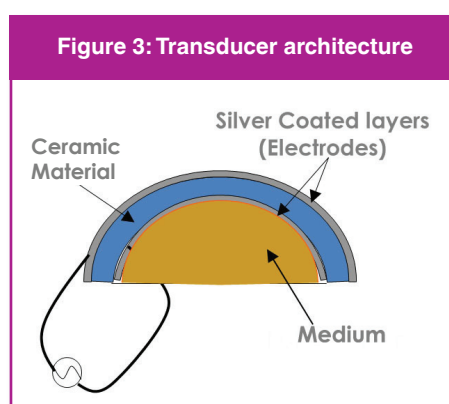
The UltraShape Power system, which delivers  $660 \text{ W/cm}^2$  acoustic pressure, incorporates 12-gram U-Sculpt transducer to target anatomical locations of various size (Fig. 2). The transducers are comprised of two layers of

Figure 2: Transducer with a 20% increase in acoustic pressure

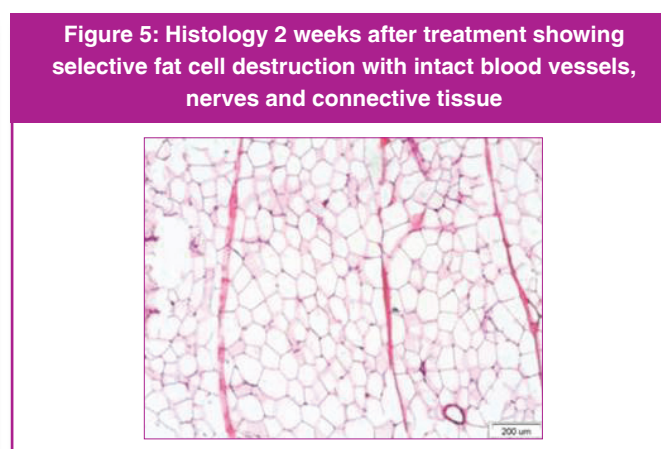
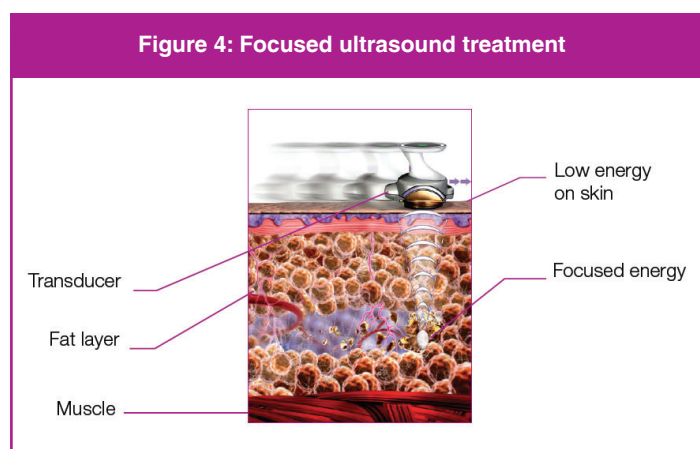


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silver-coated electrodes with a ceramic-filled center between the layers. The dome-shaped ceramic-filled center contains a medium that is matched to the human body's impedance. When electrical voltage is applied to the silver coating, an electric field is created within the ceramics, causing an alteration in the ceramic thickness. This in turn creates pressure waves within the medium – these pressure waves are interpreted as sound waves and create the ultrasonic energy (Fig. 3).



The transducer architecture, with the rounded ceramic dome, delivers low energy at the surface, but provides a concentrated intensity of energy where the ultrasound waves converge at the focus (Fig. 4). This focused energy allows targeting of defined tissues at a controlled depth, while leaving adjacent structures, such as skin, blood vessels, nerves, and muscles, unharmed (Fig. 5).



## Pulsed Mode

The UltraShape Power's transducers deliver the energy in bursts; this unique feature allows the generated heat to dissipate before the next pulse begins. This minimizes the temperature rise (0.50° C) within and around the targeted tissues. The energy delivered is transformed into mechanical stresses that remain within the focus area and exist only for the duration of energy delivery. This allows the targeting of tissues that are most susceptible to mechanical disruption, while more resistant structures remain intact.



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## Fat Clearance

A common concern regarding noninvasive fat reduction is removal of the destroyed fat cells without an increase in liver fat content. In a clinical study by Teitelbaum et al.<sup>6</sup>, the blood laboratory tests, following a series of UltraShape treatments, demonstrated that hepatic function remains unchanged with no clinically significant changes in lipid profile. During the UltraShape procedure, the membranes of the fat cells are disrupted. The fat cell content, primarily composed of triglycerides, is dispersed into the interstitial fluid among the cells and then transported by the body's natural processes to the liver. The liver makes no distinction between the fatty acid byproducts of the UltraShape procedure and fat originating from consumed food. Fat metabolites are processed in the liver in the same manner as fat originating from digested food, and both types of fat are removed via the body's natural mechanisms - the lymphatic, venous, and immune systems.

## Safety

Although non-invasive body contouring treatments are reported to be safe, discomfort and severity of adverse effects differ with the various techniques. Pain, bruising, tenderness, paresthesias, neuropraxias, burns, scarring and fat atrophy have all been reported with several devices currently on the market.<sup>4,7,8</sup> Due to its mechanical mechanism of action, UltraShape treatment was found to be safe and well tolerated, in a multi-center study, with minimal or no discomfort during or after the focused ultrasound procedure, and no reports of hematoma, fluid build-up, or subcutaneous bleeding.<sup>6</sup>

## References

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