Facial Lifting with Polydioxanone Threads – Methods and Results

Lifting facial com fios de polidioxanona – Métodos e resultados

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Abstract

Advances in cosmetology and aesthetic medicine techniques led to the most common and effective technique for facial rejuvenation, i.e., facial lifting using polydioxanone (PDO) suture threads. Therefore, this study aims to describe the main characteristics, methods, and facial rejuvenation outcomes of the facial lifting technique using PDO threads. The study followed an integrative literature review design, and data was collected from two electronic libraries: Virtual Health Library (BVS) and PubMed (United States National Library of Medicine). The articles selected were published between 2019 and 2024. The database search, per the defined descriptors, initially identified 53 articles, of which 44 from the VHL database and 9 from the PubMed database, for evaluation in the screening stage. After the article screening process, observing the pre-established inclusion and exclusion criteria, 7 articles compatible with the research topic were selected. The study demonstrated that the application of polydioxanone threads is effective in facial rejuvenation and, despite a relatively low complication rate, the procedure can be combined with other aesthetic procedures to enhance its effects.

Keywords

- aesthetics
- cosmetic techniques
- polydioxanone
- rejuvenation
- rhytidoplasty

Resumo

Devido ao avanço nas técnicas de cosmetologia e medicina estética, o uso de fios de sustentação facial (*lifting* facial) através de fios de polidioxanona (PDO) é o mais usual e eficaz para o rejuvenescimento facial. Diante disso, este estudo tem como objetivo descrever as principais características, métodos e resultados obtidos para o rejuvenescimento facial em relação à técnica *de lifting* facial com a utilização de fios de polidioxanona (PDO). O delineamento aplicado ao estudo foi de revisão integrativa da literatura. Os dados foram coletados em duas bibliotecas eletrônicas: Biblioteca Virtual em Saúde (BVS) e PubMed (Biblioteca Nacional de Medicina dos Estados Unidos). A seleção foi de artigos publicados no período de 2019 a 2024. A pesquisa realizada nas bases de dados, de acordo com os descritores definidos, identificou inicialmente 53 artigos, dos quais 44 na base de dados BVS e 9 na base de dados PubMed, a fim de serem avaliados na etapa de triagem. Após o processo de triagem dos artigos,

Palavras-chave

- estética
- polidioxanona
- rejuvenescimento
- ritidoplastia
- técnicas cosméticas

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observados os critérios de inclusão e exclusão pré-estabelecidos, foram selecionados 7 artigos compatíveis com o tema da pesquisa. O estudo demonstrou que a aplicação de fios de polidioxanona é eficaz no rejuvenescimento facial, e que, apesar da taxa de complicações ser relativamente baixa, o procedimento poderá ser combinado com outros procedimentos estéticos para potencializar os seus efeitos.

Introduction

Body image plays a fundamental role in personal identity formation, involving a dynamic and complex process of self-perception and perception of others throughout life. Aging has a direct influence on this construction, particularly due to the physiological and aesthetic changes affecting the body over time.[1]

Dermal aging features cellular changes resulting in elasticity loss, structural protein decrease, and collagen rigidity, contributing to progressive skin deterioration. These transformations are especially noticeable on the face, in which the signs of aging manifest as wrinkles, expression lines, sagging, and loss of facial volume.[2,3]

In recent decades, advances in cosmetology and aesthetic medicine resulted in the development of procedures to mitigate the visible effects of facial aging. Minimally invasive techniques have gained prominence, driven by the search for aesthetic outcomes with faster recovery and lower risk of complications than traditional surgical approaches. Among these techniques, facial lifting with support threads has become an established alternative for treating mild to moderate signs of sagging and volume loss.[4,5]

Polydioxanone (PDO) threads are widely used in facial liftings due to their specific characteristics, such as biocompatibility, biodegradability, and collagen synthesis stimulation. PDO thread application in several face and neck regions provides a lifting and remodeling effect with rapid recovery and outcomes with a natural appearance.[6,7]

Despite their growing popularity, PDO thread use requires strict application criteria, precise techniques, and individualized patient assessment. The procedure occurs in an outpatient setting, and it involves the introduction of threads into the subcutaneous tissue through cannulas. The amount and arrangement of the threads vary according to the characteristics and needs of the patient.[5–8]

Although the technique is safe and effective, it is essential to deepen the knowledge about its characteristics, methods, and outcomes, in addition to investigating its associated limitations and challenges.[5] Therefore, this study aimed to describe the main features of facial lifting with PDO threads, addressing its application methods and outcomes, and contributing to the scientific and clinical understanding of this approach.

Methods

The study design was an integrative literature review, i.e., a broad publication discussing and describing the development of a given subject from a theoretical and contextual point of view, consisting of an analysis of the literature published in books, articles, and journals. The following question guided our integrative literature review: what are the characteristics, types, advantages, and potential complications of the facial lifting technique using PDO threads?

Queries occur in two electronic libraries covering a selected collection of scientific journals in the health area: the Virtual Health Library (BVS, for its acronym in Portuguese) and PubMed (National Library of Medicine of the United States). The queries included articles in Portuguese or English published in the last 5 years, using the following Health Sciences Descriptors (DeCS): facial lifting, polydioxanone, aesthetics, aesthetic procedures, and rejuvenation. These descriptors were in Portuguese and English.

The inclusion criteria were articles with free access, within the stipulated period, and presenting relevant discussions on the topic. The exclusion criteria were articles with no free access, not available in full, review articles, and book chapters, in languages other than English or Portuguese, and not meeting the inclusion criteria.

The queries yielded 53 articles, which underwent analysis (screening) and eligibility evaluation for sequential result presentation (►**Figure 1**).

Results

The database queries per the defined descriptors initially identified 53 articles, including 44 in the BVS database and nine in the PubMed database, for evaluation in the screening stage.

The evaluation and eligibility process has a screening stage consisting of reading the title and abstract of all articles found. After screening, and observing the pre-established inclusion and exclusion criteria, we selected seven articles consistent with the research theme (►**Table 1**), including one retrospective study, two observational studies, one analytical observational study, one descriptive cross-sectional study, one descriptive and analytical study, and one descriptive study.

Discussion

Facial aging is a complex process involving skin texture change, volume loss, and gravitational descent of facial tissues. The main signs of facial aging include sagging, facial volume loss, wrinkles, and ptosis. As its surgical treatment was common but involved risks or required substantial

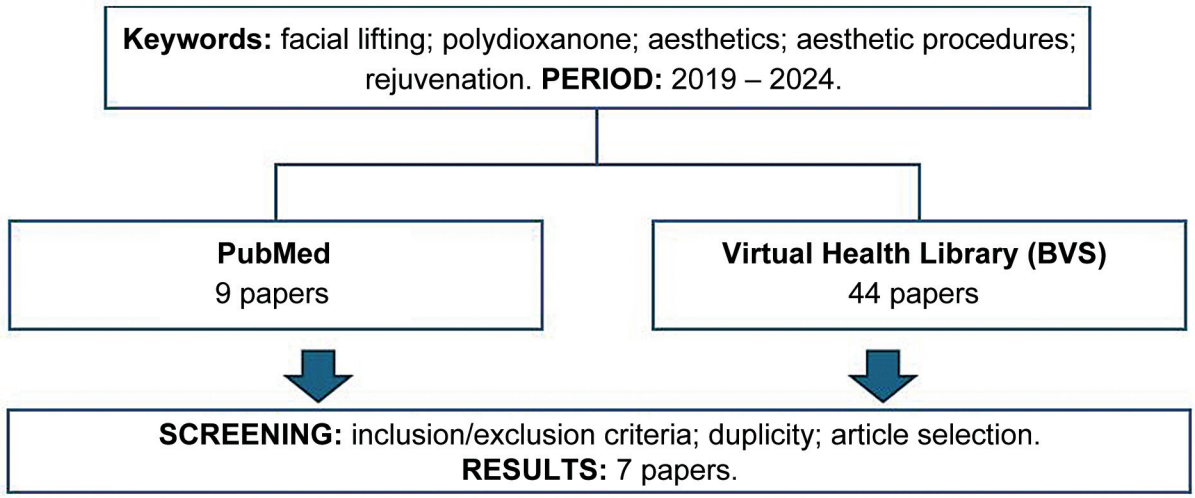

Fig. 1 Article search and selection stages. Source: The authors, 2024.

recovery time, it is giving way to minimally invasive and more effective alternatives.[4]

In the last two decades, the use of support threads in facial aesthetics treatments has been increasingly common due to its main characteristic, i.e., being a minimally invasive modality for treating facial ptosis. The facial lifting procedure involves the placement of barbed sutures, passing threads under the skin of the face and neck to counteract skin and tissue sagging and producing a biostimulatory effect on collagen formation, inducing natural tissue stability.[9]

Given recent improvements in barbed sutures and the continued demand for minimally invasive procedures, PDO threads are the most widely used. As a synthetic, biodegradable, and absorbable substance, PDO is a good material for resorbable facial support threads, lasting on average 6 months after hydrolysis and disappearing completely within the tissue. In addition, it presents low reactivity and extended post-incorporation tensile strength.[10]

PDO threads have been applied as absorbable suture materials since 1981. PDO usually undergoes complete absorption 6 months after insertion and results in minimal foreign body reaction. In facial lifting applications, non-barbed monofilament PDO threads require anchoring to stable structures. This procedure causes transient edema, which has a biostimulating effect. PDO barbed threads are knotless, and their preparation may include unidirectional or bidirectional barbs. Unidirectional barbed thread insertion uses one needle. In contrast, bidirectional barbed threads have a needle at each end and the barbs change direction at the midpoint of the suture.[9]

The positive effects of facial liftings with PDO threads are evident in all studies from ►**Table 1**.

Clinical study number 6 investigated 64 patients with nasolabial fold deepening and malar enhancement reduction resulting from sagging of the middle third of the face. These patients underwent facial lifting treatment with PDO threads and presented satisfactory results 6 months postoperatively at an objective evaluation by doctors and subjective patient satisfaction assessment. According to the study, the midface lifting procedure can occur under local anesthesia, with a shorter operating time, less postoperative downtime, lower risk of complications, and less financial and psychological burden than conventional techniques.[11]

Study number 7 analyzed 160 patients who underwent facial lifting with PDO threads for cheekbone augmentation, nasolabial fold correction, and mandibular line treatment. Its results indicate that PDO effects on the appearance of sagging tissues in the middle third of the face and jaw are significant. However, the authors highlighted that, as benefits are transient, candidates for the procedure should be patients with contraindications to invasive surgery or those who accept a short-term result for a lower cost.[9]

Study number 1, from Park, Jeong, and Park,[4] focused on patients with wide lower eyelids and pronounced nasolabial folds and presented comparative results among these patients. The authors concluded that the combined approach of lower blepharoplasty and mid-facial lifting using PDO threads offers a comprehensive solution for facial rejuvenation, resulting in significant wrinkle reduction, mid-facial lifting improvement, and patient satisfaction. In addition, they described that ultrasound-guided thread lifting, involving the evaluation of the anatomical structures of the midface and the performance of lifting procedures, is a safe and efficient method. The authors highlighted that this combined approach is a promising option for future anti-aging cosmetic surgeries.

Following the idea of combining procedures with thread lifting and botulinum toxin injections to control contralateral hypertrophy and ipsilateral synkinesis, study number 3 evaluated 50 patients with unilateral drooping faces after facial paralysis. This study revealed that an easy lifting with PDO threads combined with other minimally invasive procedures in the same session, such as botulinum toxin injection or hyaluronic acid filling on the contralateral side, can optimize facial rejuvenation on the contralateral side of patients with facial paralysis.[12]

In addition to PDO threads, aesthetic procedures use nylon (non-absorbable) and polyglycolic-lactic acid (PGLA;

Table 1 Articles selected for analysis and discussion

#	TITLE	OBJECTIVES	METHODS	MAIN RESULTS
1	**Advanced facial rejuvenation: synergistic effects of lower blepharoplasty and ultrasound guided mid-face lift using polydioxanone (PDO) threads** Park, Jun Ho; Jeong, Ji Won; Park, Ji-Ung. (2024)	To compare the results in patients undergoing lower blepharoplasty combined with a mid-facelift using PDO threads versus those undergoing lower blepharoplasty alone.	This retrospective study compared the outcomes in patients undergoing lower blepharoplasty combined with mid-facial lifting using PDO threads versus those who underwent lower blepharoplasty alone from March 2019 to December 2022. Retrospective study.	The combined procedure demonstrated superior aesthetic outcomes and greater patient satisfaction compared with lower blepharoplasty alone. Improvements were more significant in wrinkle reduction, midface volume, and interzygomatic distance in the combined procedure group. Although the combined procedure had a longer mean operating time, scar assessment scores were similar between the two groups, with no reported complications.
2	**Experimental investigation of biostimulatory effects after polydioxanone thread insertion in a pig model** Su, Diya; Wang, Shiwei; He, Tong; Wang, Jieqing. (2024)	To determine collagenation and inflammation changes occurring in adipose tissue over time after different thread type implantation.	The authors inserted three types of sutures (PDO, PGLA, and nylon) into the subcutaneous fat of 12-month-old Bama miniature pigs. Next, they evaluated collagen production and inflammatory response by hematoxylin and eosin and Masson's trichrome staining 1, 4, 12, 24, and 48 weeks after the procedure. Observational study.	PDO suture remained intact for up to 24 weeks with mild inflammation and collagen production. The integrity of the PGLA suture lasted up to 12 weeks and showed a strong inflammatory response. The nylon suture remained intact for 48 weeks, resulting in less inflammation and collagen production.
3	**Safety and efficacy of restoring facial symmetry using polydioxanone thread face lift technique in patients with facial palsy** Bhatnagar, Anuj; Rai, Roma; Kumar, Sanjay; Mitra, Barnali; Chopra, Ajay; Singh, Gautam Kumar; Mitra, Debdeep; Patil, Chetan; Sandhu, Sunmeet. (2022)	To test and evaluate the efficacy of restoring facial symmetry using the PDO thread lift technique in patients with facial paralysis.	Fifty patients with one-sided drooping after facial paralysis underwent treatment with thread lift and botulinum toxin injections to control contralateral hypertrophy and ipsilateral synkinesis. All visits were analyzed using the Facial Scoring System or Sunnybrook Facial Scoring System and serial photographs. Observational and analytical study.	After the threading procedure, all 50 patients showed improved facial symmetry. There was a significant improvement in the initial scores compared to those obtained one year later, with a p-value lower than 0.05.
4	**Experiences of barbed polydioxanone (PDO) cog thread for facial rejuvenation and our technique to prevent thread migration** Unal, Mehmet; Islamoglu, Gizem Kaya; Ürün Unal, Gülbahar; Köylü, Nihal. (2021)	To evaluate and share the experiences on the efficacy and safety of PDO thread lift for facial rejuvenation and to present a technique to prevent thread migration.	The study evaluated 38 patients who underwent PDO cog treatment for facial rejuvenation. The authors used a sharp 23 G/90 mm needle to insert a bidirectional barbed PDO thread into the subcutaneous tissue. They evaluated the procedural results using GAIS and patient satisfaction. Descriptive and analytical study.	The study included 38 patients with a mean age of 39.6 ± 7.5 years. The GAIS score showed satisfactory outcomes (78.9%, very much improved; 18.4%, much improved; 2.6%, improved). All patients were satisfied with the clinical outcomes of the procedure (76.3%, excellent; 21.0%, very good; 2.6%, good). No patient reported "fair" or "poor" outcomes.
5	**Facial thread lifting complications in china: analysis and treatment** Li, YL; Li, ZH; Chen, XY; Xing, WS; Hu, JT. (2021)	To describe the main complications in a group of 190 postoperative facial lifting patients treated after having undergone thread lift in other hospitals.	From April 2014 to January 2020, the authors treated 190 patients with postoperative facial lifting complications after having undergone thread lift in other hospitals. The sample included	The patients treated presented the following complications: skin dimpling (77 cases, 40.5%); contour irregularity (32 cases, 16.8%); visible threads (31 cases, 16.3%); thread extrusion (10 cases, 5.3%); infection (17 cases,

Table 1 (*Continued*)

#	TITLE	OBJECTIVES	METHODS	MAIN RESULTS
			189 females and one male; the patients' ages ranged from 28 to 62 years, with a mean age of 37.4. Descriptive cross-sectional study.	8.9%); swelling (9 cases, 4.7%); incomplete facial paralysis (five cases, 2.6%); hyperpigmentation (four cases, 2.1%); hematoma (four cases, 2.1%); allergy (one case, 0.05%). Follow-up was scheduled for 1 to 24 weeks after treatment.
6	**Mini-midface lift using polydioxanone cog threads** Myung Y, Jung C. (2020)	To describe the use of 18-G PDO threads to improve soft tissue laxity of the midface and achieve satisfactory outcomes through a minimally invasive procedure.	Sixty-four patients (all women, aged 33 to 60 years) underwent a midface thread lift from January 2017 to January 2018. The authors made a penetrating incision using an 18-G needle over the lateral orbital rim to insert three 18-G precannulated PDO threads into the deep medial fat pad and the inner layer of the superficial muscular aponeurotic system. The threads were anchored in the periosteum of the lateral orbit, suspending the soft tissue in a more superior direction. The surgical results assessment was subjective (patient satisfaction ratings) and objective (blinded physician evaluations based on changes in the vertical position of the malar prominence). Descriptive study.	No major complications (postoperative hematoma, infection, or temporary sensory/motor impairment) were observed. The mean procedure time was 15 minutes, and all patients underwent local anesthesia. Patient satisfaction was highest at 1 month postoperatively (mean, 4.7/5.0), decreasing at 1 year postoperatively (2.8/5.0). Objective assessment scores followed the same trend (4.5/5.0 at 1 month; 3.1/5.0 at 1 year).
7	**Effectiveness, longevity, and complications of facelift by barbed suture insertion** Bertossi, Dario; Botti, Giovanni; Gualdi, Alessandro; Fundarò, Piero; Nocini, Riccardo; Pirayesh, Ali; van der Lei, Berend. (2019)	To determine the efficacy, longevity, complications, and postoperative sequelae associated with facial liftings using barbed PDO threads.	The study retrospectively evaluated 160 consecutive patients who underwent facial liftings with barbed threads. For malar augmentation and correction of nasolabial folds, two or three PDO threads (23 gauge) were inserted per side; for mandibular line treatment, two to four PDO threads (21 gauge) were inserted per side. Observational study.	Patients showed improvement in facial tissue ptosis after suture placement and for 1 month postoperatively. This aesthetic result decreased visibly within 6 months and disappeared within 1 year. The overall rate of complications in the immediate postoperative period was 34% (55 of 160 patients). Eighteen patients (11.2%) had superficial displacement of barbed sutures, 15 (9.4%) had transient erythema, 10 (6.2%) had infection, 10 (6.2%) had skin dimpling, and 2 (1.2%) had temporary facial stiffness.

*PDO: Polydioxanone; PGLA: polyglycolic-lactic acid; GAIS: Global Aesthetic Improvement Scale.
Source: The authors, 2024.

absorbable) sutures. Study number 2 compared PDO, nylon, and PGLA in tissues similar to human facial soft tissues, such as swine adipose tissue. The results demonstrated that PDO was the most suitable material. In contrast, PGLA underwent rapid degradation and caused a strong inflammatory response, while nylon led to a reaction without curling.[10]

The data collected demonstrated that in addition to the benefits of facial liftings with PDO threads alone or combined with other minimally invasive procedures (botulinum toxin, hyaluronic acid, for example), their effects can be enhanced, going far beyond aesthetics. However, despite their effectiveness, as with all procedures, studies have identified adverse effects in the postoperative period.

Study number 7 analyzed 160 patients undergoing the easy facial lifting procedure with PDO threads and identified complications (►**Table 2**).[9]

►**Table 2** shows that more than one-third of the patients had complications. However, this rate is low compared with more invasive procedures. In addition, some complications

Table 2 Complications of facial lifting with polydioxanone threads – Study number 7

COMPLICATION TYPE	NUMBER OF COMPLICATIONS (%)
Superficial dislocation	18 (11.2)
Erythema (transient)	15 (9.4)
Skin undulations (transient)	10 (6.2)
Infection	10 (6.2)
Facial rigidity (transient)	2 (1.2)
General	55 (34.4)

Source: Bertossi et al, 2019.

Table 3 Complications of facial lifting with polydioxanone threads – Study number 5

COMPLICATION TYPE	NUMBER OF PATIENTS (%)
Skin undulations	77 (40.5%)
Cheeks	30 (15.8%)
Zygomatic buccal groove	22 (11.6%)
Nasolabial fold region	11 (5.8%)
Lateral sides	8 (4.2%)
Multiple positions	6 (3.1%)
Contour irregularity	32 (16.8%)
Visible topics	31 (16.3%)
Screw extrusion	10 (5.3%)
Infection	17 (8.9%)
Swelling	9 (4.7%)
Incomplete facial palsy	5 (2.6%)
Hyperpigmentation	4 (2.1%)
Hematoma	4 (2.1%)
Allergy	1 (0.05%)

Source: Li et al (2021).

were mild, and a few patients reported tolerable or no pain with the procedure under anesthesia.[9]

In 2014, China approved PDO thread use in large-scale non-surgical facial lifting procedures. However, due to the general lack of experience among surgeons in the country, the complication rate was relatively high.[13] In study number 5, performed from April 2014 to January 2020 with 190 patients who underwent the facial lifting procedure with PDO threads, there were complications (►**Table 3**).[13]

►**Table 3** shows that the main factors causing these complications were surgical technique and the lack of facial aesthetics understanding. In addition, facial nerve injury is a severe and rare complication that can be avoided if surgeons become properly familiar with facial anatomy.[13]

Furthermore, among the complications of the aesthetic procedure, study number 4 highlighted the possibility of thread migration or displacement, which is most common in the "free-floating" technique, i.e., when the threads are not fixed at one point and float freely in the subcutaneous tissue. The study investigated 38 patients and demonstrated the possibility of solving this complication by tying the PDO threads at the same entry point as each other. Thus, the entry point where threads are tied can provide a fixation point, albeit relatively weak. However, the resistance of the subcutaneous tissue restricts thread movement, preventing migration or displacement.[14]

Conclusion

The study demonstrated that PDO thread application is effective for facial rejuvenation. It is a simple technique, with a quick recovery, less invasive than conventional procedures, and can be combined with other aesthetic methods to enhance the desired effects. Potential complications mostly result from the lack of facial lifting training and knowledge of facial anatomy on the part of the professional. Finally, the clinical outcomes also demonstrate that the procedure can be used not only for aesthetic purposes, such as in cases of facial paralysis, suggesting its combination with other techniques and more frequent performance in the future.

Authors' Contribution
MEMA: final manuscript approval; FGDA: final manuscript approval.

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Clinical Trial
None.

Conflict of Interests
The authors have no conflict of interest to declare.

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