Clinics in Surgery

Research Article
Published: 07 Aug, 2026

Facial Rejuvenation with Autologous Nanofat Grafts in Combination with Bio-Filler. Our Case Series

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Abstract

Introduction: Autologous nanofat grafts and Platelet Rich Fibrin (PRF) are injected simultaneously in a synergistic treatment for facial rejuvenation, as adipose tissue tends to be resorbed with consequences in long-term retention of facial volume. In our case series, the clinical outcomes of this combined therapeutic approach are presented in terms of facial contour, volume, and regeneration.

Materials and Methods: In this case series, an individualized facial rejuvenation treatment algorithm was implemented in 28 patients, with concurrent administration of autologous nanofat grafts and PRF bio fillers, prioritizing aesthetic zones with anatomic defects or patients' personalized needs.

Results: Facial volume, contour, and texture improvements were reported by the expert's clinical evaluation and patients' personal opinions. Long-lasting results, particularly in durable facial volume restoration and skin laxity optimization, were evident, satisfying individuals' requests for facial rejuvenation.

Conclusion: The combination of Autologous Nanofat Grafts with PRF bio fillers has the potential to establish a multimodal therapeutic approach as the standard of care for facial rejuvenation.

Keywords: Nanofat; Bio filler; Rejuvanation; Autologus; Graft

Introduction

Depressions and volume defects in facial soft tissues can occur in the context of injuries, inflammations, and craniomaxillofacial deformities [1]. Currently, the most common cause of facial skin imperfections is the natural aging process, which often requires aesthetic interventions [2]. The impact of facial soft-tissue depressions is not only on an individual's appearance, but also on the psychosocial and emotional sphere, with a deterioration in the quality of life [3].

The correction of soft-tissue defects is traditionally achieved by transplantation of autologous adipose tissue, as it is available and biocompatible, with natural-looking results. However, the long-term sustainability of clinical cosmetic outcomes is unpredictable, as fat absorption ranges from 20 to 90 percent, and execution of multiple injections may lead to skin induration or cystic lesions. Current regenerative research has focused on biological factors that enhance neoangiogenesis in the graft, supporting volumetric stability of cosmetic results [4,5]. During the aspiration of fatty tissues, Adipose Stem Cells (ASCs) of the adult are highly available in the Stromal Vascular Fraction (SVF) [6].

Nanofat particles' dimensions are below a hundred micrometers, allowing the SVF, which contains the ASCs, to have a wider contact surface with the supporting fat granules [7]. Hence, mesenchymal stem cells play a role similar to that of Nanofat Stem Cells (NFSCs) in graft vascularization and soft-tissue regeneration, implementing paracrine mechanisms and growth factor signaling [2]. The gradual enhancement of soft-tissue laxity, color, and micro vascularization indicates that autologous fat transplantation serves as an active bio filler rather than a passive substitute utilized in facial volume deficits [8]. However, the strict manufacturer's protocol requirements and ethical approval for the ex vivo expansion of stem cells have shifted researchers' interest toward available, autologous bioproducts, enabling nanofat grafts' clinical potential [9,10].

Therefore, emerging treatment modalities, such as Autologous Platelet Concentrates (APCs), can induce skin rejuvenation with an advantageous cost-effectiveness profile without immunogenic reactions, when properly executed [11]. Platelet-Rich Plasma (PRP) constitutes the first generation of APCs, applied to superficial wrinkles and improving skin texture, with complex preparation

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Received Date: *30 Jul 2026*
Accepted Date: *06 Aug 2026*
Published Date: *07 Aug 2026*

Citation:
Chatzistefanou I, Pyraki M, Petsinis V. Facial Rejuvenation with Autologous Nanofat Grafts in Combination with Bio-Filler. Our Case Series. Clin Surg. 2026; 10: 3740.

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procedures that entail double centrifugation and synthetic anticoagulants, potentially harming healing mechanisms [12,13]. Platelet-Rich Fibrin (PRF) and Injectable Fluid PRF (I-PRF) belong to the second generation without demanding anticoagulant during centrifugation [14,15]. Growth factors, thrombin, and cytokines, which are essential for tissue repair, are released in the extracellular matrix formed by those autologous bioproducts [14]. PRF induces the proliferation and differentiation of autologous adipose tissue that is concurrently transplanted at the same operative session [16]. In this case series, our experience with the combined injection of autologous nanofat grafts and PRF bio fillers is documented by analyzing emerging advantages in facial volume regain, deep facial skin depressions, and skin laxity [17].

Materials and Methods

In our practice, 28 patients underwent a multimodal facial regeneration treatment with autologous nanofat grafts and PRF administered concurrently. Eligible patients were adults with asymmetry in facial contour, inadequate facial volume, or deep facial skin depressions of physiological ageing [2]. From this case series, patients with serious systemic health problems or heavy smokers were excluded, securing healing optimization [10].

During the diagnostic process, all patients were photographed in their baseline condition, for standardized procedures from specific angles under uniform illumination, while they signed written informed consent [2]. Under local anaesthesia, lipoaspiration was implemented in cannulas with multiple pores and low-pressure manually [10,18]. Autologous adipose tissue was extracted and washed with normal saline solution, and divided into a structural graft part and a part used for the preparation of a nanofat graft [2,19]. In a closed syringe-to-syringe process, the lipoaspirate was mechanically emulsified and fine-filtered to produce a fluid autologous nanofat graft, which included NFSCs. At the same time, the individual underwent peripheral venous blood sampling in free-anticoagulant tubes, followed by centrifugation to isolate PRF, as a gelatinous fibrin matrix bioproduct from erythrocyte fractions and platelet-poor fragments [20,21].

The combination of PRF rich in growth factors, fluid nanofat, and refined structural fat granules was blended in proportions dictated by each patient's unique anatomic characteristics to prepare the definitive autologous transplant mixture [2]. The autologous nanofat graft and the PRF were concurrently injected into the demanding anatomical facial regions of an individual based on the physical evaluation and the personalized, subjective aesthetic needs. The autologous concentrate was retrogradely infiltrated through a cannula with a blunt tip, utilizing a fan-injection method at multiple points and layers in a subdermal plane after preventive resorption to avoid intravascular infusion of the blend [2,10]. The postoperative set-up consisted of placement of local pressure bandages to avoid microvascular network development and preventive oral intake of antibiotics [2].

In a long-term follow-up period of at least 2 years, graft survival, skin laxity, skin texture, and subjective aesthetic perception are evaluated in our case series [16,22,23].

Result

All our patients demonstrated improvement in facial contour, texture, and volume with the implementation of autologous combined concentrates [11,17]. Preoperative and postoperative photographs were used for digital evaluation in concordance with physical examination, which showed superior results in skin laxity, facial rejuvenation, and long-term volume improvement with the dual-component autologous blend [2,16]. The multimodal treatment approach for facial rejuvenation in this case series consisted of refined autologous structural fat, fluid autologous nanofat graft, and PRF bio filler, which led to satisfactory filling of deep facial skin depressions, especially in the first 30 postoperative days [2,24]. In the next few months, the physiological mechanism of adipose tissue absorption functioned, and the tissue volume was adequately retained without observed superficial skin abnormalities, nodules, or contour asymmetries [2,25]. Therefore, long-term follow-up did not exhibit major complications, inflammation, excessive fat resorption, dysmorphic scars, and persistent or transient paresthesia [16,17]. Skin laxity, thickness, and moisturization improved in an accumulative pattern, leading to highly satisfactory patient-reported outcomes [2,17,26].

On the microscopic level, this autologous blend of concentrates led to modifications in the papillary and reticular layers of aging dermis by expanding a newly developed elastic oxytalan network and removing old, fragmented collagen fibrils by upregulating matrix metalloproteinases [10,27,28]. The remodeling of local tissues was activated by fibroblasts in healthy tissues, promoting the formation of a well-organized network of type I collagen and hyaluronic acid produced endogenously [27,28]. Research has shown that the extended clinical benefit of facial rejuvenation for the autologous blend lies in the remodeling procedure, protecting the graft's micro vascularity in a sustainable pattern that ensures survival in demanding facial aesthetic regions [2,10].

Discussion

The correction of facial volume and the improvement of soft tissue texture in cosmetic and maxillofacial surgery were traditionally performed with autologous fat grafts, despite the existing long-term volumetric restrictions owing to central fat resorption due to the lack of immediate graft vascularization [2,29]. To address these concerns, autologous nanofat grafts are used, providing a rich substrate for NFSCs and SVF and enabling the graft to participate in various cellular signaling pathways [2,19]. The concurrent administration of PRF that contains biologically active products, such as Vascular Endothelial Growth Factor (VEGF) and Platelet-Derived Growth Factor (PDGF), overcomes the survival obstacles of transplanted autologous adipose tissue [2,30]. This double-element bioproduct consisting of autologous nanofat graft and PRF bio filler is tolerated by immune mechanisms while delivering a slowly diluted autologous rack that enhances volumetric graft retention without enzymatic resolution and, subsequently, the necessity of repetitive injections [2].

Macroscopically, the efficient multimodal treatment in our case series illuminates facial rejuvenation algorithms that can cure skin defects or correct age marks [11,17]. Excessive fat resorption or skin induration is observed in adipose-only autologous transplant procedures, such as nanofat or conventional fat grafts; however, when combined with PRF, the volumetric retention is secured following an initial physiological phase of graft absorption [2]. Long-term objective clinical assessment showed, in this case series, remarkable improvement in moisturizing, pore definition, and skin laxity, without serious adverse events, such as liponecrosis, paresthesia, or superficial nodule formation [2,16].

Interactive paracrine mechanisms in the SVF of autologous nanofat grafts are mediated by anti-aging growth factors released from PRF bio filler [2,16]. The pairing of the mechanical stability of structural fat granules with the signaling pathways of fluid autologous nanofat grafts and PRF can correct deep facial skin depressions, enhance the facial contour, and improve skin laxity [2,16,26].

This clinical case series validates the safety and efficacy of the combined approach of administering autologous nanofat graft and PRF bio filler, with a long-term follow-up period in real-world practice. However, future research should shift toward a prospective, randomized, multi-center, double-blinded, controlled clinical trial to define the exact proportions of each component of the autologous blend suitable for individualized skin and volumetric deformities, standardizing, as well, the execution of the intervention with precise choice of regimens [10].

Conclusion

The concurrent implementation of structural fat granules, autologous nanofat grafts rich in SVF and PRF bio filler that induces growth factor release, is a safe, effective, and long-lasting paradigm shift in facial rejuvenation protocols for improvement of facial contour, texture, and volume [2,16]. The essential growth factors released in a time-dependent pattern from autologous platelet concentrates address volumetric retention limits by controlling ischemia and hypoxia in the immediate postoperative period, as observed in conventional autologous fat grafts, avoiding multiple surgical repetitions or injections with artificial fillers [12,30]. The autologous concentrate blend offers beneficial aesthetic outcomes, establishing the clinical foundations to become potentially the standard of care for facial rejuvenation procedures in the future [2,26].

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