



Level 5 Diploma in Contemporary Skin Rejuvenation

Unit 3 Lesson 1

In aesthetic practice, High-Intensity Focused Ultrasound (HIFU) is a non-invasive treatment designed to lift, tighten, and rejuvenate the skin by delivering focused ultrasound energy to precise anatomical layers of the face and neck. These layers respond to the energy by undergoing thermal coagulation, leading to tissue contraction and long-term collagen remodelling.

What HIFU Does

HIFU delivers focused ultrasound energy deep into the skin at various depths without damaging the surface. This causes controlled thermal injury, leading to:

- Immediate tissue contraction
- Collagen denaturation and neocollagenesis
- Elastin remodelling
- Subtle fat disruption (in some protocols)

Controlled thermal injury is the **core mechanism** by which **High-Intensity Focused Ultrasound (HIFU)** achieves skin lifting, tightening, and rejuvenation. This process is **precisely calibrated** to cause intentional, localized damage that stimulates the skin's **natural repair processes**—without harming surrounding tissues or the skin surface.

What Is Controlled Thermal Injury in HIFU?

Controlled thermal injury refers to **focused heating** of tissue at specific depths using ultrasound energy, causing **coagulative necrosis** (protein denaturation) at target points. The term "controlled" means:

- **Localized:** The heat is concentrated at a precise focal point.
- **Subclinical:** The surface of the skin remains intact.
- **Safe:** The extent of injury is designed to **stimulate regeneration**, not destruction.

How It Works – Step-by-Step Breakdown

1. Focusing Ultrasound Energy

- HIFU uses transducers to focus **ultrasound waves** at a **specific depth** (1.5 mm, 3.0 mm, 4.5 mm, etc.).



- The energy converges at a focal point below the skin, much like how a magnifying glass focuses sunlight to a single hot spot.

2. Rapid Heating at the Focal Point

- At the focal point, tissue temperature rapidly rises to **60–70°C (140–158°F)** within milliseconds.
- This heat causes **immediate denaturation** of structural proteins like **collagen**.

3. Coagulative Necrosis (Microthermal Zones)

- Each pulse of ultrasound energy creates a **thermal coagulation point** about **1 mm³** in size.
- These micro-injuries do **not damage the surrounding tissue** due to the precise focus.
- Multiple coagulation points are arranged in **lines or grids** to cover the treatment area.

4. Wound Healing Response Activation

- The body perceives these microthermal zones as minor wounds.
- This triggers a **fibroblast-mediated repair process**, including:
 - **Neocollagenesis** – new collagen production
 - **Neoelastogenesis** – new elastin fiber formation
 - **Angiogenesis** – development of new capillaries

5. Tissue Contraction and Remodeling

- Existing collagen fibers contract as they denature, resulting in **immediate tightening**.
- Over **8–12 weeks**, collagen is replaced with newly organized, denser fibers.
- Long-term lifting, firming, and smoothing effects emerge.

Depth-Specific Effects

Depth	Tissue Targeted	Thermal Effect
1.5 mm	Superficial dermis	Surface tightening, fine line reduction
3.0 mm	Deep dermis	Collagen remodeling and moderate lifting
4.5 mm	SMAS (muscle layer/fibrous fascia)	Structural lifting and tightening of deeper tissues
6.0+ mm	Subcutaneous fat (optional zones)	Fat disruption for contouring (e.g., double chin, jowls)



Key Features of Controlled Thermal Injury in HIFU

- **Non-invasive:** No needles, incisions, or downtime.
- **Precision targeting:** No damage to skin surface or adjacent tissues.
- **Gradual improvement:** Results improve over 2–3 months post-treatment.
- **Natural stimulation:** Uses the body's own healing response.

Safety Considerations

- Parameters like **energy level**, **pulse duration**, and **spacing of focal points** must be carefully calibrated.
- **Over-treatment or overlapping pulses** can cause burns or nerve damage if improperly applied.
- Always performed by trained professionals using certified HIFU devices.

Anatomical Targets of HIFU

Depth	Target Tissue	Anatomical Goal
1.5 mm	Superficial dermis	Improve skin tone, texture, and reduce fine lines
3.0 mm	Deep dermis / upper subcutaneous layer	Stimulate deeper collagen production and moderate tightening
4.5 mm	SMAS (Superficial Musculo-Aponeurotic System)	Lift and tighten underlying facial support structures
6–13 mm (body areas)	Subcutaneous fat layer	Contour localized fat deposits and improve firmness