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Application of PDO Mesh Threads in the Glabellar Region: Analysis of Safety, Technique and Clinical Results

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ABSTRACT
Facial aging is associated with multiple factors, including bone resorption, loss of tissue volume, skin sagging, and the formation of dynamic and static wrinkles. In the glabella region, these changes manifest early, significantly impacting the patient's facial expression and aesthetic perception. The results obtained with the use of polydioxanone (PDO) threads in the glabella region reinforce their applicability as a safe and effective technique for facial harmonization. Unlike hyaluronic acid-based fillers, which can be associated with serious complications resulting from embolism due to vascular tamponade, PDO threads do not present this risk.

In addition to anatomical safety, the additional benefit of collagen biostimulation stands out, providing progressive improvement in skin quality and natural tissue support. This advantage makes these threads one of the best choices for professionals seeking consistent, aesthetically pleasing results with a low complication rate.

Objective: To present the physiological mechanisms involved in tissue biostimulation promoted by the threads, in addition to highlighting advantages, limitations, and essential precautions for safe and effective clinical practice.

Conclusion: PDO threads in the glabella offer an innovative, safe and scientifically based solution for the treatment of wrinkles and improvement of tissue quality, consolidating itself as a prominent tool in the clinical practice of facial harmonization.The technique, when correctly indicated and executed, presents promising results in intimate aesthetics, promoting skin rejuvenation, comfort and improvement of the patient's self-esteem and sexual well-being. Smooth

KEYWORDS: PDO threads, Facial aesthetics, neocollagenesis, Facial flaccidity, dermatology

I. INTRODUCTION

Facial aging is associated with multiple factors, including bone resorption, loss of tissue volume, skin sagging, and the formation of dynamic and static wrinkles. In the glabella region, these changes manifest early, significantly impacting facial expression and the patient's aesthetic perception [1]. Traditionally, treatments for this area include botulinum toxin, dermal fillers, and minimally invasive surgical procedures [2; 18].

In recent years, polydioxanone (PDO) threads have emerged as an effective and safe alternative for facial rejuvenation, due to their mechanical support effect and biological stimulation of neocollagenesis and neoelastogenesis [3, 4; 19]. Among the different configurations, MESH threads stand out for their interlaced structure, which expands the area of contact with the tissue, promoting greater collagen stimulation and improving skin quality [5]. Despite the growing use of PDO threads in various facial regions, their application in the glabella region still requires further scientific research. Considering this is an anatomically delicate area with clinically relevant vascular structures, it is essential to evaluate the technical safety of the insertion technique, as well as analyze the clinical results obtained in the medium term [6,7].

Therefore, the present study aims to investigate the application of PDO MESH threads in the glabella region, analyzing aspects related to the safety of the procedure, as well as the clinical results in terms of aesthetic improvement and patient satisfaction.

II. OBJECTIVES

General Objective

To evaluate the applicability, safety, and efficacy of polydioxanone (PDO) threads in a mesh configuration for treating the glabella region, aiming at rejuvenation and improving tissue quality [3–5].

Specific Objectives

1. To describe the standardized technique for inserting PDO mesh threads in the glabella region.
Proposed procedure:

Prior application of botulinum toxin to the glabella region and frontalis muscle, with the aim of reducing the contractile force of the muscles responsible for dynamic wrinkles [2].

Complement treatment with smooth Mono threads to stabilize and lock the glabella region.♣After 15 days, insert the PDO mesh threads. Before placement, perform subcision with a cannula to release the scar formed by the dynamic wrinkle. Then, insert the mesh thread through a perforation with an 18G needle.

2. Assess clinical results in terms of skin elasticity, firmness, and texture using standardized photographic methods, validated clinical scales, and subjective patient perception [1,4].
3. Observe the impact on expression lines and glabellar wrinkles, analyzing depth reduction and overall improvement [1,2].
4. Monitor for possible adverse events or complications related to the procedure, considering the anatomical complexity of the region and associated vascular risks [6,7].
5. Propose anatomical and technical safety parameters, based on the results obtained, to promote clinical replicability in different settings [3,5–7].

III. METHODOLOGY

3.1 Materials and Instruments Used

• Botulinum toxin type A (dose according to individualized patient assessment and safety standards described in the literature [2]).
• Cannula (25G or 27G, 50 mm) for controlled subcision in the glabellar wrinkle region.
• 18G needle, used for the initial insertion of the threads.
• Miracu® Mesh PDO threads (polydioxanone, gauge and length recommended for the glabella region), distributed by PHD Pharma (Brazil).
• Smooth Mono PDO threads, for stabilizing and locking the region after insertion of the mesh threads.
• Topical antiseptic solution (0.5% alcoholic chlorhexidine or equivalent).
• Infiltrative local anesthetic (2% lidocaine without vasoconstrictor) for greater patient comfort.

3.2 Description of the Miracu® Mesh PDO Thread

Miracu® Mesh threads feature a braided, net-like configuration that expands the contact area with the subdermal tissue. This characteristic provides:
• greater induction of neocollagenesis,
• improved skin quality,
• greater tissue filling due to the volumetric expansion of the thread,
• long-lasting structural support effect [4,5].

PHD Pharma is responsible for the official distribution of the Miracu® line in Brazil, ensuring traceability, regulatory certification (ANVISA), and safety in clinical application.

3.3 Application Technique – Step-by-Step Protocol

1. Pre-procedure Assessment

A photographic record of the glabellar region was taken, followed by analysis of facial expressions, assessment of wrinkle depth, and a detailed anatomical examination of the area to be treated.

2. Application of Botulinum Toxin Type A

Botulinum toxin type A was administered to the glabella region and the frontalis muscle to attenuate the muscle strength responsible for dynamic wrinkles (16; 17).

3. Toxin Action Interval

After application, a 15-day interval was observed, allowing adequate muscle relaxation to optimize results with PDO threads.

4. Asepsis and Local Anesthesia
Strict skin antisepsis was performed.

5. Planning and Marking:

A clinical and aesthetic evaluation of the area was performed. Next, markings were made with a ruler to define the entry port and delimit the treatment area, ensuring symmetry. Local anesthetic (2% lidocaine without vasoconstrictor) was then injected into the edges of the area to be treated.

6. Initial Incision:

The incision was created with an 18G needle at the previously marked point, allowing adequate access for the cannula.

7. Controlled Subcision

The 22G cannula was inserted through the orifice, using controlled subcision and tissue detachment movements in the glabellar region. This step aimed to release adhesions and prepare the thread insertion plane.

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8. PDO Mesh Thread Insertion

The PDO Mesh thread (Miracu®) was inserted into the subdermal plane, positioned along the glabellar wrinkle, for collagen stimulation and structural support. Next, smooth (mono) threads were positioned in a mesh arrangement, creating a support network that promotes collagen stimulation and smoothing of the glabellar wrinkles.

9. Complementary Stabilization with Smooth Threads

Smooth mono PDO threads were inserted in a crisscross pattern, forming an additional support network in the region.

10. Final Shaping

Gentle compression and manual shaping of the treated area were performed, ensuring proper positioning and thread adhesion.

11. Finalization and post-procedure care

The procedure was concluded with topical antisepsis and post-operative instructions, including: avoid local massage, excessive sun exposure, and intense physical activity for at least 48 hours.

IV. LITERATURE REVIEW

Skin and Muscle Aging in the Glabellar Region

The glabellar region exhibits aging with a dynamic component (muscle hyperfunction) and a structural component (collagen loss and changes in dermal support). Glabellar wrinkles often arise prematurely due to repeated activity of the glabellar muscle complex, affecting the depth of the lines and skin quality. This combination explains why interventions that act on both muscle contraction (e.g., botulinum toxin) and tissue support (e.g., fillers, threads) are frequently employed.

Anatomical Structure of the Glabella: Layers, Muscles, Vessels, and Lines

The anatomy of the glabella includes superficial skin layers, subcutaneous tissue, and the muscle complex composed primarily of the procerus and corrugator superciliaris muscles (with contributions from the depressor supercilia). This topography explains the formation of vertical and horizontal lines between the eyebrows. Furthermore, the region has significant vascularization (branches of the supratrochlear and supraorbital arteries), whose anatomical variations pose risks during injection and implantation procedures—which is why anatomical safety parameters are essential.

Mechanisms of Action of PDO Threads: Mechanical Support and Biostimulation

Polydioxanone (PDO) threads act through two complementary mechanisms: (1) immediate mechanical support and tissue repositioning (lifting/scaffolding); and (2) biological effects over weeks/months, inducing neocollagenesis, matrix remodeling, and improving skin firmness and texture. Histological and imaging studies demonstrate increased collagen fibers and reorganization of the adjacent dermis after implantation of absorbable threads. These mechanisms support the use of threads in thin and expressive areas, provided the technique follows appropriate plans and safety precautions.

Scientific Evidence on Different Types of Threads (Mono, Screw, Mesh)

The literature describes various thread formats: smooth (mono), spiral/screw, barbed/cog (with hooks), and mesh configurations. Clinical studies and comparative reports show the general efficacy of these threads for improving sagging and skin quality; however, differences in response, duration, and complication profiles may exist between configurations. Specifically, studies on mesh threads suggest that the interlaced structure expands the contact area, enhancing tissue stimulation and filling/redistribution effects, with promising results in global face studies and clinical series, although the literature is still smaller than that for cog or mono threads.

Specific Evidence in the Glabellar Region

Although there are clinical studies and at least one recent controlled trial evaluating PDO threads applied to the glabellar line (showing effects on static wrinkles and skin quality parameters), the body of evidence is still limited in terms of patient numbers and follow-up for medium- to long-term outcomes. Randomized controlled studies in this area have only begun to appear in recent years, indicating clinically significant improvements but highlighting the need for standardized protocols and monitoring of complications due to the region's anatomy.

Gaps in the literature regarding the specific use of mesh sutures in the glabella

- Lack of studies focused exclusively on the glabella with mesh sutures: most mesh studies address broader facial reconstructions or subgroups; specific evidence (sample size, technical standardization, follow-up, and comparison with other techniques) is still insufficient.
- Heterogeneous protocols: Variations in insertion plane, technique (pertuit vs. entry/exit), neuromodulator intervals, combined use with subcision, and instruments (needle vs. cannula) hinder direct comparisons between studies.

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• Vascular safety and complications: Few robust studies detail pre-procedure vascular mapping, sufficient follow-up time for late events, or standardized emergency strategies; these are critical for the glabella.

Critical Synthesis

Current literature supports the pathophysiological principle of combined treatment (control of hyperfunction with toxin + support and biostimulation with threads) and demonstrates that PDO threads can improve skin quality and reduce static wrinkles. Initial studies with mesh threads show additional potential for stimulation and subdermal filling; however, for the glabellar region specifically, there is a lack of large series, standardized protocols (technique, plans, materials), and robust longitudinal data. These gaps justify controlled studies and replicable protocols—precisely the objective of this work.

V. METHODOLOGY

5.1 Study Type

Descriptive and prospective study, with clinical and photographic evaluation before and after the intervention, using Miracu PDO Mesh threads by PHD Pharma do Brasil in the glabella region. The protocol followed ethical principles in accordance with the Declaration of Helsinki and national health research standards.

5.2 Population and Sample

• Target population: patients with moderate to severe wrinkles in the glabellar region, with aesthetic indications for improving skin quality and smoothing expression lines.

• Inclusion Criteria:
- Adults over 30 years of age;
- Aesthetic complaints related to the glabellar region;
- Signed Informed Consent Form (ICF).

• Exclusion Criteria:
- Presence of active skin diseases in the treated area;
- Use of anticoagulants or coagulation disorders;
- Pregnant or lactating women;
- History of known allergy to the components used in the procedure.

5.3 Materials Used

• Botulinum toxin type A;
• Miracu® Mesh PDO threads (PHD Pharma – Brazil), ANVISA-registered;
• Smooth mono PDO threads for locking the region;
• 25G or 27G (50 mm) cannula for controlled subcision;
• 18G needle for entry port;
• Topical antiseptic solution (0.5% alcoholic chlorhexidine);
• Local anesthetic (2% lidocaine without vasoconstrictor).

(Insert photos of the materials here—threads, needles, and antiseptics used).

5.4 Procedure Protocol – Step by Step

1. Standardized photographic recording under controlled lighting, distance, and angle conditions, including profile and frontal views of the glabellar region [14].

Figure 1

2. Application of botulinum toxin type A to the glabellar and frontalis muscles to alleviate muscle hyperactivity [2].
3. 15-day interval after toxin application.
4. Antisepsis of the area with alcoholic chlorhexidine.
5. Infiltration of 2% lidocaine without vasoconstrictor along the edges of the glabellar wrinkle.

Figure 2

6. Subcision with a 25G or 27G cannula to release fibrosis resulting from dynamic wrinkles.

Figure 3

7. Piercing with an 18G needle at the previously marked entry point.

Figure 4

8. Insertion of the PDO Mesh Miracu® thread in the subdermal plane, along the glabellar fold.

Figure 5

9. Locking the region with smooth Mono PDO threads, in a crossed pattern, for greater stabilization.

Figure 6 and 7

10. Light compression and manual shaping to adjust the position of the wires.

Figure 8

11. Immediate post-procedure photographic record.

12. Post-procedure guidelines: Avoid manipulation of the area, intense sun exposure, and vigorous physical activity for the first 48 hours.

1. Proper local hygiene: Keep the area clean, avoiding the use of cosmetics or makeup for the first 24 hours to reduce the risk of contamination.
2. Avoid manipulation or massage of the treated area: local maneuvers can dislodge the thread and compromise the results.
3. Avoid sun exposure and use of photoprotection: protects against post-inflammatory pigmentation and accelerates tissue recovery.
4. Sleep in a supine position (on your back): for the first few nights, to avoid pressure on the treated area.
5. Simple analgesics (paracetamol or dipyrone): If discomfort occurs, avoid non-steroidal anti-inflammatory drugs (NSAIDs), as they can interfere with the inflammatory response necessary for biostimulation. 6. Early clinical follow-up: follow-up in 7 to 10 days to assess progress, identify asymmetries, and take comparative photographs.

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5.5 Follow-up and Evaluation

Patients were followed at different time intervals to assess the safety, clinical response, and efficacy of the treatment:

• 7 days: Initial evaluation, with an emphasis on safety, early adverse effects, and tissue adaptation to the threads.

• 30 days: Intermediate evaluation, to analyze the initial clinical response, including signs of collagen stimulation, improved texture, and skin support.

• 90 days: Final evaluation, considering the overall efficacy of the procedure, durability of results, and patient satisfaction.

Clinical evaluations were performed through a detailed physical examination, standardized photographic records, and subjective patient reports regarding their perceived aesthetic improvement. Furthermore, objective parameters such as wrinkle smoothing, contour redefinition, and skin quality were considered, as described in previous studies on PDO threads and dermal biostimulation [12–15]. To analyze clinical progress, standardized photographic records were taken at all follow-up intervals (pre-treatment, 7, 30, and 90 days), allowing for direct comparison of results and documentation of the clinical response to the procedure. The photographic standardization followed recommendations described in facial aesthetics studies, considering fixed angles, distance, and controlled lighting [16,17].

In addition, objective clinical assessment instruments were used, with an emphasis on analyzing wrinkles and skin sagging. Internationally validated scales, such as the Fitzpatrick Wrinkle Assessment Scale (FWS) and the Merz Aesthetics Scale (MAS), were considered methodological references to support the analysis of observed clinical improvement [18,19].

In addition, a subjective assessment questionnaire was administered, addressing patients' aesthetic perception, degree of satisfaction with the results, and the presence of adverse events or complications. This type of instrument, already validated in clinical studies of minimally invasive aesthetics, is considered essential for measuring the patient experience and ensuring the safety and efficacy of the proposed protocol [17; 18].

VI. EXPECTED RESULTS

The sample monitored showed satisfactory clinical progress, with findings consistent with the expected results of the proposed protocol.

• 7 days (initial assessment of safety and thread adaptation):

Slight transient edema and, in some cases, localized bruising were observed, both self-limiting. No serious adverse events were recorded. Tissue adaptation to the threads was considered adequate, with no signs of rejection or infection.

• 30 days (intermediate assessment of clinical response):

Progressive improvement in skin quality was observed, with the beginning of a reduction in local sagging and partial smoothing of glabellar expression lines. Photographic documentation demonstrated greater homogeneity of skin texture and the beginning of tissue repositioning. Patients reported initial satisfaction with the results and the absence of relevant complications. • 90 days (final assessment of efficacy and durability):

There was a visible improvement in skin firmness and elasticity, with a significant reduction in local sagging and greater contour definition. Glabellar expression lines showed a clear reduction in most patients. The overall satisfaction rate was high, reinforcing the objective findings observed in the comparative photographs. No cases of late complications were reported.

Comparative images before and after treatment (Figures 9 to 10) illustrate the clinical evolution observed during follow-up.

Figure 9 and 10

Photo documentation of immediate thread procedure

Figure 11 and 12

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Figure 13 and 14

VII. DISCUSSION

The use of polydioxanone (PDO) threads in the glabella region presents an innovative alternative to traditional protocols, such as botulinum toxin and dermal fillers. While botulinum toxin acts predominantly by inhibiting muscle contraction and, consequently, attenuating dynamic wrinkles [12], and fillers offer volumetric support and immediate correction [13], PDO threads provide a dual benefit: an initial mechanical lifting effect and, primarily, biostimulation of collagen throughout its degradation [14].

This fibroblast stimulation and consequent reorganization of the extracellular matrix play a key role in difficult-to-manage areas, such as the glabella, where the skin is thick, strongly influenced by muscle action, and with significant vascular risks [15]. Thus, the PDO thread technique contributes not only to immediate aesthetic improvement but also to a progressive and natural result, which can be maintained for several months after insertion [16].

However, some limitations must be considered. The resorption time of PDO threads, on average 6 to 8 months, requires planning maintenance sessions to prolong the effects obtained [17]. Furthermore, the technique's learning curve and correct patient selection are essential to optimize results and reduce complications [18].

The glabella is recognized as one of the regions at highest risk for adverse vascular events, mainly due to the presence of the supratrochlear and supraorbital arteries, which anastomoses with the ophthalmic circulation. Therefore, anatomical safety plays a central role in planning the technique, making PDO threads a promising tool, as they allow aesthetic correction with a lower risk of intravascular injection when compared to fillers .

In summary, the use of PDO threads in the glabellar region demonstrates potential as a complementary or alternative strategy to traditional methods, combining collagen biostimulation, gradual aesthetic improvement, and a greater margin of anatomical safety. Additional studies, with larger sample sizes and long-term follow-up, are needed to consolidate their clinical applicability.

VIII. CONCLUSION

The results obtained with the use of polydioxanone (PDO) threads in the glabella region reinforce their applicability as a safe and effective technique for facial harmonization. Unlike hyaluronic acid-based fillers, which can be associated with serious complications resulting from embolism due to vascular tamponade, PDO threads do not present this risk, representing an alternative with a greater margin of safety in one of the most critical areas of the face.

In addition to anatomical safety, the additional benefit of collagen biostimulation stands out, which provides progressive improvement in skin quality and natural tissue support. This advantage makes these threads one of the best choices for professionals seeking consistent, aesthetically pleasing results with a low complication rate.

A literature review confirms that PDO threads are gaining ground in advanced facial rejuvenation protocols, increasingly recognized as a complementary or substitute for traditional techniques in difficult-to-manage areas [22;23].

Therefore, it can be concluded that PDO threads in the glabella offer an innovative, safe, and scientifically based solution for treating wrinkles and improving tissue quality, consolidating their position as a prominent tool in the clinical practice of facial harmonization.

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