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Research Article

Enhanced Recovery Protocol Using Peptide Therapy, PRP, Carboxytherapy, and Estradiol for Labiaplasty: A Retrospective Observational Study

David Ghozland*, Ericka Herrera

Department of Obstetrics and Gynaecology

***Corresponding Author:** David Ghozland, Department of Obstetrics and Gynaecology.

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Abstract

Background: Postoperative pain, edema, and ecchymosis are common challenges following labiaplasty, potentially prolonging recovery. This study evaluates a multimodal enhanced recovery protocol incorporating topical peptides (BPC-157, GHK-Cu), carboxytherapy, topical estradiol, and autologous platelet-rich plasma (PRP) to assess effects on postoperative outcomes.

Methods: Retrospective review of 10 consecutive patients undergoing labiaplasty from April 25–September 1, 2025. Protocol included: (1) BPC-157 + GHK-Cu cream BID, (2) nightly transcutaneous carboxytherapy x3 days, (3) topical estradiol x14 days, (4) intraoperative PRP with repeat at 4 weeks. Outcomes included postoperative pain (VAS), swelling (graded photographs), ecchymosis, healing time, and patient satisfaction, compared to historical controls.

Results: The enhanced recovery cohort showed a 20% reduction in swelling, 30% lower VAS pain scores ($p < 0.05$), 2-day earlier bruising resolution, and faster return to baseline activity (11 vs. 14 days). No adverse events were observed. Patient satisfaction improved, with 90% rating recovery as "excellent".

Conclusion: This multimodal protocol utilizing regenerative peptides, estrogen support, PRP, and carboxytherapy accelerated recovery after labiaplasty. Findings support further investigation in prospective controlled trials.

Keywords: Labiaplasty; Ecchymosis; Healing Time

Introduction

Labiaplasty is one of the most frequently performed cosmetic gynecologic surgeries. While surgical techniques are well refined, post-procedure inflammation, bruising, and discomfort impact recovery and satisfaction. The integration of regenerative biologics may enhance healing through modulation of the wound environment.

- BPC-157 is a synthetic pentadecapeptide derived from gastric juice with angiogenic, anti-inflammatory, and cytoprotective properties. Preclinical models demonstrate accelerated healing in muscle, tendon, nerve, and skin wounds via stimulation of VEGF, FAK-paxillin signaling, and fibroblast migration [1,2].
- GHK-Cu is a naturally occurring copper-binding peptide with potent effects on collagen synthesis, dermal remodeling, and antioxidant activity. It upregulates TGF-β1 and supports skin regeneration and contraction [3].
- PRP delivers autologous growth factors such as PDGF, TGF-β, and VEGF that facilitate epithelialization, collagen deposition, and angiogenesis. Its use in aesthetic surgery and gynecology has grown with favorable safety and efficacy profiles.
- Carboxytherapy, the subdermal or transdermal administration of CO_2, increases local tissue oxygenation via the Bohr effect, improves capillary microcirculation, and reduces lymphedema and inflammation. Studies have shown its utility in periorbital edema, skin laxity, and wound healing [4].

- Topical estradiol improves dermal thickness, vascularity, and mucosal repair by stimulating estrogen receptor-β in vulvovaginal tissues. It has been shown to improve wound tensile strength, reduce inflammation, and accelerate epithelial repair in postmenopausal and postpartum populations [5,6].
- Despite individual evidence for these modalities, limited data exist on their combined use in labiaplasty recovery. This study evaluates the clinical outcomes of a structured, biologically driven postoperative protocol.

Methods

- **Design and Setting:** Retrospective observational study at a private cosmetic gynecology practice (Los Angeles, CA).
- **Inclusion Criteria:** Female patients aged 25–55 undergoing labia majora or minora reduction without major comorbidities.

Intervention protocol

Component	Protocol Description
Peptide Therapy	BPC-157 + GHK-Cu cream applied BID to surgical area x14 days
Carboxytherapy	Transcutaneous CO_2 application (FDA-cleared device) x3 nights postop
Estradiol Cream	0.01% estradiol vaginal/perineal cream QHS x14 days
PRP Injections	Intraoperative autologous PRP injection at closure and repeated at 4-week follow-up

Table 1

Measured outcomes

- **Pain:** VAS scores on POD 1, 3, 7, 14
- **Swelling:** Graded via standardized photos (0–3)
- **Bruising:** Time to resolution (days)
- **Healing Time:** Days to unrestricted activity
- **Safety:** Complications or adverse effects
- **Satisfaction:** Likert scale (1–5)

Statistical Analysis: Mann-Whitney U test; $p < 0.05$ considered significant.

Results

Pilot outcome comparison

Outcome	Historical Controls	Enhanced Protocol	% Improvement
Swelling (graded avg)	2.5	2.0	20% ↓
Pain (VAS Day 3 avg)	7.0	4.9	30% ↓
Bruising Resolution (d)	7.0	5.0	28.6% faster
Full Recovery (d)	14.0	11.0	21.4% faster
Patient Satisfaction	75% rated "Excellent"	90% "Excellent"	+20%

Table 2

Safety: No infection, wound dehiscence, allergic reactions, or systemic side effects reported.

Metric	Control (n = 10)	Enhanced Protocol (n = 10)	p-value
Mean Pain (VAS Day 3)	7.0	4.9	0.02*
Bruising Duration (days)	7.0	5.0	0.04*
Swelling Score (Day 3)	2.5	2.0	0.03*
Days to Full Activity	14.0	11.0	0.01*

Table 3: Postoperative Outcomes Comparison.

Therapy	Mechanism	Key Effects
BPC-157	VEGF induction, GHR upregulation, NO pathway modulation	Angiogenesis, anti-inflammation
GHK-Cu	Collagen synthesis, antioxidant upregulation	ECM remodeling, repair
PRP	Cytokine/growth factor delivery	Tissue regeneration
Estradiol	Estrogen receptor-β activation, VEGF modulation	Mucosal healing, angiogenesis
Carboxytherapy	Microcirculation, Bohr effect, lymphatic drainage	Reduced swelling, improved oxygenation

Table 4: Mechanisms of Action.

Discussion

This protocol marks the first integrated use of multiple biologic and hormone-based strategies for enhanced recovery in labiaplasty. Results show clinically meaningful improvement in healing kinetics and subjective patient experience.

Mechanistic synergy

- BPC-157 promotes VEGF-dependent neovascularization and modulates NO pathways, facilitating tissue repair.
- GHK-Cu activates TGF-β signaling, increases integrins, and supports fibroblast activity—critical in ECM remodeling.
- Estradiol enhances epithelialization, modulates collagen type III/I ratios, and supports granulation in vulvovaginal mucosa.
- Carboxytherapy improves perfusion and lymphatic drainage, reducing inflammatory exudate and edema.
- PRP augments healing via fibroblast activation and cytokine gradients that recruit repair cells.

Supporting literature

- **Estradiol and Wound Healing:** Friedrich [5], Nappi [6], and Berman., *et al.* [8] found estradiol accelerated vulvovaginal epithelial recovery post-injury.
- **Carboxytherapy Studies:** Brandi., *et al*. [4,7] demonstrated reduced edema and enhanced dermal elasticity post-procedure with transdermal CO_2. A 2020 pilot [9] reported carboxytherapy reduced post-rhinoplasty swelling.

Limitations

- Small sample size, non-randomized design
- Subjective satisfaction reporting
- Peptides not FDA-approved for topical wound use; compounded formulations vary in potency

Conclusion

A biologically augmented recovery protocol for labiaplasty incorporating peptides, PRP, carboxytherapy, and estradiol demonstrated improved postoperative outcomes without adverse events. These findings support the design of future controlled trials to validate efficacy and isolate contributions of each modality.

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