

Micropigmentation in dermatological rehabilitation: Scar camouflage through permanent makeup

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ABSTRACT

Background: Micropigmentation (permanent makeup) is increasingly recognized not only as a decorative technique but also as a method of dermatological rehabilitation. Pigment implantation into the superficial dermis enables effective camouflage of scars, reducing psycho-emotional stress and improving patients' quality of life. **Objective:** The objective was to explore the potential applications of micropigmentation for scar correction, to define the indications and limitations of the method, and to evaluate its impact on the psycho-emotional state of patients. **Methods:** This work provides definitions of "micropigmentation" and "scar," reviews the classification of scar types, and describes clinical indications and procedural algorithms. An analysis of current studies and systematic reviews was conducted to assess the efficacy and safety of the method. **Results:** Micropigmentation demonstrated the most significant positive effects in cases of normotrophic and atrophic scars. The patients reported a marked improvement in appearance, enhanced self-esteem, and greater social confidence. Keloid and severe hypertrophic scars require caution and prior dermatological consultation. Successful practice demands specific knowledge, skills in color theory, and precise pigment distribution techniques. Clinical evidence confirms reductions in anxiety and depressive symptoms following the procedure. **Discussion:** Micropigmentation is a minimally invasive yet clinically significant method of dermatological rehabilitation. It serves both aesthetic and psychosocial functions. The absence of standardized training protocols and long-term studies underscores the need for further research. **Conclusion:** Scar micropigmentation deserves recognition as an essential element of comprehensive aesthetic and medical rehabilitation strategies. With interdisciplinary collaboration and high professional competence, the method may substantially improve the accessibility and quality of care for patients with scar tissue alterations.

Key words: Micropigmentation, Permanent makeup, Scars, Camouflage, Aesthetic rehabilitation, Quality of life

INTRODUCTION

Modern aesthetic medicine increasingly faces the challenge not only of improving appearance but also of restoring lost confidence in patients with pronounced skin defects. Among these, scar formations occupy a special place—visible marks on the skin resulting from trauma, surgical interventions, or inflammatory processes. Their presence may become a source of psychological distress, particularly when located in exposed areas of the body.

In recent decades, micropigmentation, the technique of implanting pigment into the superficial layers of

the skin, has established itself not only as a tool for long-lasting aesthetic makeup but also as an effective method for visual scar camouflage [1]. The evolution of techniques, the development of specialized pigments, and the growing expertise of practitioners have allowed this approach to be integrated into the system of restorative and dermato-aesthetic care. Medical micropigmentation has been widely adopted in reconstructive practice, particularly after oncological surgery, demonstrating high patient satisfaction and a psychosocial benefit [2].

Despite the variety of therapeutic methods for scar correction, micropigmentation provides a gentle,

How to cite this article: Yakovleva OV. Micropigmentation in dermatological rehabilitation: Scar camouflage through permanent makeup. Our Dermatol Online. 2026;17(2):172-177.

Submission: 26.12.2025; **Acceptance:** 11.02.2026

DOI: 10.7241/ourd.20262.5

non-invasive way to improve the appearance of the affected area by bringing it closer to the natural skin tone. This is especially important for patients unwilling or unable to undergo surgical interventions, or those with contraindications to other corrective methods [3].

The present study aims to explore the potential applications of micropigmentation in treating various types of scars, to define the scope of competence for specialists in this field, and to assess the impact of the procedure on patients' psycho-emotional well-being. The discussion addresses indications, ethical considerations, and the potential for interdisciplinary collaboration among professionals in cosmetology, dermatology, and psychology.

Concept of Micropigmentation

Micropigmentation, also known as permanent makeup, is a technique of implanting pigments (dyes) into the superficial layers of the dermis (papillary layer) (Fig. 1) using specialized equipment, with the aim of correcting or visually improving the appearance of the skin [4,5]. It is applied both for decorative purposes (classic use in the eyebrow, lip, and eyelid areas) and for medical-aesthetic purposes, including areola reconstruction after mastectomy, scar camouflage, and correction of vitiligo [3].

Definition and Classification of Scars

The wound healing process is a complex sequence of well-organized biochemical and cellular events aimed at restoring skin integrity. Any disturbance or imbalance in these processes, often influenced by unfavorable conditions or an excessive connective tissue response, leads to abnormal healing [6]. In other words, a scar is a connective tissue formation that develops at the site of skin injury during the healing process.

In dermatological practice, scars are classified according to the amount of newly formed connective scar tissue (Fig. 2):

1. Normotrophic scars — located at the level of the surrounding skin, soft and minimally noticeable. They typically appear as thin, linear, whitish lines that do not differ significantly in color from healthy skin. In most cases, they result from surgical interventions.
2. Atrophic scars — located within the wound area, below the level of healthy tissue, creating a “tissue deficit” effect. They usually develop after acne or

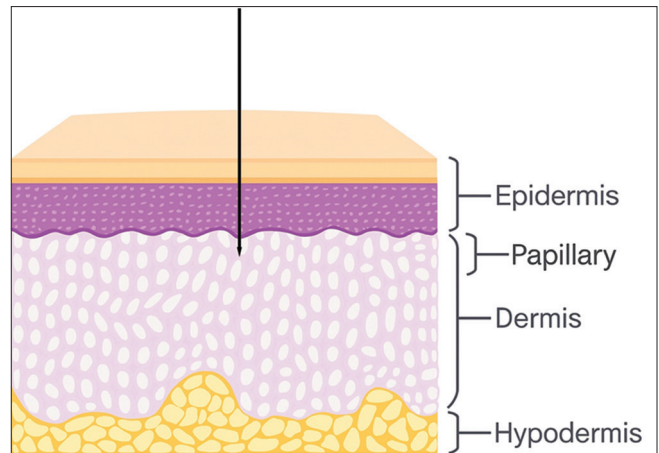


Figure 1: Structure of the skin.

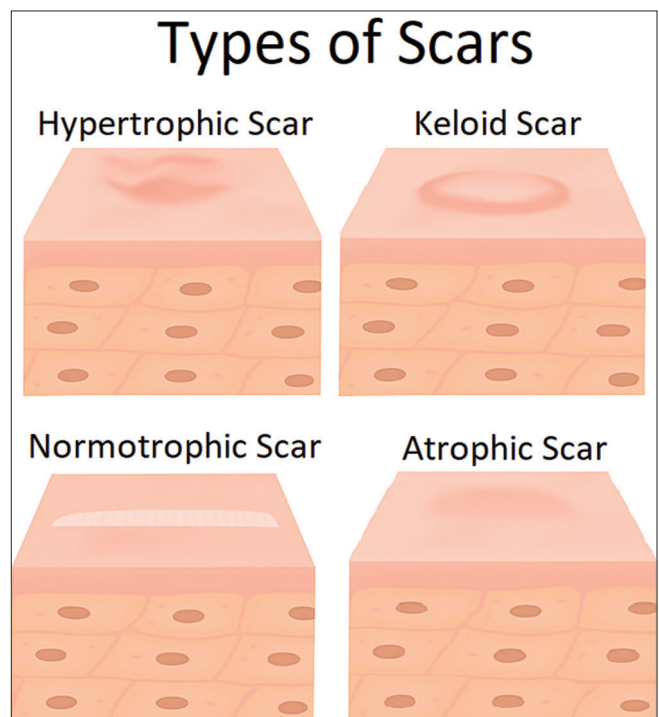


Figure 2: Classification of scars.

chickenpox, as well as in the form of striae (stretch marks).

3. Hypertrophic scars — thickened, smooth, dense, and elevated above the skin surface, but not extending beyond the wound margins. They form due to excessive collagen accumulation, creating a “tissue surplus” effect.
4. Keloid scars — considered an unfavorable outcome of scar formation. These are irregularly shaped, nodular, vascular-rich, and often painful lesions. They extend beyond the initial wound area, protrude above the skin surface, and are prone to recurrence [5].

Clinical Indications and Limitations

According to current data [1,7], permanent makeup practitioners may safely and effectively work with:

- normotrophic scars,
- atrophic scars,
- hypopigmented areas of scar tissue.

Keloid and pronounced hypertrophic scars are contraindications for the procedure without prior consultation with a dermatologist.

Procedure Technology and Work Specifics

Performing micropigmentation on scar tissue requires a high level of professional qualification, a deep understanding of skin anatomy, and knowledge of the principles of connective tissue healing. Unlike standard permanent makeup zones, a scar represents a morphologically altered skin area with impaired vascularization, reduced elasticity, and often distorted surface relief. This necessitates an individualized approach, adaptation of technique, and careful adjustment of equipment parameters (Fig. 3). In some cases, a multi-stage strategy is advisable: initial preparatory work with the tissue (massage, topical

creams), followed by 2–3 sessions with intervals to ensure stable healing and color fixation [5,7].

A specialist focusing on scar camouflage must possess the following professional competencies:

- Basic medical knowledge — understanding of skin physiology, scar formation stages, scar types, and risk factors for complications [3];
- Knowledge of dermatological contraindications — the ability to distinguish keloid and active hypertrophic scars, in which the procedure may be unsafe [1];
- Color theory and camouflage skills — accurate pigment selection considering skin phototype, scar depth, and its current coloration. Errors in pigment choice may worsen the visual defect;
- Mastery of shading and pixel pigment distribution techniques — ensuring a natural color transition and avoiding sharp demarcation between the scar and healthy skin.

Protocol for Micropigmentation Procedure in Scar Camouflage

Prior to performing micropigmentation, a mandatory stage is the preliminary patient assessment, aimed at identifying contraindications, reducing the risk of complications, and selecting an individualized technique.

1. Medical History Collection
 - Examination and evaluation of the skin condition in the target area, including the identification of the type of scar. Scar tissue undergoes a maturation process that may take up to 1.5 years.
 - At this stage, the practitioner conducts a detailed assessment of the treatment area, explains the possibilities and limitations of the procedure.
 - Obtaining informed consent from the patient, with a detailed explanation of all procedural stages and expected outcomes.
2. Preparatory Stage
 - The practitioner cleanses the skin and applies an antiseptic.
 - Application of a topical anesthetic cream.
3. Equipment Preparation
 - All working surfaces and containers are covered with protective film to prevent cross-contamination.
 - The professional tattoo device is sealed with a barrier protection and secured in the grip area with a bandage wrap.



Figure 3: Professional equipment.

- A single-use cartridge (a plastic module containing one or multiple needles with an elastic membrane to prevent pigment or bodily fluids from entering the machine body and motor, thereby eliminating the risk of cross-contamination) is opened in front of the patient. For scar camouflage, needle groupings of 3 to 7–9 in different configurations are used (Round Liner – RL, Flat, Magnum) (Fig. 4).
 - Skin-tone pigments are dispensed into single-use caps.
4. Pigment Implantation Procedure
- After a 10–15 minute anesthetic exposure, the practitioner begins pigment implantation using professional equipment. The pigment is deposited into the upper dermal layers with shading or layering movements to cover the required area. Work is performed carefully, continuously monitoring the scar’s response to microtrauma. Pigment shades chosen are as close as possible to the patient’s natural skin tone.
 - Various machine settings can be used, with needle stroke ranging from short (2.8 mm) to long (4.0 mm). The practitioner’s skill and preferences play a significant role.
 - Three types of pigments may be used: mineral (inorganic, based on metal oxides), hybrid (a mixture of organic and inorganic components), and organic (synthetic, hydrocarbon-based dyes characterized by bright saturation, ease of implantation, and high color density). Hybrid pigments are generally preferred, as they combine the benefits of both types—color stability, ease of implantation, a wide shade range, and longer-lasting results.
5. Post-Procedure Care
- After the procedure, the practitioner provides the patient with detailed instructions for skin care during the healing period and recommendations to prolong the effect of the treatment.

6. Touch-Up After 1–1.5 Months
- Within 1–2 months, depending on age, the skin fully heals, allowing evaluation of pigment retention and identification of any uneven areas. A correction session one month after the initial procedure is recommended to consolidate results, eliminate irregularities, and achieve the desired color intensity and blending. In some cases, more than one touch-up may be required to obtain the optimal outcome.

MICROPIGMENTATION (PERMANENT MAKEUP) AS A TOOL FOR RESTORING THE PATIENT’S QUALITY OF LIFE

The modern understanding of health encompasses not only physical well-being but also psychological, emotional, and social comfort. In this context, permanent makeup applied for medical and aesthetic purposes extends beyond a simple cosmetic procedure and attains the status of a full-fledged tool for restoring patients’ quality of life.

This procedure becomes particularly significant in cases of pronounced aesthetic defects caused by trauma, surgical interventions, burns, dermatological conditions (including vitiligo, acne, and post-acne), as well as in post-oncological rehabilitation (for example, after mastectomy with areola reconstruction). In such clinical scenarios, micropigmentation functions as a form of “social camouflage,” allowing patients to reintegrate into society without constant reminders of their past medical conditions.

According to a systematic review by Becker and Cassisi (2021) [3], more than 80% of patients who underwent medical micropigmentation (including scar correction) reported improvements in quality of life, including reduced social anxiety, enhanced self-esteem, and restored confidence in social interactions. These effects were particularly evident among women after breast surgery, patients with facial defects, and young individuals with post-acne scars.

Additional evidence of the psychosocial benefits of permanent makeup is provided by studies [1] demonstrating statistically significant reductions in anxiety and depressive symptoms following aesthetic scar correction. Another striking example is the multinational mixed-method study conducted by Dr. Jerry Tan and colleagues, “Assessment of

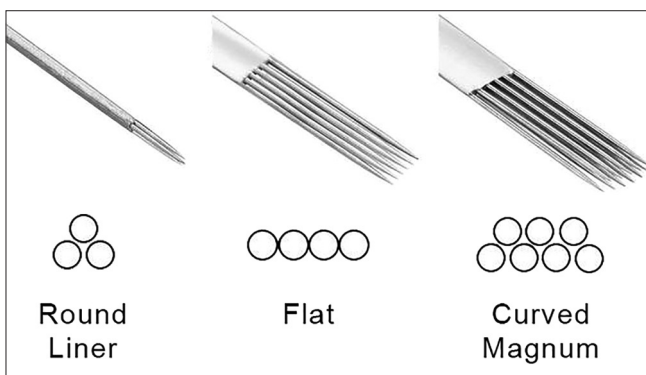


Figure 4: Types of needles used in scar camouflage micropigmentation.

Psychological Well-being and Social Consequences of Atrophic Acne Scarring,” which highlighted the profound impact of scarring on individuals’ lives. The study included discussions with 30 adults and a survey of 723 adults with atrophic scars. Results revealed that 31.6%, 49.6%, and 18.8% of respondents reported mild, moderate, and severe/very severe scarring, respectively. Approximately 25.7% of the participants felt less attractive due to their scars, 27.5% expressed embarrassment or shyness, 8.3% reported experiencing verbal or physical abuse related to their scars, and 15.9% believed they had been unfairly dismissed from employment. Alarming, 37.5% felt that scars affected how others perceived them, 35.5% avoided public speaking, and 43.2% believed their scars negatively influenced their romantic relationships [8].

Practitioners performing micropigmentation for rehabilitative purposes serve not only as technical specialists but also as mediators between the physical condition of the skin and the patient’s internal state. This work requires a respectful, ethical, and individualized approach, reinforcing the interdisciplinary significance of this procedure—at the intersection of aesthetic medicine, psychology, and dermatology.

Thus, in its medical application, permanent makeup is not merely a method of improving appearance but also an effective means of reducing psychosocial burden, supporting patients’ return to an active and fulfilling life.

DISCUSSION

The findings, along with a review of current studies, indicate that micropigmentation represents an important component of restorative dermatology and aesthetic medicine. Although the method initially developed within the framework of cosmetic correction, it is increasingly being applied in a clinical context—including in the management of post-traumatic and postoperative scars [9-11].

The effectiveness of the procedure is largely determined by the type of scar, its depth, pigmentation characteristics, and the condition of the surrounding skin. Particularly favorable outcomes are observed when treating normotrophic and atrophic scars, while hypertrophic and keloid scars require heightened caution or complete exclusion from treatment. This highlights the importance of a multidisciplinary approach, in which the permanent makeup practitioner

collaborates with dermatologists, surgeons, or rehabilitation specialists [12,13].

Additionally, it should be emphasized that micropigmentation provides not only aesthetic but also psycho-emotional benefits. It helps reduce social anxiety, eliminate visual “reminders” of traumatic experiences, and promotes better social adaptation for patients. This makes the method relevant not only in private practice but also within state-supported medical and social rehabilitation programs. Numerous studies demonstrate that visible scars significantly impair quality of life, leading to social withdrawal, anxiety, and reduced self-esteem [14,15].

Nevertheless, unresolved issues remain, including the need for standardized training protocols, unified safety guidelines, and the development of an evidence base supported by a larger number of clinical cases. Further research is also required to evaluate long-term outcomes, pigment safety, and the interactions of micropigmentation with dermatological and cosmetic procedures.

CONCLUSION

Scar micropigmentation is a modern and clinically significant technique situated at the intersection of aesthetic and restorative medicine. It improves the appearance of the skin, enhances patients’ quality of life, and supports their reintegration into society without embarrassment or psychological discomfort.

Scar correction through permanent makeup requires high professional training, ethical practice, and individualized treatment planning. The method demonstrates particular effectiveness in cases of atrophic and normotrophic scars, as well as in hypopigmented areas.

Thus, micropigmentation deserves recognition as an integral part of comprehensive rehabilitation strategies for patients with skin defects, especially when more invasive treatment options are unavailable or undesirable. Its inclusion in clinical protocols and educational programs could significantly improve the accessibility and quality of aesthetic and medical care.

ACKNOWLEDGMENTS

The author expresses gratitude to colleagues and patients who participated in the clinical practice.

Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

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Source of Support: This article has no funding source.

Conflict of Interest: The authors have no conflict of interest to declare.