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Case Report

Non-Crosslinked Hyaluronic Acid Intralesional Therapy for Post-Mastectomy Scar Retraction and Pain: A Case Report

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ABSTRACT

Scars following mastectomy can lead to chronic pain, restricted mobility, and psychological distress. Intralesional injections with non-crosslinked hyaluronic acid (HA) may offer a minimally invasive solution to improve scar quality and function. A 56-year-old woman presented with a painful, retractile scar after right mastectomy with intraoperative radiotherapy. She experienced movement limitation and was considered a candidate for lipofilling. Two intralesional treatments were performed with Neauvia Hydro Deluxe (non-crosslinked HA + 0.01% CaHA). The patient reported improved tissue pliability, reduced pain, and enhanced mobility. Objective findings included improvements in the POSAS and reductions in pigmentation, vascularity, and scar thickness. The Global Aesthetic Improvement Scale (GAIS) rated the result as "very much improved." This case highlights the potential of non-crosslinked HA for improving scar quality and reducing pain post-mastectomy, providing an alternative or adjunct to surgical revision.

INTRODUCTION

Mastectomy, while life-saving, often leaves behind more than just physical scars. The psychological, aesthetic, and functional consequences of mastectomy scars are well documented, particularly among women for whom breasts carry cultural and personal meaning related to femininity, sexuality, and identity (1–3). Scarring may result in persistent pain, restricted mobility, and body image disturbances, often impacting quality of life long after oncologic treatment ends (1, 4, 5).

From a physiological standpoint, mastectomy scars are frequently hypertrophic, adherent, and retractile due to the extent of surgical excision, underlying tissue loss, and the effects of adjuvant therapies such as radiotherapy. These factors contribute to fibrotic remodeling, vascular compromise, and occasional nerve entrapment, which can produce chronic pain, stiffness, and tissue rigidity (6, 7). Addressing these scars, therefore, requires more than superficial correction; successful treatment must target the deeper extracellular matrix and its altered architecture.

Conventional interventions for scar modulation include massage, laser therapy, microneedling, corticosteroid injections, and surgical revision (8). Recently, the use of injectable agents in regenerative aesthetics has opened new avenues for scar treatment. Among these, non-crosslinked hyaluronic acid (HA) has gained interest for its bioactive properties. Unlike crosslinked HA, which primarily provides structural support and volume, non-crosslinked formulations serve a different role: enhancing hydration, modulating inflammation, and influencing fibroblast behavior within the dermal matrix (9, 10).

In vitro studies have shown that non-crosslinked HA can upregulate collagen and elastin synthesis, promote angiogenesis via VEGF expression, and reduce oxidative stress in dermal cells. These effects may help reverse aspects of pathological scarring, especially in hypovascularized or irradiated tissue. Its uniform diffusion and biocompatibility make it particularly suited for intralesional application in delicate, fibrotic areas. When combined with low concentrations of calcium hydroxyapatite (CaHA), as in some modern formulations, additional stimulation of dermal remodeling may occur without the volumizing effect typical of fillers (9, 11, 12).

This case report presents the clinical and aesthetic outcomes of a patient treated with Neauvia Hydro Deluxe, a formulation containing non-crosslinked HA and 0.01% CaHA for a painful, retracted post-mastectomy scar. The treatment was delivered through targeted intralesional injections, resulting in significant improvement in scar elasticity, pain reduction, and overall tissue quality.

CASE PRESENTATION

Patient history and clinical background

A 56-year-old female patient presented with a painful, retracted scar five years following a right nipple-sparing mastectomy with intraoperative radiotherapy (IORT) for breast cancer. IORT was performed at the time of surgery to enable preservation of the nipple–areola complex in a clinically complex case.

The intralesional treatment described in this report was initiated five years after surgery and radiotherapy. The optimal timing for such intervention remains to be established and may depend on the degree of tissue healing and radiation-induced changes.

The patient reported persistent discomfort at the surgical site, characterized by chronic pain both at rest and during arm movement. The pain was accompanied by a notable restriction in shoulder mobility, and the patient described a sensation of scar tightness, particularly exacerbated during upper limb elevation. Additionally, she expressed significant psychological distress related to the appearance and altered sensation of the scar, which negatively impacted her body image and emotional well-being.

On clinical examination, the scar appeared visibly retracted and adhered to the underlying tissues. Palpation revealed fibrotic stiffness and reduced skin pliability. Assessment using the Patient and Observer Scar Assessment Scale (POSAS) indicated unfavorable scar characteristics, including increased pigmentation, vascularity, and thickness. Given these findings, the patient was evaluated as a candidate for lipofilling; however, she elected to pursue a non-invasive, injectable approach.

Treatment protocol

The selected treatment involved the use of Neauvia Hydro Deluxe (Matex Lab, Switzerland), a biostimulatory injectable formulation composed of non-crosslinked hyaluronic acid (18 mg/mL) combined with 0.01% calcium hydroxyapatite (CaHA). A total of two treatment sessions were administered, spaced 30 days apart. Each session included intralesional microinjection of 2.5 mL of the product using a 30-gauge needle, resulting in visible papules at the injection sites.

Injection technique

Injections were performed directly into the fibrotic and retracted scar tissue, with the formation of visible papules confirming appropriate intradermal placement (Figure 1). The use of a cannula was avoided because it proved painful, technically challenging, and ineffective at penetrating the dense fibrotic tissue.

In areas of marked fibrosis, careful serial puncture with the needle allowed progressive delivery of the product, facilitating its distribution within the scar without the need for extensive mechanical disruption. Throughout the procedure, particular attention was paid to maintaining a safe injection depth to avoid contact with the underlying breast implant. This approach enabled precise targeting of the affected areas while minimizing patient discomfort and procedural risk.

Figure 1. *Close-up view of the post-mastectomy scar immediately after intralesional injection of Neauvia Hydro Deluxe. The image shows localized erythema and pinpoint bleeding at injection sites, consistent with microperforations created by a 30G needle. The scar appears fibrotic and hypertrophic with visible retraction and surface irregularities.*

Clinical outcomes

Following the first treatment, the patient reported a marked reduction in both passive and active pain, as well as a noticeable increase in tissue hydration and elasticity. After the second session, further clinical improvements were observed. The scar demonstrated a softer, more pliable texture and improved coloration (Figures 2, 3). Objective assessment revealed measurable reductions in vascularity, pigmentation, and scar thickness, as measured on the POSAS scale. Both the patient and the treating clinician independently rated the outcome as "very much improved" on the Global Aesthetic Improvement Scale (GAIS). No adverse effects, complications, or delayed reactions were noted throughout the treatment or follow-up period.

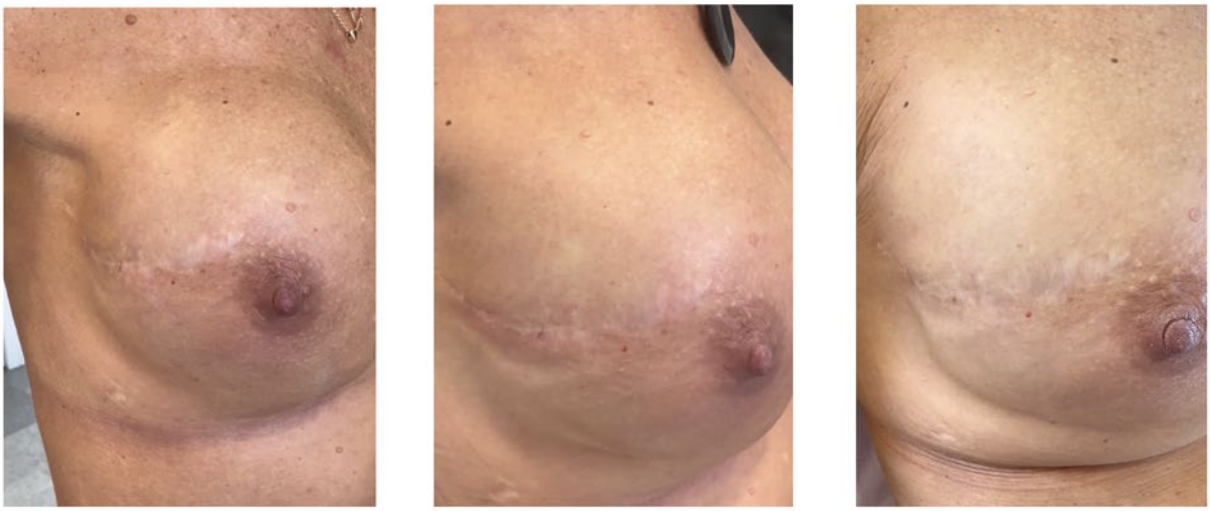

Figure 2. *Clinical outcomes after two sessions of intralesional Neauvia Hydro Deluxe injection. The images demonstrate visible improvement in scar texture and color. Retraction and fibrosis are reduced, with a smoother contour and less pigmentation.*

Figure 3. *Assessment of scar elasticity and pliability before and after treatment. Sequential images demonstrate improved tissue flexibility and softness of the post-mastectomy scar, as assessed by manual skin pinching. After each treatment session with Neauvia Hydro Deluxe, the scar shows greater mobility and reduced tension, correlating with patient-reported reductions in pain and tightness.*

Ethical considerations

The patient provided written informed consent for photographic documentation and the publication of this case report.

DISCUSSION

Post-mastectomy scar formation, particularly after oncologic surgery and radiotherapy, represents a complex therapeutic challenge with both physical and psychological dimensions. These scars often extend deep into the subcutaneous layers, binding fascial planes, entrapping nerves, and restricting movement, frequently resulting in chronic pain and emotional distress (1, 3, 4). The patient described in this report exhibited all of these features, including a dense, adherent, and painful scar with reduced elasticity and shoulder mobility.

Beyond the physical sequelae, post-mastectomy scars profoundly impact body image and self-perception. Slatman et al. described how many women perceive their scarred chest as alien, reflecting a disruption in bodily identity (1), while Davies et al. emphasized the coexistence of gratitude and grief in the perception of these scars (4). Effective treatment, therefore, must address both the functional and sensory dimensions of recovery while minimizing further invasiveness.

Current management strategies range from physiotherapy and massage to surgical revision techniques such as lipofilling or flap reconstruction. However, many conservative approaches focus on surface texture or appearance rather than addressing deep fibrosis, adhesion, and vascular compromise. In a randomized controlled trial, Górecki et al. showed that targeted myofascial therapy achieved greater improvement in scar mobility and shoulder function compared to standard physiotherapy, underscoring the value of addressing deeper fascial restrictions (13).

In the present case, a two-session protocol using Neauvia Hydro Deluxe, a non-crosslinked hyaluronic acid (HA) enriched with low-dose calcium hydroxyapatite (CaHA), was employed to soften the fibrotic scar and restore tissue elasticity. Biologically, HA supports dermal hydration, fibroblast viability, and extracellular matrix (ECM) organization. Zerbinati et al. demonstrated that non-crosslinked HA increased VEGF secretion

and reduced IL-8 expression in keratinocytes, suggesting pro-angiogenic and anti-inflammatory effects (9). Clinically, jet injection of HA has been associated with improved skin texture and elasticity (14).

CaHA, even at low concentrations, acts as a regenerative stimulant by promoting fibroblast proliferation, collagen and elastin synthesis, and angiogenesis (15, 16). The combination of HA with microdosed CaHA has been hypothesized to provide complementary remodeling effects, potentially enhancing dermal structure without a volumetric effect (12). While controlled trials in irradiated or post-surgical scars are still limited, the rationale for this dual approach is supported by accumulating experimental and clinical data.

After two sessions, the patient reported a marked reduction in both resting and movement-related pain and regained measurable shoulder mobility. POSAS assessment confirmed improvements in pigmentation, vascularity, and scar thickness. Subjectively, the patient described the tissue as "softer" and "more alive," aligning with qualitative improvements in self-perception. Both patient and clinician rated the outcome as "very much improved" on the Global Aesthetic Improvement Scale.

The observed pain relief deserves attention. Although HA lacks direct analgesic properties, its ability to restore hydration and mechanical balance may reduce tension on nociceptors within fibrotic tissue. Even minimal increases in pliability can relieve strain on entrapped nerve endings. Importantly, the mechanical disruption of fibrotic adhesions (subcision effect) that occurs during needle insertion and product deposition should be acknowledged as a potentially significant contributing factor to the observed clinical improvement. It is therefore difficult to distinguish, on the basis of a single case, the relative contributions of the biostimulatory properties of the injected formulation from those of the mechanical release itself.

Comparable outcomes have been observed with other non-invasive modalities. Leung et al. reported that mechanical scar stimulation significantly enhanced mobility and appearance compared to standard therapy (17), while MacGillis and Vinshtok documented favorable remodeling of hypertrophic and atrophic scars following high-velocity pneumatic HA delivery (14). While these observations are encouraging, controlled studies are needed to confirm whether minimally invasive HA-based interventions can reliably improve scar structure, function, and patient well-being in this specific clinical context.

Nevertheless, the limitations of this case must be recognized. As a single-patient observation, it lacks comparative data and long-term follow-up. The duration of improvement and the specific biological pathways involved, whether through hydration, fibroblast activation, or inflammatory modulation, remain to be clarified. Patient-specific factors such as age, radiation exposure, and prior treatments may also influence results and should be considered in future studies.

Despite these limitations, this case suggests that HA-based regenerative therapy may have a role as part of a multimodal approach to complex scar management, particularly when combined with mechanical release techniques. However, further evidence from controlled studies is needed before definitive recommendations can be made.

Future research should aim to validate these findings in controlled clinical settings, ideally comparing HA–CaHA combinations with existing methods such as lipofilling, corticosteroids, or laser-assisted remodeling. Integration with physiotherapy, laser resurfacing, or platelet-rich plasma may further enhance outcomes. For patients unwilling or unable to undergo additional surgery, such minimally invasive, biologically active treatments may represent a promising complementary option for improving both function and quality of life.

Conflict of Interest

The author declares no conflicts of interest related to this work. The author has no financial or personal relationships that could inappropriately influence or bias the content of this publication.

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REFERENCES

1. Slatman J, Halsema A, Meershoek A. Responding to scars after breast surgery. Qual Health Res. 2016;26(12):1614-1626. doi:10.1177/1049732315591146.
2. Doh H, Pompper D. Beyond the wounds: the SCAR Project as space for examining breast cancer and mastectomy experiences. Soc Semiot. 2015;25(5):597-613. doi:10.1080/10350330.2015.1041792.
3. Hasan S, Chew KS, Balang RV, Wong SSL. Beyond the scars: a qualitative study on the experiences of mastectomy among young women with breast cancer in a country with crisis. BMC Womens Health. 2023;23(1):596. doi:10.1186/s12905-023-02734-0.
4. Davies CC, Brockopp D, Moe K, Wheeler P, Abner J, Lengerich A. Exploring the lived experience of women immediately following mastectomy: a phenomenological study. Cancer Nurs. 2017;40(5):361. doi:10.1097/NCC.0000000000000413.
5. Salati SA, Alsulaim L, Alharbi MH, Alghamdi FA, Alharbi AA, Alqahtani MS, Alharbi AA, Alshammari FA, Alharbi RA, Alharbi RS. Postmastectomy pain syndrome: a narrative review. Cureus. 2023;15(10):e47384. doi:10.7759/cureus.47384.
6. Warner RM, Wallace DL, Ferran NA, Dunn RL, Butler PE. Mastectomy scars following breast reconstruction: should routine histologic analysis be performed? Plast Reconstr Surg. 2009;123(4):1141-1147. doi:10.1097/PRS.0b013e31819f25d5.
7. Rosso R, Scelsi M, Carnevali L. Granular cell traumatic neuroma. Arch Pathol Lab Med. 2000;124(5):709-711. doi:10.5858/2000-124-0709-GCTN.
8. Meretsky CR, Polychronis A, Schiuma AT. A comparative analysis of the advances in scar reduction: techniques, technologies, and efficacy in plastic surgery. Cureus. 2024;16(8):e66806. doi:10.7759/cureus.66806.
9. Zerbinati N, Sommatis S, Maccario C, Capillo MC, Rauso R, Bassi A, D'Este E, Gallo R, Montanari E. In vitro evaluation of the effect of a not cross-linked hyaluronic acid hydrogel on human keratinocytes for mesotherapy. Gels. 2021;7(1):15. doi:10.3390/gels7010015.
10. Rho NK, Kim HS, Kim SY, Lee W. Injectable "skin boosters" in aging skin rejuvenation: a current overview. Arch Plast Surg. 2024;51(6):528-541. doi:10.1055/a-2366-3436.
11. Cavallini M. Layered biorevitalization: the sandwich technique combined with Neauvia Hydro Deluxe for enhanced skin quality. J Appl Cosmetol. 2025;43(2):Ahead of print.
12. Yutskovskaya YaA, Kogan EA, Koroleva AYu, Galadari HI. Comparative clinical and histomorphologic evaluation of the effectiveness of combined use of calcium hydroxyapatite and hyaluronic acid fillers for aesthetic indications. Dermatol Clin. 2024;42(1):103-111. doi:10.1016/j.det.2023.06.011.
13. Górecki M, Naczk M, Doś J, Anioła B, Majchrzycki M, Marszałek S. Mind the gap: treating post-surgical scar tissue in post-mastectomy patients – a randomized clinical trial. Physiother Q. 2024;32(3):45-51. doi:10.5114/pq/175037.
14. MacGillis D, Vinshtok Y. High-velocity pneumatic injection of non-crosslinked hyaluronic acid for skin regeneration and scar remodeling: a retrospective analysis of 115 patients. J Cosmet Dermatol. 2021;20(4):1098-1103. doi:10.1111/jocd.14002.
15. Aguilera SB, McCarthy A, Khalifian S, Lorenc ZP, Goldie K, Chernoff WG. The role of calcium hydroxylapatite (Radiesse) as a regenerative aesthetic treatment: a narrative review. Aesthet Surg J. 2023;43(10):1063-1090. doi:10.1093/asj/sjad173.

16. Amiri M, Meçani R, Niehot CD, van Loghem JAJ, Velthuis PJ, Schuurman AH, Mullenders J, Niessen FB. Skin regeneration-related mechanisms of calcium hydroxylapatite (CaHA): a systematic review. Front Med. 2023;10. doi:10.3389/fmed.2023.1195934.
17. Leung AKP, Ouyang H, Pang MYC. Effects of mechanical stimulation on mastectomy scars within 2 months of surgery: a single-center, single-blinded, randomized controlled trial. Ann Phys Rehabil Med. 2023;66(5):101724. doi:10.1016/j.rehab.2022.101724.