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Case Report

THE ROLE OF HYPERBARIC OXYGEN THERAPY (HBOT) AND PLATELET-RICH PLASMA (PRP) FOR TISSUE REGENERATION

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ABSTRACT

Background: Hyperbaric oxygen therapy (HBOT) and platelet-rich plasma (PRP) have individually demonstrated potential in enhancing tissue regeneration through improved oxygenation and growth factor delivery. This study evaluated the clinical outcomes of combined therapeutic approach using HBOT and PRP in patients with early signs of compromised tissue perfusion after surgery.

Methods: We conducted a prospective case series of four patients presenting with clinical signs of localized ischemia. All patients underwent therapy consisting of series of HBOT sessions combined with PRP injections directly into the affected tissue. Tissue perfusion and healing progression were monitored clinically on daily basis. Photographic documentation was used to track the progress.

Results: All four patients demonstrated improvement in tissue color, warmth and healing process following the start of the combinational therapy. The beginning of the revascularization was observed within 3-5 days of treatment initiation. None of the patients required surgical revision or debridement. There were no adverse effects. The combined approach appeared to resolve early ischemic changes and accelerate wound closure.

Conclusion: The combined use of HBOT and PRP provide a synergistic effect in enhancing tissue recovery in patients with postoperative wound ischemia. This approach may reduce the need for surgical procedures and improve aesthetic and functional outcomes.

Keywords: Hyperbaric oxygen therapy (HBOT), Platelet-rich plasma (PRP), Postoperative ischemia, Wound healing

INTRODUCTION

Tissue ischemia following surgery remains a serious and potentially devastating complication, particularly in patients with impaired vascular supply or previous tissue trauma. Reduced wound circulation in the postoperative period can result in delayed healing, tissue necrosis, infection or wound dehiscence - compromising both the functional and aesthetic outcomes of surgical procedures (1).

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Several risk factors predispose patients to postoperative ischemia, including prior surgeries in the affected area, smoking, systematic vascular disease, massive weight loss, hormonal treatments and etc.

Hyperbaric oxygen therapy (HBOT) has long been recognized as treatment for ischemic wounds and compromised flaps by delivering 100% oxygen at high pressure to stimulate angiogenesis, reduce edema and support leukocyte and fibroblast function (2). Platelet-rich plasma (PRP), an autologous concentration of growth factors and cytokines, offers an additional regenerative strategy by promoting neovascularization, tissue repair and reducing local inflammation (3).

While both therapies have demonstrated individual effectiveness in managing ischemic wounds (2, 4-6), their combined use in postoperative ischemia has not been widely studied. We present a series of four clinical cases where HBOT and PRP were applied to reverse early ischemic changes in patients with significant risk factors or previous surgical interventions on the operated sites.

MATERIALS AND METHODS

This is a prospective case series involving four patients treated in our clinic between August 2023 and July 2025. All patients presented with clinical signs of compromised tissue perfusion—such as delayed capillary refill, discoloration, venous stasis and decreased local temperature—within the early postoperative period (day 1). These findings were suggestive of localized tissue ischemia.

Each patient underwent a comprehensive clinical evaluation, including review of surgical history, comorbidities, lifestyle risk factors (smoking, alcohol, drastic weight loss etc.), and hormonal or reproductive history.

Clinical Cases

1) A 38-year-old patient with previous breast augmentation in another clinic and the presence of a semicircular scar in the area of the lower pole of the areola-mammillary complex. During the current operation – explantation and implantation of new breast implants, periareolar deepithelization was performed, reaching the previously placed implant. The part of the periprosthetic capsule from the areola-mammillary complex to the level of the inframammary fold was removed. The combination of periareolar deepithelization with subsequent closure and removal of the capsule may be the reason for the development of ischemic suffering of the areola-mammillary complex **(Figure 1).**

2) A 37-year-old patient after massive weight loss and a hypotrophic scar from a previous abdominoplasty in the area of the current incision, which is a predisposing factor for the developed postoperative wound ischemia **(Figure 2).**

3) A 39-year-old patient who preoperatively reported having undergone three courses of *in vitro* procedures in the period 2020-2023. After the second procedure, she had an abortion with partial ischemic necrosis of the uterus. The patient had two successful pregnancies and births by caesarean section - 2013 and 2024. The patient reports high doses of progesterone during the second pregnancy. The hormonal therapies performed, with the subsequent necrosis of the uterus, as well as the existing scars from the caesarean sections could be connected to the circulatory deficiency of the abdominoplasty wound **(Figure 3).**

4) A 59-year-old patient, a long-time active smoker predisposed to developing ischemic suffering due to the postoperative wound after a facelift **(Figure 4).**

Once ischemia was confirmed clinically, all patients received a combined treatment protocol consisting of:

- Hyperbaric Oxygen Therapy (HBOT): Delivered at 1.45 ATA for 60 minutes per session, 2 sessions per day for the first week and 1 session per day for the second week, using Revitalair hyperbaric chamber (2,5,6).
- Platelet-Rich Plasma (PRP): Autologous PRP prepared via HuMax centrifuge by Human for 5 minutes at RCF 1500g. Regenkit-BCT-3 tubes are used for the preparation of the autologous plasma. Injected directly into the ischemic tissue and peri-wound area under sterile conditions, using 32g needle, once per day for the first seven days, right after the HBOT (7).

Each case was documented with serial photographs on the 1st postoperative day, 3th, 7th and 30th postoperative days.

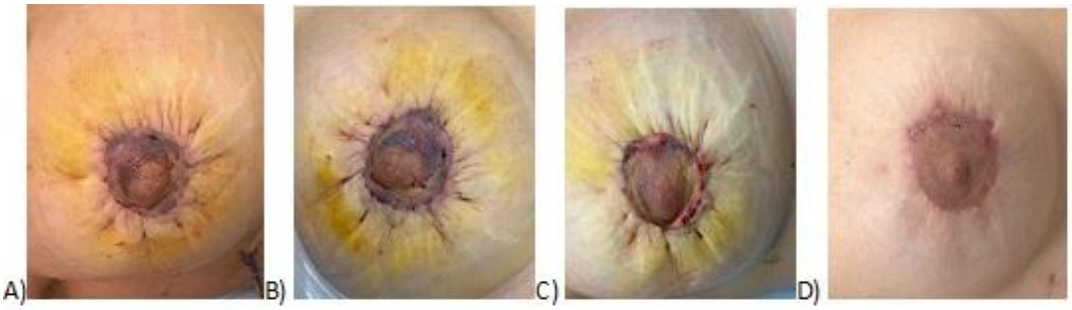

Figure 1. A) 1st postoperative day, B) 3rd postoperative day, C) 7th postoperative day, D) 30th postoperative day.

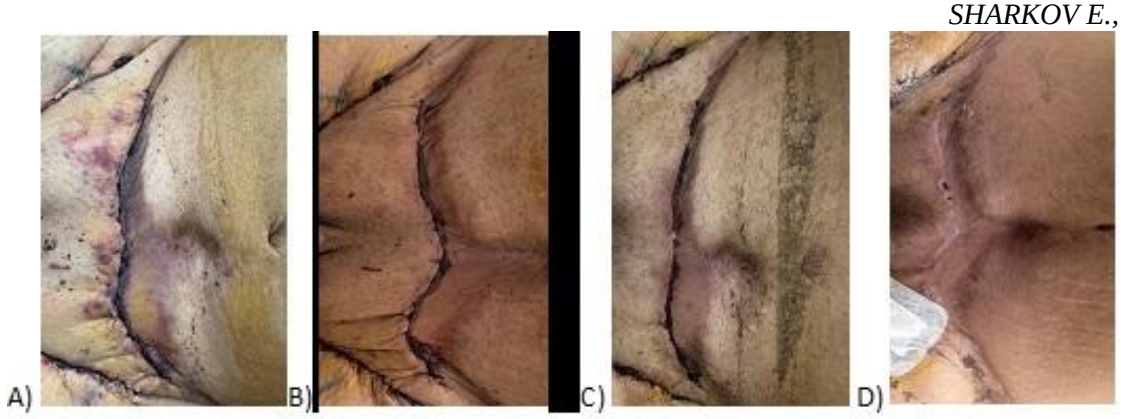

Figure 2. A) 1st postoperative day, B) 3rd postoperative day, C) 7th postoperative day, D) 30th postoperative day.

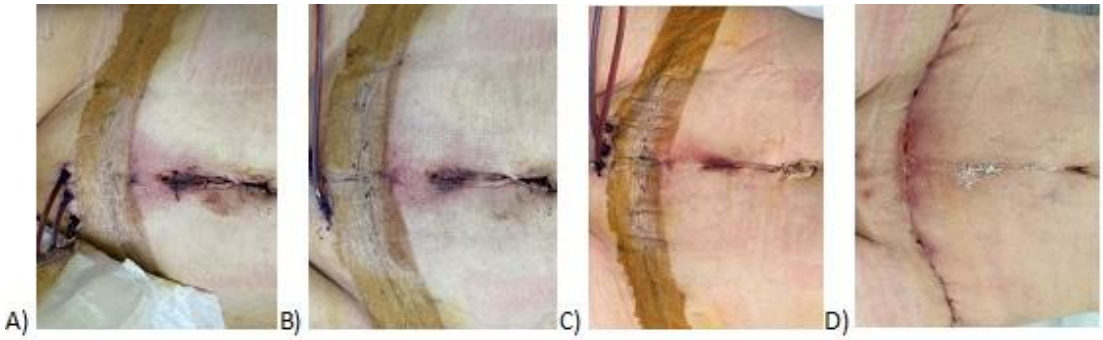

Figure 3. A) 1st postoperative day, B) 3rd postoperative day, C) 7th postoperative day, D) 30th postoperative day – surgical wound is closed by secondary granulation and dressings with nanocrystal silver

Figure 4. A) 1st postoperative day, B) 3rd postoperative day, C) 7th postoperative day, D) 30th postoperative day.

RESULTS

All four patients demonstrated significant improvement in tissue perfusion and wound healing after the initiation of a combined protocol for HBOT and PRP therapy. Early signs of revascularization, such as improved skin coloration, warmth and capillary refill – were observed within 72 hours of treatment. None of the patients required surgical debridement, flap revision, or systematic antibiotic therapy.

All patients with post-surgical scars, despite operating in previously scarred and fibrotic tissue, showed rapid re-vascularization and avoidance of further necrosis.

The heavy smoker patient showed slower, but measurable improvement. The ischemic zones were stabilized and progressed to healing without further surgical intervention.

CONCLUSION

These clinical cases highlight the potential benefit of combining hyperbaric oxygen therapy and platelet-rich plasma in managing postoperative ischemia, particularly in high risk patients with prior surgeries, vascular compromise, or other systematic factors. The observed improvements in tissue perfusion, color and wound stability suggest a great synergistic regenerative effect. The combination of those two therapies appears

safe, well-tolerated by the patients and may reduce the need for surgical revision.

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