DENSITY™ High-Eye Tip for Non-Invasive Periorbital Rejuvenation

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Introduction

Demand for non-invasive eye rejuvenation is rapidly increasing as patients seek effective, low-downtime treatments that avoid surgery[1]. Among facial regions, the periorbital area tends to show aging earliest and most prominently due to its thin, delicate skin, high muscular activity, and minimal sebaceous support[2]. These anatomical features lead to early-onset fine lines, sagging, and pigmentation—and make treatment more challenging due to the area's sensitivity to heat, risk of edema or burns, and proximity to delicate structures.

Effective treatment requires precise energy control and epidermal protection. The Density™ RF system, particularly its specialized Eye Tip, addresses these challenges by delivering focused thermal energy with patient comfort and safety in mind.

Anatomical Considerations

The periorbital region is structurally unique. Eyelid skin is the thinnest in the body (0.3–0.5 mm)[3] and lies directly atop the orbicularis oculi muscle, with minimal subcutaneous fat[4]. As collagen degrades and ligamentous support weakens, dermal laxity and fine wrinkles develop.

Its lack of insulating fat and proximity to sensitive structures (e.g., orbital rim, lacrimal glands) make it particularly reactive to thermal energy. As such, treatment demands low-energy, precisely localized delivery. The Density™ Eye Tip—with impedance- and temperature-regulated RF—is uniquely engineered for this purpose.

Technology Overview: Density™ Eye Tip

The Eye Tip features a compact 0.25 cm² treatment area and combines sequential monopolar and bipolar RF to target both deep and superficial dermal layers:

- **Monopolar RF** delivers deeper volumetric heating via current flow to a grounding pad.
- **Bipolar RF** delivers superficial, localized heating between electrodes on the tip.

This dual-mode protocol is based on findings that monopolar preheating reduces impedance, improving bipolar RF efficacy[5]. The tip's design allows for precise maneuvering around orbital contours and functions optimally with light contact, preserving precision.

Integrated cryogenic cooling protects the epidermis and enhances comfort, eliminating the firm contact pressure often required by traditional RF systems.

Mechanism of Action

The Density™ Eye Tip delivers sequential monopolar and bipolar radiofrequency (RF), delivering controlled thermal energy into both superficial and deep dermal layers. This energy denatures collagen fibers and stimulates fibroblasts, initiating neocollagenesis, elastin remodeling, and dermal tightening. Monopolar RF penetrates deeply to generate volumetric heating within the reticular dermis, while bipolar RF delivers more localized heating to the superficial papillary dermis—together supporting both foundational and surface-level rejuvenation in the periorbital area.

Beyond these structural effects, RF treatment also activates intracellular signaling pathways that counteract age-related matrix degradation. In

particular, RF has been shown to upregulate the **NRF2/GLO-1** pathway, which plays a key role in inhibiting the formation of advanced glycation end products (AGEs) and their receptor (RAGE). This suppression reduces the activity of **nuclear factor-kappa B (NF-κB)** and **matrix metalloproteinases (MMP-2/3/9)**—enzymes responsible for collagen breakdown—while promoting a shift in macrophage polarization from pro-inflammatory M1 to reparative M2 phenotypes. These molecular responses support a more stable extracellular matrix, improved elasticity, and increased collagen and elastin fiber density, particularly when monopolar and bipolar RF are used in combination[6].

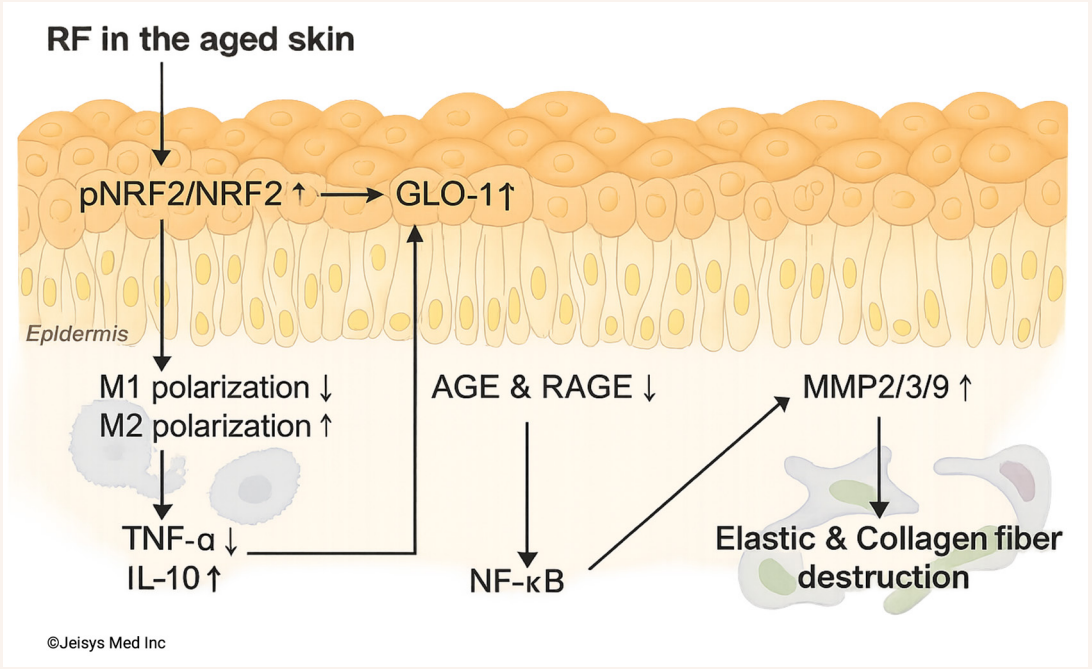

Fig1. Mechanism of Action: NRF2-Mediated Anti-Aging Effects of RF in Aged Skin

Clinical Outcomes

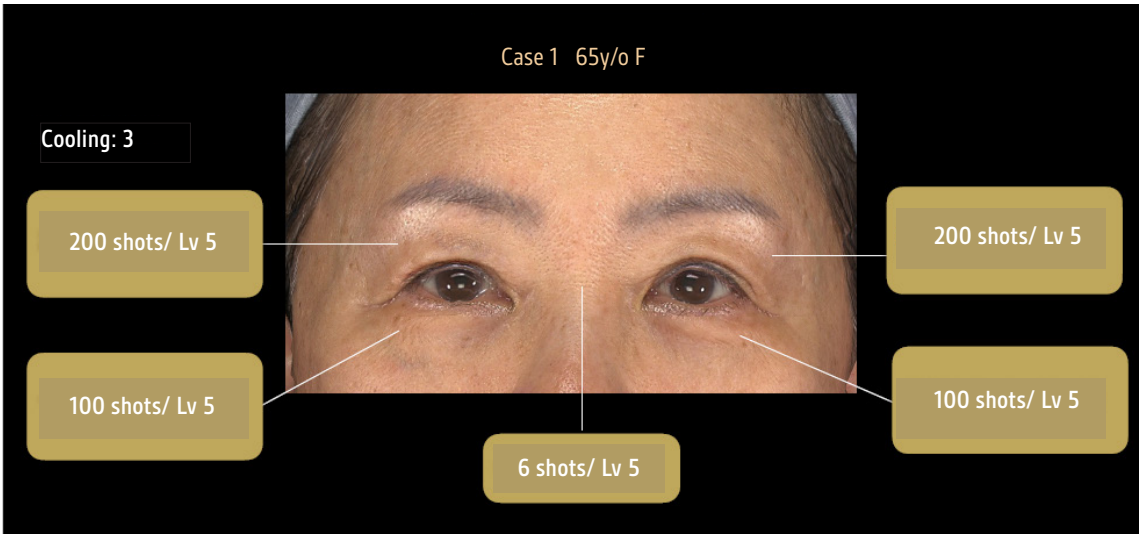

Figure 1. Clinical photographs before treatment, 1 month after treatment, and 5 months after treatment with the Density™ Eye Tip.

Clinical Methodology

A case series (Fitzpatrick I–III) was conducted using the Density™ Eye Tip to treat upper/lower eyelids, infraorbital areas, and crow's feet.• Energy settings:

- **Settings**: High-E, Lv 5
- **Shots**: 606 shots in total
- **Anesthesia**: None

Clinician-Measured Improvements

- Eyelid skin tightening, reduced wrinkles and improved skin texture over all treated area, including the horizontal lines at nasal bridge, maximal improvement observed 4-5 months after treatment

These outcomes demonstrate that Density™'s sequential RF effectively improves periorbital skin quality with minimal downtime and high patient satisfaction.

Safety and Contraindications

No adverse events occurred in the case series beyond transient erythema.

Contraindications include:

- Active periorbital infections or dermatitis
- Recent eyelid surgery or filler
- Implanted metal/electronic devices
- Pregnancy or lactation

Use of **eye shields** is recommended for upper eyelid treatment. Built-in real-time impedance check, and cryogenic cooling reduce the risks of adverse events, such as burns.

Conclusion

The Density™ Eye Tip offers a clinically effective and patient-friendly solution for periorbital rejuvenation. With **sequential monopolar-bipolar RF, real-time safety controls, and integrated cooling**, it enables collagen remodeling without downtime or invasive procedures. Clinical results and NRF2 pathway activation support its role in reversing signs of aging both structurally and molecularly—positioning Density™ as a **next-generation, eye-optimized RF platform for non-invasive rejuvenation**.

ReferReferences (Vancouver Style)

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