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Case Report

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Successful Treatment of Acneiform Rash Induced by Trastuzumab as Neoadjuvant Therapy for Breast Cancer with a 595 nm Pulsed Dye Laser: A Case Report

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Abstract

Introduction: Trastuzumab is now increasingly being used as a potent HER2 inhibitor in treating breast cancer, while acneiform rashes sometimes arise as skin-related side effects in patients undergoing treatment with HER2 inhibitors, and their specificity as drug-induced eruptions makes their management quite challenging. Pulsed dye laser (PDL) therapy has been utilized to treat a wide variety of vascular lesions, achieving excellent outcomes.

Case Report: A 595 nm PDL was used to treat a 38-year-old woman suffering from an acneiform rash induced by trastuzumab as neoadjuvant therapy for breast cancer. One-half of the face received PDL treatment, while the other half served as the control.

Conclusion: After just one PDL treatment, the skin lesion demonstrated a remarkable improvement, with a significant reduction in erythematous papules and inflammatory pustules, as well as an improvement in skin thickening. PDL therapy might offer an effective alternative for managing acneiform rashes induced by trastuzumab.

Keywords: Laser therapy; Exanthema; Trastuzumab; Drug eruptions; Case report.

Introduction

Since human epidermal growth factor receptor 2 (HER2) is often overexpressed in breast cancer cells, HER2 inhibitors are being used in breast cancer treatment more and more frequently. While the arrival of medications that block HER2 activity has improved results, cutaneous adverse effects have increased. Acneiform rashes as drug eruptions are typically observed in patients receiving HER1/EGFR inhibitors; however, some individuals receiving HER2 inhibitors have also reported experiencing the same skin lesions.[1] Regretfully, this kind of drug rash, especially on the face, may lead to the patient stopping medication or adjusting the dosage, which can affect the treatment of the primary disease. Despite conventional treatment options, the management of acneiform rashes remains challenging due to the need for rapid and effective treatment. In the clinical setting, pulsed dye laser (PDL) therapy has been utilized to treat a broad range of vascular lesions, including inflammatory conditions like acne and psoriasis, with excellent results. This case report presents the successful use of PDL therapy for the treatment of an acneiform rash induced by trastuzumab as neoadjuvant therapy for breast cancer.

Case Report

A 38-year-old woman with invasive cancer of the right breast suffered numerous erythematous papules and inflammatory pustules on her face (Figure 1a), along with skin thickening and dilated capillaries, on day 14 of neoadjuvant therapy. The patient felt the facial rash as mildly pruritic and painless, with no previous history of dermatological problems. The patient received six sessions of neoadjuvant TCbHP (trastuzumab, pertuzumab, nab-paclitaxel, and carboplatin). Trastuzumab was given initially at 8 mg/kg, followed by 6 mg/kg d1, q3w. Pertuzumab was given initially at 840 mg, followed by 420 mg d1, q3w. The doses of nab-paclitaxel and carboplatin were 260 mg/m2 and AUC = 6 mg/mL/min, respectively. After the completion of 6 sessions of neoadjuvant therapy, the patient underwent a right mastectomy for breast cancer and received a postoperative targeted therapy with a regimen of trastuzumab (6 mg/kg d1, q3w) and pertuzumab (420 mg d1, q3w). Although her facial rash had never subsided since its onset, she had refrained from seeking treatment for it, considering that she was still undergoing neoadjuvant therapy and was concerned that her body might not be able to tolerate the side effects of additional medications. It was not until she completed the second phase of postoperative targeted therapy that she sought treatment in our department.

Based on her medical history and clinical evaluation, the patient was diagnosed with a trastuzumab-induced

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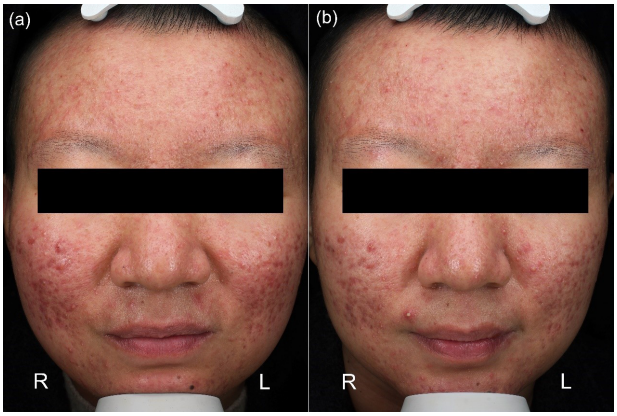

Figure 1 Clinical Pictures of the Patient. (a) Before treatment. (b) On the seventh day after the first PDL treatment

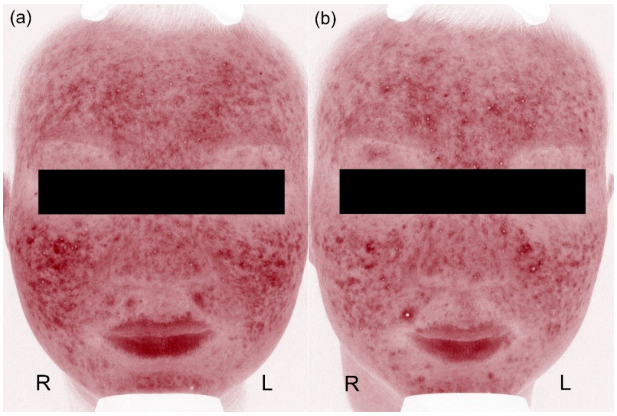

Figure 2. RBX Red Images Generated by RBX® Technology. (a) Before treatment. (b) On the seventh day after the first PDL treatment

acneiform rash. Considering the patient's concerns about the side effects of medical treatments, we introduced her to the distinct advantages of PDL therapy in the treatment of acneiform rashes, such as specific targeting of vascular lesions, reduction of inflammatory response, significant efficacy with fewer side effects, and the fact that our clinical experience has shown PDL therapy to be effective and safe in similar cases. With the patient's consent, the left side of her face was treated with a 595-nm PDL (Vbeam Perfecta, Syneron, Inc., USA) using the following settings: spot size of 7 mm, fluence of 6.25-6.75 J/cm^2, and pulse width of 1.5 ms without topical anesthesia, while the right side of the face was left untreated for comparison. The patient was instructed to wash her face with a facial cleanser and dry the residual water before the PDL treatment, and she was also instructed to avoid direct sunlight after the treatment was completed. As the patient was still in the stage of targeted therapy, she did not receive other treatments for acneiform rashes because she was anxious that she would not be able to afford the side effects of topical or systemic use of medications. Before and after the treatment, clinical photographs were taken and analyzed by using VISIA (Canfield Imaging Systems, Fairfield, NJ).

On the seventh day after the first PDL treatment, the patient returned for a follow-up visit and was photographed. It was found that after only one PDL treatment, the patient's rash on the left side of the face had significantly improved in comparison with the pre-treatment rash (Figure 1b), with a marked reduction in erythematous papules and inflammatory pustules and improvement in skin thickening. The RBX Red images showed a significant reduction in the red area after PDL treatment (Figure 2), indicating a reduction in inflammation and angiogenesis. Meanwhile, compared to the right side of the face, the left side treated with the PDL showed a greater improvement. Written informed consent was obtained from the patient for her anonymized clinical information and photographic material to be published in this case report.

Discussion

In this case, the preoperative neoadjuvant treatment regimen consisted of four drugs: nab-paclitaxel, carboplatin, trastuzumab, and pertuzumab. It is worth noting that the rash occurred in the autumn and winter, and the site of the rash was concentrated on the face and did not involve the body, indicating that the drug rash may be related to photosensitivity caused by sunlight exposure. However, when the postoperative targeted therapy contained only two drugs, trastuzumab and pertuzumab, the patient's rash did not show any improvement, so it can be presumed that nab-paclitaxel and carboplatin were not the main causes of the acneiform rash in this patient. Based on the mechanisms of action of pertuzumab and published findings, we believe that the skin lesion in this case can most appropriately be attributed to trastuzumab.

Trastuzumab can specifically inhibit HER2, which is a member of the epidermal growth factor receptor family. Acneiform rashes as drug eruptions are significantly associated with EGFR/HER1 inhibitions; nevertheless, there have also been reports of HER2 inhibitors-induced acneiform rashes. Human keratinocytes express the HER1 receptors abundantly in the skin, and these receptors are crucial for keratinocyte growth in the basal layer. HER1 inhibitors cause changes in the stratum corneum by interfering with cell growth. Additionally, they can trigger the expression of chemokines that promote inflammation and keratinocyte apoptosis,[2] leading to hyperkeratosis, follicular plugs, and localized inflammation, which can eventually develop into an acneiform rash. Furthermore, human keratinocytes have been found to express HER2, especially in the spinous layer, which is considered to be associated with cellular differentiation.[3] It has been noted that HER2 inhibitions can lead to acneiform rashes as shown in clinical cases, albeit the precise mechanism by which HER2 inhibitors produce skin modifications remains unclear. It has been speculated that this may be due to the inhibitions of HER2 homodimers or HER1-HER2 heterodimers in the skin.[1]

Conventional treatments for acneiform rashes usually

include topical and systemic treatments. Topical medications, such as corticosteroids, retinoids, and antibiotic creams, offer the advantage of convenience and fewer side effects; the disadvantage is that they may be slow to work and require long-term use. Systemic treatments, such as oral retinoids and antibiotics, on the one hand, may be more effective in severe acneiform rashes, but on the other hand, they may have more side effects, which may not be permitted by the physical condition of some specialized patients. The withdrawal of the drug or dose adjustment is often the most effective treatment clinicians can quickly associate with severe drug rashes; however, in this particular case, such measures would have adversely affected the treatment of the primary disease. It is quite meaningful to find a way to maintain patient adherence to treatment of the primary disease while also managing acneiform rashes effectively.

Considering that acneiform rashes are characterized by erythema, inflammatory pustules, and dilated capillaries, we speculated that PDL therapy would help to reduce the rash. In this case, we found that PDL therapy was highly effective in treating trastuzumab-induced acneiform rashes, especially in reducing inflammation and eliminating redness, as shown in the before-after and left-right comparisons of PDL therapy. The PDL typically emits light at wavelengths of 585 nm or 595 nm, which are readily absorbed by oxygenated hemoglobin. This reduces inflammatory mediators and modulates vascular proliferation associated with inflammation, thereby reducing the skin's inflammatory response.[4,5] Meanwhile, the PDL is thought to reduce sebum production by decreasing sebaceous gland activity.[6,7] In addition, previous research has shown that PDL increases the expression of TGF-β1, a cytokine essential for eliminating inflammation, and also plays an essential role in initiating wound healing.[8] In the future treatment of trastuzumab-induced acneiform rashes, we suggest that PDL therapy could be considered as part of the treatment regimen in combination with topical hormones, antibiotics, and sun avoidance to obtain better therapeutic efficacy and to increase patient adherence to treatment of the primary disease. We recommend 3-5 treatments at one-month intervals when treating trastuzumab-induced acneiform rashes with PDL therapy. Our recommended treatment endpoints are a substantial reduction of inflammatory pustules in the patient's rash and a gradual change in skin color from red to normal. However, the specific pathogenic mechanism of trastuzumab-induced acneiform rashes and the mechanism of PDL therapy for trastuzumab-induced acneiform rashes require further research.

Conclusion

PDL therapy offers a promising therapeutic option for the management of trastuzumab-induced acneiform rashes, and its potential to improve patient adherence to neoadjuvant therapies and patient mental health is significant.

Authors' Contribution

Conceptualization: Yunchuan Yang.
Data curation: Yuanxin Li.
Formal analysis: Yunchuan Yang.
Investigation: Shuo Sun.
Methodology: Yunchuan Yang.
Project administration: Yuangang Lu.
Resources: Yunchuan Yang.
Software: Shuo Sun.
Supervision: Yuangang Lu.
Validation: Jingying Guo.
Visualization: Jingying Guo.
Writing–original draft: Yuanxin Li.
Writing–review editing: Yuangang Lu.

Competing Interests

All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

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Informed Consent

Written informed consent was obtained from the patient(s) for their anonymized clinical information and photographic material to be published in this case report.

References

1. Sheu J, Hawryluk EB, Litsas G, Thakuria M, LeBoeuf NR. Papulopustular acneiform eruptions resulting from trastuzumab, a HER2 inhibitor. Clin Breast Cancer. 2015;15(1):e77-81. doi: 10.1016/j.clbc.2014.09.003.
2. Mascia F, Mariani V, Girolomoni G, Pastore S. Blockade of the EGF receptor induces a deranged chemokine expression in keratinocytes leading to enhanced skin inflammation. Am J Pathol. 2003;163(1):303-12. doi: 10.1016/s0002-9440(10)63654-1.
3. De Potter IY, Poumay Y, Squillace KA, Pittelkow MR. Human EGF receptor (HER) family and heregulin members are differentially expressed in epidermal keratinocytes and modulate differentiation. Exp Cell Res. 2001;271(2):315-28. doi: 10.1006/excr.2001.5390.
4. Bhardwaj SS, Rohrer TE, Arndt K. Lasers and light therapy for acne vulgaris. Semin Cutan Med Surg. 2005;24(2):107-12. doi: 10.1016/j.sder.2005.04.001.
5. Karsai S, Schmitt L, Raulin C. The pulsed-dye laser as an adjuvant treatment modality in acne vulgaris: a randomized controlled single-blinded trial. Br J Dermatol. 2010;163(2):395-401. doi: 10.1111/j.1365-2133.2010.09806.x.
6. Hamilton FL, Car J, Lyons C, Car M, Layton A, Majeed A. Laser and other light therapies for the treatment of acne vulgaris: systematic review. Br J Dermatol. 2009;160(6):1273-85. doi: 10.1111/j.1365-2133.2009.09047.x.
7. Jih MH, Kimyai-Asadi A. Laser treatment of acne vulgaris. Semin Plast Surg. 2007;21(3):167-74. doi: 10.1055/s-2007-991185.
8. Seaton ED, Mouser PE, Charakida A, Alam S, Seldon PM, Chu AC. Investigation of the mechanism of action of nonablative pulsed-dye laser therapy in photorejuvenation and inflammatory acne vulgaris. Br J Dermatol. 2006;155(4):748-55. doi: 10.1111/j.1365-2133.2006.07429.x.