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Validation of the effectiveness of Monopolar Radiofrequency 6.78 MHz for facial rejuvenation.

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Abstract: *Monopolar radiofrequency (RF) is a technology used to treat tissue sagging, skin rejuvenation, andredefine facial contours. It generates controlled heat that activates fibroplasty, neocollagenesis, and neoelastogenesis, promoting rejuvenation. Rejera® technology, based on 6.78 MHz monopolar radiofrequency emission, operates through capacitive coupling with deep dermal heating, respecting the integrity of the epidermis. The development of a clinical protocol based on the Glogau classification allows the individualization of therapy according to the degree of photoaging and skin sagging.*
Objective: This study aimed to validate a clinical protocol for the application of Rejera® technology, considering the Glogau classification as a skin grading criterion. Rejera® technology, based on the Glogau classification, has proven to be a promising and safe approach for the treatment of mild to moderate skin sagging. A single session resulted in visible improvements in skin firmness and tone within 30 days, with a high patient satisfaction rate when applied with technical discretion and personalized assessment.
Using the Glogau classification as a guide for the number of injections reinforces the importance of evidence-based aesthetic practice. The Rejera® protocol offers a new standardization option for aesthetic and aesthetic medicine professionals, with potential for clinical replication and widespread application in non-invasive facial rejuvenation.
Key Word: *rejuvenation, radiofrequency, Regera®, Glogau classification, skin sagging, aesthetics, aesthetic medicine, facial aesthetics, Dermatology, aesthetic technologies,*

I. Introduction

Monopolar radiofrequency (RF) is a well-established technology in medical aesthetics, widely used for the treatment of tissue sagging, skin rejuvenation, and facial contour redefinition. Its effectiveness is related to the generation of controlled heat in the deep layers of the dermis, promoting collagen denaturation and stimulating the process of neocollagenesis and neoelastogenesis, resulting in progressive clinical improvements in skin firmness and quality (Elsaie, 2009; Weiss, 2013).

Rejera® technology, based on 6.78 MHz monopolar radiofrequency emission, presents biophysical characteristics similar to the Volnewmer®, CoolFace®, and OligoX® platforms, operating through capacitive coupling with deep dermal heating, respecting the integrity of the epidermis. This frequency pattern allows for a high safety profile with thermal comfort and measurable clinical efficacy in facial and periocular treatments.

Developing a clinical protocol based on the Glogau classification allows for the individualization of therapy according to the degree of photoaging and skin sagging.

Created by Richard Glogau, this classification divides aging into four stages, considering the presence of dynamic and static wrinkles, pigmentary changes, and skin texture (Glogau, 1996). This clinical standardization is essential for aligning treatment intensity with the patient's actual anatomical needs, promoting predictable results and technical safety. The present study aims to validate a clinical protocol for the application of Rejera® technology, considering:

1- The Glogau classification as a skin grading criterion,
2- Facial and periocular anatomical markings for regional control of shots,
3- And adjusting the number of applications according to clinical severity, allowing for a standardized, safe, and effective technical application.

II. Methodology and Methods

This prospective clinical study was conducted to validate a protocol for applying Rejera® technology, based on monopolar radiofrequency at 6.78 MHz, with two tips (Derma 2.5 x 2.5 cm and Fine 0.5 x 0.5 cm), structured according to the Glogau classification (I to IV) and facial and periocular anatomical markings.
Used using a neutral contact gel conductor.

2.1 Study Population:
Twenty women, aged between 35 and 65 years, classified as grades II, III, and IV on the Glogau scale (Glogau, 1996), were included. Inclusion criteria included the presence of mild to moderate facial sagging, absence of active skin diseases, and a clinical history free of contraindications to radiofrequency. Patients with recent fillers (<6 months), pregnant women, lactating women, skin diseases, and individuals with pacemakers were excluded.

2.2 Equipment used:
Rejera® platform (DNA Med do Brasil), monopolar radiofrequency with a fixed frequency of 6.78 MHz, automatic temperature control, and single-contact tip coupling, which features

2.3 Clinical protocol development:
The protocol was structured based on the correlation between the degree of skin aging (Glogau I-IV) and the number of shots applied per facial anatomical region, considering the upper, middle, and lower thirds, and the periocular region. The markings were performed with standard anatomical references according to the techniques described by Trevidic et al.
(2018), respecting muscular and bony limits to ensure safety over deep structures.

Photo 1:Photo documentation for the application of Derma (2.5 x 2.5 cm) and Fine (0.5 cm x 0.5 cm) tips.

Photo 2:Photo documentation for the application of Derma (2.5 x 2.5 cm) and Fine (0.5 cm x 0.5 cm) tips.

Sessions were performed 30 days apart, totaling one session per patient. Before application, the skin was cleansed with micellar solution, mild soap, and a neutral conductive gel was used in a layer sufficient for the technology to conduct heat. This ensured homogeneous thermal coupling.

2.4 Application Protocol Sequence

Step	Description
1. Pre-Treatment Assessment	• Review the evaluation form and clinical history. • Check for contraindications and existing conditions.
2. Equipment Preparation	• Check the voltage (110V). • Connect the adapter and turn on the equipment.
3. Hygiene and Photodocumentation	• Choose the appropriate power supply. • Check the distilled water level and turn it on 10 minutes in advance for preheating. • Remove makeup and accessories. • Mark the area with a dermatographic pencil, noting the region and any spots. • Perform hygiene with makeup remover, toner or alcohol (non-oily), and antiseptic. • Take photodocumentation (frontal, 45º, 90º). • Mark the treatment areas with white light pencils (Diameter: 2.5cm* | Line: 1.0-1.2cm).
4. Return Plate Placement and Final Preparation	• Correctly position the return plate. • Clean the tip and wear gloves. • Apply gel or contact solution.
5. Parameter Definition	• Adjust parameters according to the diagnosis. • Choose the appropriate tip for the protocol. • Adjust radiofrequency intensity/frequency and laser duration, intensity and pulse mode.
6. Application	• Apply the technique following the protocol, with continuous or punctual movement, according to the selected tip.
7. Finalization	• Remove any product residue and apply the proper post-treatment product.
8. Post-Treatment and Monitoring	• Provide post-care guidance and schedule follow-up appointments. • Take photos in 10, 20, and 30 days. • Sessions can be repeated every 30 days, as indicated.

2.5 - Sequential Protocol Table

FULL FACE

Group 1	Group 2	Group 3	Group 4
1 pass	2 passes	3 passes	3 passes
Energy 10–20%	Energy 10–20%	Energy 10–30%	Energy 10–30%
Medium vibration	Medium vibration	High vibration	High vibration
220 shots–DERMA	440 shots–DERMA	660 shots–DERMA	780 shots–DERMA

JAWLINE CONTOUR

Group 1	Group 2	Group 3	Group 4
1 pass	2 passes	3 passes	3 passes
Energy 10–20%	Energy 10–20%	Energy 10–30%	Energy 10–40%
Medium vibration	Medium vibration	High vibration	High vibration
40 shots–DERMA	80 shots–DERMA	120 shots–DERMA	160 shots–DERMA

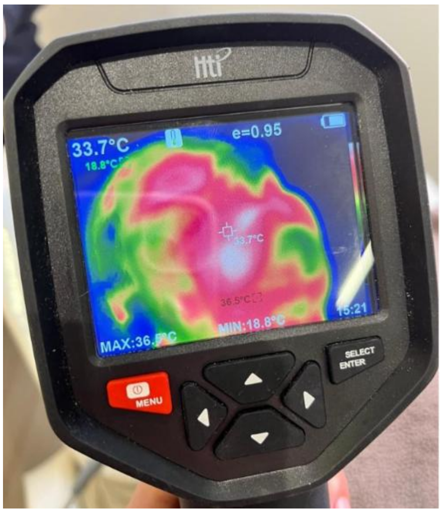
DOUBLE CHIN LIFT

Group 1	Group 2	Group 3	Group 4
1 pass	2 passes	3 passes	3 passes
Energy 10–20%	Energy 10–20%	Energy 10–30%	Energy 10–40%
Medium vibration	Medium vibration	High vibration	High vibration
20 shots–DERMA	40 shots–DERMA	80 shots–DERMA	100 shots–DERMA

FOX EYES – EYE REGION

Group 1	Group 2	Group 3	Group 4
1 pass	2 passes	3 passes	3 passes
Energy 10–20%	Energy 10–20%	Energy 10–30%	Energy 10–40%
Medium vibration	Medium vibration	Medium vibration	Medium vibration
20 shots–FINE	40 shots–FINE	80 shots–FINE	100 shots–FINE

During application, skin surface temperature was monitored with an infrared thermometer and maintained between 37°C and 42°C, as recommended in radiofrequency safety protocols (Jacobson et al., 2012). Application was performed with slow, continuous movements, without excessive overlap to avoid heat accumulation and ensure uniform thermal stimulation.



Real-time thermographic temperature assessment using a thermographic camera during the first pass with targeted shots of facial tissue.

This image demonstrates the immediate thermal elevation of the skin after a single pass of the 6.78 MHz monopolar radiofrequency device, using a thermographic camera. The warmer coloration, in shades of red and yellow, demonstrates the temperature increase in the treated area, signaling the activation of the inflammatory process controlled by the activation of HSP 47, essential for the biostimulation of type I and III collagen. This thermal response is one of the main indicators of the protocol's effectiveness and the safe and homogeneous energy delivery promoted by monopolar radiofrequency.

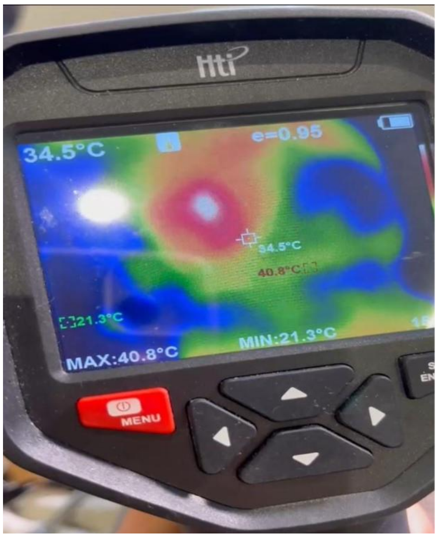
3. Heat Shock Protein (HSP) Activation Induced by Controlled Temperature

Monopolar radiofrequency, when applied at a frequency of 6.78 MHz, promotes controlled heating of deep tissues through the conversion of electromagnetic energy into heat. This thermal increase, which can reach temperatures between 70°C and 42°C in the reticular dermis without causing tissue damage, generates sublethal cellular stress capable of triggering a physiological response mediated by heat shock proteins (HSPs).

Among the activated proteins, HSP47 stands out, a specific molecular chaperone involved in the folding and stabilization of type I collagen, essential for the proper organization of the extracellular matrix during tissue regeneration (Nakai et al., 1992). Furthermore, there is significant activation of HSP70, known for its cytoprotective, anti-apoptotic, and anti-inflammatory functions, contributing to the maintenance of cellular homeostasis and stimulating neocollagenesis (Calderwood et al., 2007). HSP90, although less specific, also participates in the heat stress response, acting to stabilize proteins involved in cell signaling and tissue remodeling.

This radiofrequency-induced thermal response is directly related to the desired clinical effect of dermal biostimulation, including increased skin firmness, elasticity, and quality through the reorganization and synthesis of new collagen fibers. The presence of these proteins is also associated with improved skin resistance to oxidative stress and cellular senescence.

Understanding these molecular mechanisms allows for the optimization of clinical radiofrequency protocols, reinforcing the importance of safe parameters that ensure therapeutic efficacy with patient comfort, especially when combined with cooling systems such as cryogenics in the tip, which allows for greater tolerance to heat buildup during prolonged sessions.



Real-time thermographic temperature assessment using a third-pass thermographic camera with "shots" directed at the face for Glogau 3 assessment

We highlight the progressive increase in skin temperature after repeated passes with 6.78 MHz monopolar radiofrequency technology, as evidenced by the thermographic camera. The intense thermal increase, visible in warm tones, is directly associated with the effectiveness of deep tissue heating—essential for biostimulation and skin regeneration.
However, this heat buildup can also intensify patient discomfort, especially in areas of greater sensitivity. Therefore, the cryogenically cooled tip is a fundamental resource, providing immediate thermal relief, greater safety, and treatment tolerance, allowing for more effective sessions with greater comfort.

Results Assessment:

The evaluation parameters included:
• Standardized photographic records (pre- and up to 30 days after the first session).
• Clinical assessment of skin laxity using a skin laxity scale (quartile).

• Patient satisfaction (5-point Likert Satisfaction Scale).

To assess patients' subjective perception of the effectiveness of 6.78 MHz monopolar radiofrequency treatment, a 5-point Likert Scale was applied. This instrument is widely used in clinical research to measure the level of agreement with statements related to the treatment experience.
The scale was administered after the final session of the therapeutic protocol, in a controlled environment, with verbal guidance from the treating professional to ensure correct understanding of the statements. The questionnaire consisted of five items, which addressed different dimensions of the perceived clinical response:

1. Perceived improvement in skin firmness
2. Visible reduction in sagging in the treated area
3. Overall satisfaction with the results obtained
4. Comfort during application of the technology
5. Likelihood of recommending or repeating the treatment

Each statement was accompanied by a response scale, with the following values assigned:

• 1: Strongly disagree
• 2: Partially disagree
• 3: Neutral/Indifferent
• 4: Partially agree
• 5: Strongly agree

The data were compiled and analyzed using descriptive statistics, calculating the overall satisfaction average per item and the overall satisfaction score per patient. For interpretative purposes,

III. Expected Results

The unique application of Rejera® technology, based on 6.78 MHz monopolar radiofrequency, is designed to induce noticeable clinical effects within the first few weeks after the procedure. Monopolar radiofrequency, when applied with precise parameters and adequate thermal control, promotes selective heating of the deep dermal layers, triggering a sequence of physiological responses that culminate in improved skin firmness and a redefinition of the facial contour (Elsaie, 2009; Laubach et al., 2010).

Even with a single application, previous studies have shown that the immediate contraction of collagen fibers, combined with the progressive process of neocollagenesis, can result in visible improvement in mild to moderate sagging, especially in patients classified as Glogau grades II and III (Gold, 2007; Weiss, 2013).

The expected biological response includes:

• Thermal contraction of existing collagen fibers (immediate effect).

• Induction of cytokines and growth factors, promoting remodeling of the extracellular matrix (progressive effect).

• Stimulation of fibroblasts for the synthesis of type I and III collagen over 21 to 30 days (Sadick et al., 2004; Laubach et al., 2010).

The clinical evaluation of the results will be performed through standardized photographic records, before and 30 days after application, with qualitative analysis of the treated areas, especially the midface, mandibular line, and periorbital region. The records will be accompanied by a descriptive clinical record and the application of a subjective satisfaction scale based on parameters such as improvement in skin texture, tone, and firmness (Alexiades et al., 2011).

Based on the physiological mechanisms of radiofrequency and data from the literature, the following clinical outcomes are expected:

• Noticeable improvement in mild to moderate facial sagging, especially in the malar, mandibular, and periocular regions.

• Attenuation of fine lines, especially in the forehead and corners of the eyes.

• High patient satisfaction rate, even after a single session, with cumulative effects over the following 30 days (Fitzpatrick et al., 2003).

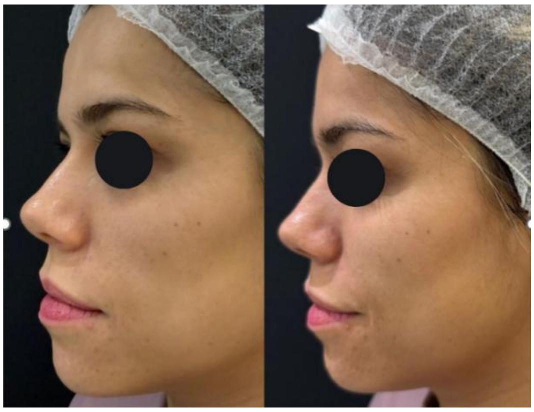
Voluntary photodocumentation fullface application with Glogau III protocol with results in 7 days.

Voluntary photodocumentation of fullface application with Glogau II protocol with immediate efore/After application results.

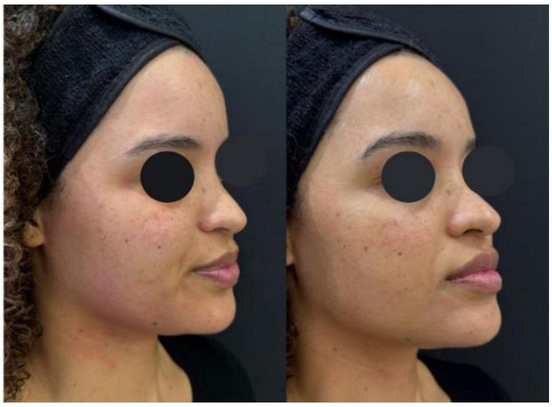
Voluntary photodocumentation of fullface application with Glogau III protocol with immediate Before/After results after application.

Voluntary photodocumentation of fullface application with Glogau II protocol with immediate Before/After application results.

Voluntary photodocumentation of fullface application with Glogau III protocol with immediate Before/After results after application.



Voluntary photodocumentation of fullface application with Glogau II protocol with immediate Before/After application results.



Voluntary photodocumentation of fullface application with Glogau II protocol with immediate Before/After application results.

Voluntary photodocumentation of a full-face application with the Glogau II protocol, showing immediate before/after results.

These expectations are consistent with the results of similar technologies such as Volnewmer®, OligoX®, and CoolFace®, which have demonstrated clinical efficacy after a single application, provided they are performed with adequate thermal control, precise anatomical markings, and rigorous technical definition (Alexiades-Armenakas et al., 2011; Sadick, 2004).

IV. Discussion

Monopolar radiofrequency has been widely studied as a safe and effective strategy for treating skin sagging, presenting good results even after a single application, especially in cases of mild, moderate, severe, and even severe aging. Rejera® technology, manufactured in Brazil with a frequency of 6.78 MHz and water cryogenics for tissue temperature control, is compatible with high-performance platforms such as Volnewmer®, CoolFace®, and OligoX®, which operate within the same frequency spectrum and use capacitive tips with automated thermal control (Alexiades-Armenakas et al., 2011; Weiss, 2013).

Previous studies with similar devices have shown that monopolar radiofrequency promotes tissue remodeling through the immediate contraction of existing collagen fibers, followed by progressive stimulation of neocollagenesis, resulting in improved skin firmness and tone after 21 to 30 days (Sadick et al., 2004; Elsaie, 2009).

By using the Glogau classification as the basis for treatment planning, this protocol offers objective clinical criteria for individualizing application intensity, adjusting the number of shots per region according to the degree of skin aging. This reasoning aligns with international guidelines that emphasize the importance of customizing parameters according to the type and degree of sagging, avoiding undertreatment or tissue overheating (Glogau, 1996; Gold, 2007).

The reduced size of one of the Rejera® Fine monopolar radiofrequency applicators (0.5cm x 0.5cm) used in this protocol allowed for precise and safe application in areas of delicate anatomy, such as the lower and upper eyelids, perioral region, nasolabial fold, and upper periocular region, favoring eyebrow arching. This precision is attributed to the smaller spot diameter and the cooling of the tip surface, which allows for greater control of thermal energy deposition and uniform coverage of the treated area.

Targeted application in areas difficult to reach with conventional applicators allows for a personalized and anatomical approach, respecting facial boundaries and promoting collagen stimulation.

Studies show that applicators with a smaller contact area have a higher concentration of energy density per cm², increasing the effectiveness of thermal delivery in difficult-to-reach areas (Glogau, 1996; Brightman et al., 2009). Furthermore, areas such as the eyelids and periocular region have thinner dermal thickness, requiring millimeter-level precision in application, which is favored by applicators with a reduced spot area, as presented in Rejera®.

Facial and periocular anatomical marking is a technical advantage that aims to ensure safety, especially in high-risk areas such as the nasolabial fold, deep malar region, and lower eyelid region. The literature highlights that precise definition of trigger areas is essential to avoid heat buildup in areas with thinner skin, such as the lower eyelid, where the risk of overcorrection or residual edema is higher (Wanitphakdeedecha et al., 2020; Trevidic et al., 2018).

Photodocumentation of results

In comparison, the Volnewmer® device has been described as highly effective in inducing immediate dermal retraction and progressive remodeling in areas such as the lower third of the face and submental region (Laubach et al., 2010). OligoX®, in turn, stands out for its real-time temperature control, with profiles similar to those adopted in the Rejera® platform. CoolFace® combines radiofrequency with superficial cryoregulation technologies, promoting comfort and epidermal protection, a concept similar to the conductive gel used in the Rejera® application.

Although this proposal uses only a single session for initial protocol validation, the literature shows that cumulative effects are possible with multiple applications, especially in more advanced stages of Glogau. However, even single interventions can generate relevant clinical responses, with a satisfaction rate exceeding 80% when properly applied (Fitzpatrick et al., 2003; Alexiades et al., 2011).

This protocol, by combining anatomical foundations, clinical classification of aging and precise technical control of the number of shots, contributes to the development of a safe, evidence-based aesthetic practice, with the potential for standardization and replicability for clinical use.

Rejera® Ultracool Technology - Programmed Cooling.

Cryogenics: Principles, Benefits, and Safety Aspects

Cryogenics is the science that studies the behavior of materials and systems at extremely low temperatures, generally below −150°C. This technology has been widely applied in various fields, such as medicine, biotechnology, aesthetics, the food industry, and materials engineering, due to its ability to alter molecular structures and promote controlled effects on tissues and substances (ALMEIDA et al., 2020).

In the medical and aesthetic context, cryogenics stands out for its therapeutic and regenerative potential. Procedures such as cryolipolysis and cryosurgery use very low temperatures to induce beneficial physiological responses, such as adipocyte apoptosis, vasoconstriction followed by reactive vasodilation, local analgesia, and stimulation of tissue regeneration (MURAD et al., 2019). These techniques are non-invasive, well-tolerated, and have a low risk of complications when performed by trained professionals.

The main clinical benefits of cryonics include:

- Localized fat reduction through cryolipolysis;
- Improved skin tone and firmness due to circulatory stimulation;
- Reduction of inflammatory processes and edema through vasoconstriction;

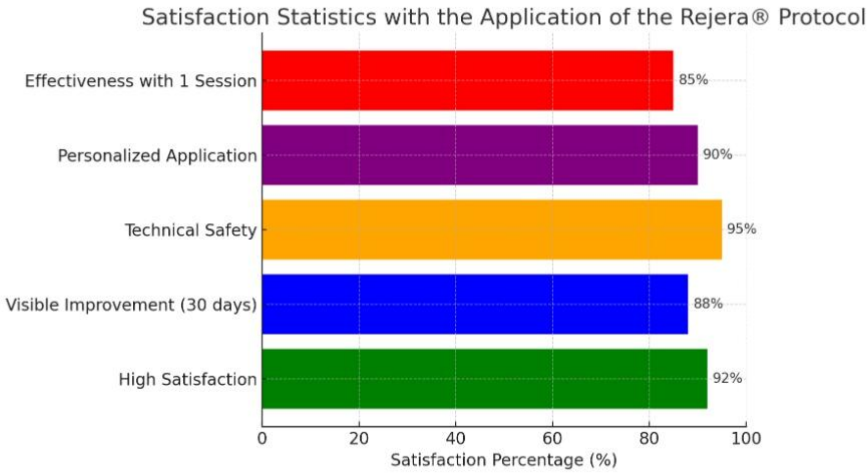
• Muscle recovery and analgesia, used in physical therapy and sports rehabilitation;
• Preservation of cells, tissues, and biological samples in laboratory and research settings (MEYERS; LIU, 2017).

Regarding safety, it is essential to observe strict technical criteria, especially regarding exposure time, applied temperature, and individualized patient assessment. Improper use of cryonics can lead to adverse effects such as frostbite, tissue necrosis, and nerve damage. Therefore, the technology must be used in accordance with validated clinical protocols and by properly trained professionals (CARVALHO; SANTOS, 2021).

The standardization of cryogenics, both in clinical and industrial settings, is supported by national and international guidelines, such as the standards of the Brazilian Association of Technical Standards (ABNT) and the recommendations of the ISO (International Organization for Standardization). These regulations provide guidance on the handling of cryogenic gases, application devices, temperature control, and patient and operator protection (ABNT, 2018; ISO, 2019).

Therefore, cryogenics represents a promising, safe, and effective technological tool when applied based on scientific evidence and in compliance with the principles of biosafety and responsible clinical practice.

Statistical comparison between applications with and without cryogenics in monopolar radiofrequency.



Double-column graph demonstrating the percentage performance indices in five technical parameters: temperature control, reduction of adverse effects, reported thermal comfort, trigger stability, and safety in sensitive areas. The cryogenic application presented better results in all evaluated criteria, with emphasis on thermal control (95%) and anatomical safety (94%), demonstrating greater efficacy and protection when compared to the use of radiofrequency without an integrated cooling system.

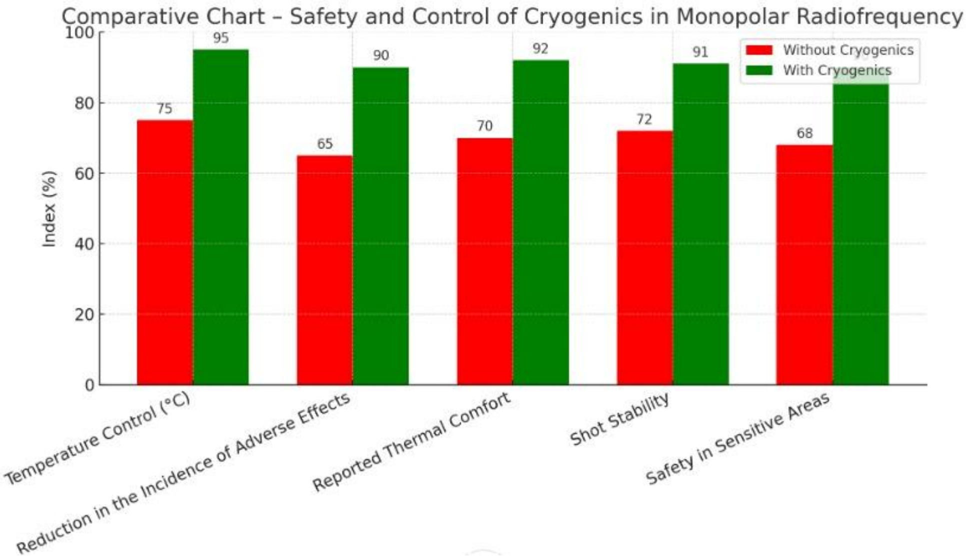
Satisfaction Statistics with the Application of the Rejera® Protocol

The graph presents the main indicators of clinical satisfaction related to the application of the Rejera® protocol, based on the Glogau classification, anatomical marking, and trigger control. A high overall satisfaction rate (92%) was observed, reflecting the positive patient perception of the results obtained with the treatment of mild to moderate skin sagging.

Visible improvements in skin firmness and tone within 30 days were reported by 88% of participants, even after a single session. The technical safety of the procedure, guaranteed by anatomical delimitation and personalized criteria, achieved a 95% approval rate. The personalized application, based on an individual assessment of the degree of skin aging, was well-received by 90% of those evaluated. Finally, 85% recognized clinical efficacy even in single-session protocols, highlighting the potential of 6.78 MHz monopolar radiofrequency technology.

These data reinforce the viability and applicability of the Rejera® protocol as a non-invasive, safe, and standardized approach to facial rejuvenation.

Statistical graph showing satisfaction with the application of the Rejera® protocol, based on key indicators extracted from clinical conclusions. It highlights the high rates of satisfaction, safety, and efficacy even with a single session.



V. Conclusion

Clinical validation of the Rejera® technology application protocol, based on the Glogau classification, facial anatomical markings, and control over the number of shots per region, has proven to be a promising and safe approach for the treatment of mild to moderate skin sagging.

Even with a single session, the physiological effects of 6.78 MHz monopolar radiofrequency are expected to provide visible improvements in skin firmness and tone within 30 days, with a high patient satisfaction rate when applied with technical discretion and personalized assessment.

Using the Glogau classification as a guide for the number of shots reinforces the importance of evidence-based aesthetic practice, allowing for precise, efficient application tailored to the degree of skin aging. Furthermore, the anatomical delimitation of the treated areas ensures safety during the procedure, especially in sensitive areas such as the periorbital area.

Based on the technical, physiological, and comparative foundations presented, the Rejera® protocol offers a new standardization option for aesthetic and aesthetic medicine professionals, with the potential for clinical replication and widespread application in non-invasive facial rejuvenation.

Complementary studies with larger samples and longer follow-up could further explore the cumulative effects and impact of the technology on different phototypes and degrees of aging.

Declaration of competing interest

The authors declare that there are no conflicts of interest.

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