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CASE REPORT

Successful Treatment of Childhood Nail Lichen Planus with Ruxolitinib Cream: A Case Report

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Abstract: The role of oral JAK inhibitors in the treatment of nail lichen planus (NLP) has recently been reported, but there have been no literature reports on the treatment of NLP with topical Janus kinase (JAK) inhibitor. We present, for the first time, a preliminary clinical experience with topical ruxolitinib cream, a JAK inhibitor, in a child with NLP. The remarkable results suggest topical ruxolitinib cream may be a potential treatment option for NLP.

Keywords: nail lichen planus, child, Janus kinase inhibitor, ruxolitinib cream

Introduction

Nail lichen planus (NLP) is a chronic inflammatory disease that significantly impacts patients' quality of life. However, to date, there have been no clinical studies dedicated to NLP, and there are few reports on successfully cured cases. Although there have been isolated case reports suggesting that Janus kinase (JAK) inhibitors may be effective in treating NLP, these reports exclusively involve oral JAK inhibitors (JAKIs) in adults, with no documented use of topical applications or pediatric cases. Herein, we report a child with NLP who exhibited a favorable response to ruxolitinib treatment.

Report of a Case

Patient was a 10-year-old boy with a history of bilateral hand nail dystrophy and vitiligo for 3 years. In the recent month, he exhibited partial distal nail cracking and nail plate defect, prompting his visit to our hospital for treatment. Typical signs of NLP were observed by physical examination (Figure 1A and B) and dermoscopy (Figure 1C and D), including nail bed fragmentation, longitudinal ridges and grooves, distal splitting, and dorsal pterygium, which led to a clinical diagnosis of NLP. Topical corticosteroids have shown limited therapeutic effectiveness in NLP, and intralesional injection or oral systemic administration carry the risk of complications. As such, upon discovering that the patient was using topical ruxolitinib cream to treat his vitiligo lesions, we decided to also utilize ruxolitinib cream twice daily for managing his NLP. After 2 months, the patient exhibited the growth of flat new nails with a noticeable improvement in nail shape. After 10 months of treatment, the patient's nails had essentially restored to a flat and smooth condition (Figure 1E–H).

As of this writing, this child continues to apply ruxolitinib cream and no adverse reactions have been noted.

Discussion

NLP is considered a potentially critical condition of the nails that often leads to atrophy or scarring if left untreated.[1] Treatment options are primarily derived from expert advice, clinical studies and case reports. As a subtype of lichen planus (LP), NLP shares similar pathophysiological mechanisms with LP.[2] Although the mechanisms leading to LP are not fully understood, immune dysregulation has been suggested to be strongly relevant in the pathophysiology of LP.[1] Activated T cells, principally cytotoxic $CD8^+$ cells, launch an auto-immune attack against basal keratinocytes, assisted by $CD4^+$ helper T cells via secretion of T_H1 cytokines.

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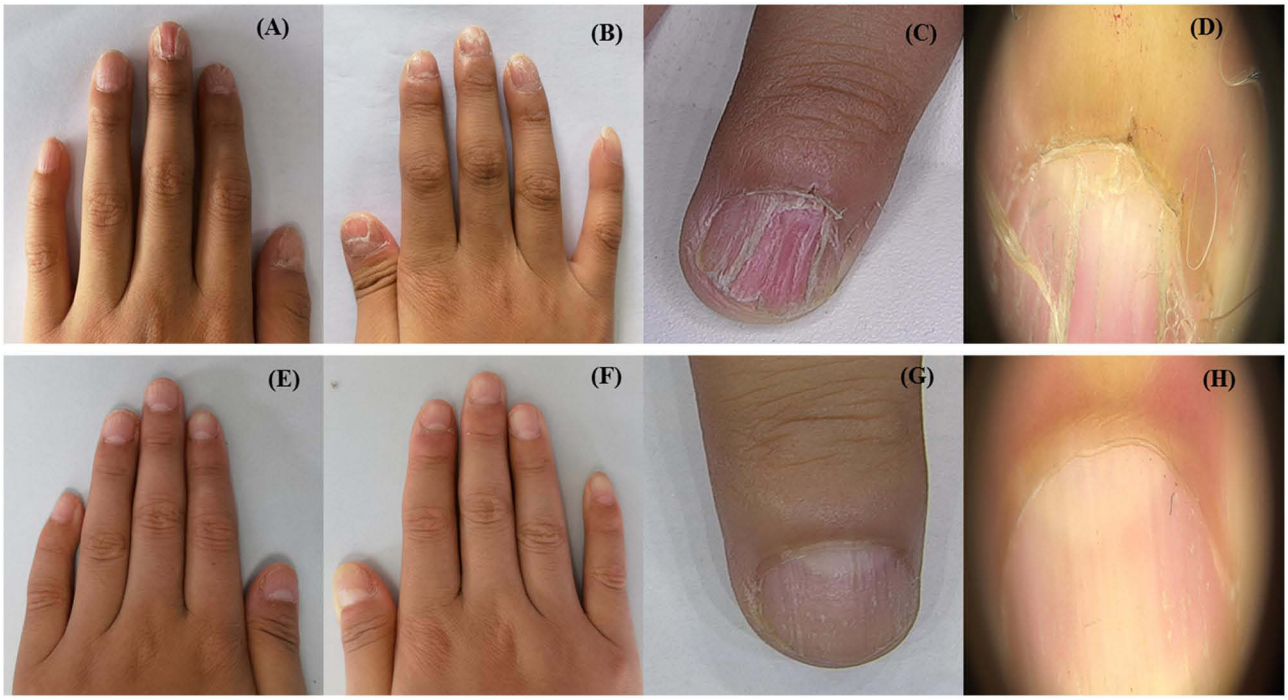

Figure 1 (**A** and **B**) A 10-year-old boy with nail lichen planus. (**C** and **D**) Dermoscopy imagery before treatment. (**E** and **F**) Complete clearance after 10 months of treatment with ruxolitinib. (**G** and **H**) Dermoscopy imagery after treatment.

Based on the observation that interferon-gamma (IFN-γ)-induced chemokines, including CXCL10 and CXCL9, are significantly upregulated in both the serum and skin/mucosal lesions of patients, Lernia first proposed that the IFN-γ/CXCL10 axis is critical for the initiation and persistence of chronic inflammation in LP and hypothesized that JAKIs, by blocking IFN-γ signaling and downstream CXCL10 expression, could be a potential therapeutic strategy for LP.[3] This hypothesis was subsequently supported by multiple studies. For instance, Shao et al demonstrated that IFN-γ enhances cell-mediated cytotoxicity against keratinocytes via JAK2/STAT1 signaling.[4] Additionally, Pietschke et al observed high expression of interleukin (IL)-21 in LP skin lesions, which activates $CD8^+$ T cells through the STAT1/STAT3 pathway.[5] In recent years, accumulating clinical evidence from case reports and investigations has further substantiated the clinical relevance of this theoretical framework. To date, six published cases report successful treatment of NLP with JAKIs, including tofacitinib,[6,7] baricitinib,[8] and abrocitinib,[2,9] which collectively indicate promising efficacy and safety profiles of JAKIs for NLP.

Notably, there is a lack of literature specifically focusing on the use of ruxolitinib for NLP; however, in a prospective Phase II clinical study, Brumfiel et al demonstrated that topical ruxolitinib exhibits high efficacy in the treatment of cutaneous LP.[10] After 4 weeks of ruxolitinib treatment, the total lesion count decreased by a median of 50 lesions, and modified Composite Assessment of Index Lesion Severity (mCAILS) scores were significantly reduced.

Molecularly, when type I/II cytokines (eg, IFN-γ, IL-21) bind to their receptors, a signaling cascade is initiated from the cell membrane to the nucleus: type I/II cytokine receptors oligomerize and then recruit JAKs, which then activate STAT proteins via tyrosine residue phosphorylation. Subsequently, this activation prompts STAT dimerization and translocation into the nucleus, ultimately regulating cytokine expression.[11] Significantly, JAK1-deficient mutant cell lines exhibit defects in IFN-1 and IFN-2 signaling, whereas JAK2-deficient cell lines show impairments in IFN-γ signaling.[12] As a result, as a selective inhibitor of both JAK1 and JAK2, ruxolitinib treatment of LP leads to a reversal in the expression profiles of 12 interferon-stimulated genes.[10] This reversal reflects the blockade of cytotoxic T-cell responses and the induction of anti-apoptotic signaling, which may underlie the rapid and effective therapeutic potential of ruxolitinib in NLP.

In our patient, the remarkable results suggest topical ruxolitinib cream may be a potential treatment option for childhood NLP. More case reports and clinical observations are needed to investigate the potential benefit of ruxolitinib in nail lichen planus and the maintenance of the response.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement and Informed Consent

The ethics committee of Hangzhou Third People's Hospital approved to publish the case details (2023ka047). Written informed consent for publication of case details and accompanying images was provided by the patient's parents.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

No known potential conflicts of interest with this work.

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