Elafin in Behçet's Disease: A Potential Link Between Neutrophilic Inflammation and Disease Activity

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Abstract

Background: Behçet's disease (BD) is a chronic, relapsing, multisystem inflammatory disorder characterized by recurrent mucocutaneous lesions, ocular involvement, and systemic manifestations, with a pathogenesis strongly driven by neutrophilic hyperactivity and dysregulated innate immunity. Among emerging biomarkers reflecting neutrophil-mediated inflammation, elafin—also known as peptidase inhibitor 3 (PI3)—has gained increasing attention due to its role as an endogenous inhibitor of neutrophil elastase and proteinase-3, as well as its immunomodulatory and anti-inflammatory properties.

The aim of this review is to explore the role of serum elafin in Behçet's disease, with particular emphasis on its relationship to neutrophilic inflammation and its potential utility as a biomarker for disease activity. We analyze current evidence regarding elafin expression, its regulatory mechanisms in inflammatory conditions, and its correlation with clinical manifestations and disease severity in BD. Furthermore, we discuss how elafin may reflect the balance between proteolytic activity and host defense, particularly in diseases characterized by excessive neutrophil activation.

Available evidence suggests that elafin levels are elevated in inflammatory states and may correlate with markers of disease activity, including acute phase reactants and cytokine profiles. In Behçet's disease, where neutrophil hyperreactivity plays a central pathogenic role, elafin may serve as a compensatory anti-protease response to increased elastase activity. This dynamic interaction highlights its potential as a sensitive biomarker for monitoring disease activity and possibly predicting flares. However, current data remain limited and sometimes inconsistent, necessitating further well-designed studies.

In conclusion, elafin represents a promising biomarker linking neutrophilic inflammation to disease activity in Behçet's disease. Its dual role as both a regulator of protease activity and an immunomodulatory molecule positions it as a potential tool for disease monitoring and therapeutic targeting. Future research should focus on validating its clinical utility and integrating it into multimarker approaches for improved disease assessment.

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Keywords: *Elafin ,Behçet's Disease, Disease Activity*

Introduction

Behçet's disease (BD) is a chronic, relapsing, multisystem vasculitic disorder of unknown etiology, characterized by recurrent oral and genital ulcers, ocular inflammation, skin lesions, and variable systemic involvement including vascular, neurological, and gastrointestinal manifestations. The disease is most prevalent along the ancient Silk Road, particularly in countries of the Middle East and East Asia, suggesting a complex interplay between genetic predisposition and environmental triggers. Among genetic factors, the strong association with HLA-B51 highlights a significant immunogenetic component, although it does not fully explain disease heterogeneity or activity patterns. The clinical course of BD is marked by unpredictable exacerbations and remissions, necessitating reliable biomarkers for disease monitoring and prognostication [1,2].

The pathogenesis of Behçet's disease is primarily driven by dysregulation of the innate immune system, with a central role attributed to neutrophilic hyperactivity. Neutrophils in BD exhibit increased chemotaxis, phagocytosis, and reactive oxygen species production, contributing to endothelial dysfunction and tissue injury. Neutrophil extracellular traps (NETs) and excessive release of proteolytic enzymes such as neutrophil elastase further amplify inflammation and vascular damage. This exaggerated neutrophilic response not only initiates but also perpetuates the inflammatory cascade, linking innate immunity with adaptive immune dysregulation involving Th1 and Th17 pathways [3,4].

Given this neutrophil-dominant inflammatory milieu, attention has increasingly shifted toward molecules that regulate protease activity and modulate inflammatory responses. Elafin, also known as peptidase inhibitor 3 (PI3), is an endogenous serine protease inhibitor produced by epithelial cells, monocytes, and neutrophils. It specifically inhibits neutrophil elastase and proteinase-3, thereby protecting tissues from excessive proteolytic damage. Beyond its anti-protease function, elafin possesses antimicrobial and immunomodulatory properties, including the ability to regulate cytokine release and attenuate inflammatory signaling pathways. These characteristics position elafin as a biologically relevant molecule in diseases marked by neutrophil-driven inflammation, such as Behçet's disease [5,6].

In various inflammatory and autoimmune conditions, including psoriasis, inflammatory bowel disease, and rheumatoid arthritis, altered elafin levels have been associated with disease activity and tissue inflammation. Elevated circulating or local elafin expression is often interpreted as a compensatory response to increased protease burden. However, the exact role of elafin—whether protective, pathogenic, or merely reflective of inflammatory status—remains incompletely understood and may vary across diseases. In the context of BD, where neutrophil elastase activity is markedly increased, investigating elafin dynamics may provide valuable insights into disease mechanisms and activity assessment [7,8].

Despite advances in understanding BD pathogenesis, there remains a significant unmet need for reliable, non-invasive biomarkers that accurately reflect disease activity and predict flares. Currently used markers such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) lack specificity and may not correlate consistently with clinical manifestations, particularly in cases with isolated mucocutaneous or ocular involvement. This limitation underscores the importance of identifying novel biomarkers that are more closely linked to the underlying immunopathological processes, especially those related to neutrophil activation [9,10].

Although emerging evidence suggests a potential role for elafin in inflammatory diseases, studies specifically addressing its significance in Behçet's disease are limited and fragmented. The relationship between serum elafin levels and disease activity, severity, and specific organ involvement in BD has not been fully elucidated. Moreover, the potential of elafin to serve as a biomarker reflecting neutrophilic inflammation in BD remains underexplored, representing a clear research gap in the current literature [11].

Therefore, this review aims to comprehensively evaluate the role of elafin in Behçet's disease, focusing on its biological functions, its association with neutrophil-mediated inflammation, and its potential

correlation with disease activity. By integrating current evidence, we seek to highlight the clinical relevance of serum elafin as a promising biomarker and to identify future research directions that may enhance disease monitoring and therapeutic strategies in Behçet's disease [12].

Pathophysiology of Behçet's Disease with Emphasis on Neutrophilic Inflammation

Behçet's disease is currently classified as a variable vessel vasculitis, affecting arteries and veins of all sizes, which distinguishes it from other vasculitic syndromes. The hallmark of its pathophysiology is a profound dysregulation of the innate immune system, particularly involving neutrophils, which act as key effector cells in initiating and propagating inflammation. Histopathological findings frequently demonstrate neutrophilic infiltration around blood vessels, endothelial swelling, and fibrinoid necrosis, supporting the central role of neutrophils in vascular injury. This neutrophil-predominant inflammation contributes to both mucocutaneous lesions and severe systemic manifestations such as vascular thrombosis and ocular inflammation [13,14].

Neutrophils in Behçet's disease exhibit a hyperactive phenotype characterized by enhanced chemotaxis, increased phagocytic activity, and excessive production of reactive oxygen species (ROS). These abnormalities lead to oxidative stress and direct endothelial damage, which further amplifies the inflammatory cascade. In addition, activated neutrophils release granule-derived enzymes such as neutrophil elastase and myeloperoxidase, which degrade extracellular matrix components and promote tissue injury. This exaggerated neutrophil response is considered a primary driver of disease activity and correlates with clinical flares [15,16].

A critical mechanism linking neutrophils to vascular pathology in BD is the formation of neutrophil extracellular traps (NETs). NETs are web-like structures composed of DNA, histones, and antimicrobial proteins released by activated neutrophils. While NET formation serves as a host defense mechanism, excessive or dysregulated NETosis in Behçet's disease contributes to endothelial dysfunction, thrombogenesis, and sustained inflammation. NETs can activate endothelial cells and promote a procoagulant state, which explains the increased risk of vascular complications observed in BD patients [17,18].

The interaction between neutrophils and endothelial cells further perpetuates disease pathogenesis. Endothelial dysfunction is a key feature of Behçet's disease, characterized by impaired nitric oxide production, increased expression of adhesion molecules, and heightened susceptibility to inflammatory injury. Activated neutrophils adhere to the endothelium and release cytokines and proteases, exacerbating vascular inflammation. This bidirectional interaction creates a vicious cycle that sustains disease activity and contributes to organ damage [19,20].

In addition to innate immune activation, adaptive immune responses also play a significant role in Behçet's disease. There is a predominance of Th1 and Th17 cell responses, with elevated levels of cytokines such as interferon-γ, interleukin-17, and tumor necrosis factor-alpha (TNF-α). These cytokines further stimulate neutrophil activation and recruitment, bridging innate and adaptive immunity. The interplay between neutrophils and T cells highlights the complexity of BD pathogenesis and underscores the importance of immune network dysregulation [21,22].

Genetic susceptibility contributes to the exaggerated inflammatory response observed in BD. The strongest association is with HLA-B51, which has been linked to increased neutrophil activity and altered immune responses. Additionally, polymorphisms in genes related to cytokine production and innate immunity, such as IL-10 and IL-23 receptor genes, have been implicated in disease susceptibility. These genetic factors may influence both the intensity of neutrophilic inflammation and the clinical phenotype of the disease [23,24].

Environmental triggers, including microbial agents, are thought to initiate or exacerbate the inflammatory process in genetically predisposed individuals. Infectious agents such as Streptococcus species and herpes simplex virus have been proposed as potential triggers, possibly through molecular mimicry or activation of pattern recognition receptors. These triggers may lead to aberrant immune activation, particularly involving neutrophils, thereby initiating disease flares [25,26].

Given the central role of neutrophils in Behçet's disease, molecules involved in regulating neutrophil

function and protease activity have gained increasing attention. Among these, neutrophil elastase is a key mediator of tissue damage, and its activity must be tightly controlled to prevent excessive injury. Dysregulation of the balance between proteases and their inhibitors contributes significantly to disease progression. This imbalance provides a strong rationale for investigating endogenous anti-protease molecules such as elafin in the context of BD [27].

Elafin, as a natural inhibitor of neutrophil elastase and proteinase-3, may represent a crucial regulatory mechanism attempting to counteract excessive proteolytic activity in Behçet's disease. In conditions of heightened neutrophil activation, increased elafin expression may occur as a compensatory response to limit tissue damage. However, whether this response is sufficient or functionally effective in BD remains unclear. Understanding this balance between proteases and anti-proteases is essential for elucidating disease mechanisms and identifying novel biomarkers [28].

Overall, the pathophysiology of Behçet's disease is driven by a complex interplay between neutrophilic hyperactivity, endothelial dysfunction, genetic predisposition, and environmental triggers. The central role of neutrophils and their proteolytic enzymes provides a strong foundation for exploring biomarkers such as elafin that reflect these underlying mechanisms. This perspective not only enhances our understanding of disease activity but also opens avenues for targeted therapeutic strategies aimed at modulating neutrophil-driven inflammation [29].

Biology of Elafin

Elafin, also known as peptidase inhibitor 3 (PI3) or skin-derived anti-leukoproteinase (SKALP), is a low–molecular weight serine protease inhibitor belonging to the whey acidic protein (WAP) family. It is primarily produced by epithelial cells, including keratinocytes and mucosal epithelial cells, but can also be expressed by monocytes, macrophages, and neutrophils under inflammatory conditions. Structurally, elafin is characterized by a compact, stable conformation containing a WAP domain that enables its high-affinity binding to target proteases. This structural stability allows elafin to function effectively even in protease-rich inflammatory environments, making it particularly relevant in diseases characterized by excessive neutrophil activation [30,31].

The primary biological function of elafin is the inhibition of neutrophil-derived serine proteases, particularly neutrophil elastase and proteinase-3. These enzymes play critical roles in host defense by degrading microbial components; however, their excessive release leads to tissue destruction and amplification of inflammation. Elafin binds irreversibly to these proteases, neutralizing their activity and thereby protecting tissues from proteolytic damage. This anti-protease function is essential in maintaining tissue integrity, especially in conditions with heightened neutrophilic inflammation such as Behçet's disease [32,33].

Beyond its role as a protease inhibitor, elafin exhibits significant anti-inflammatory properties. It has been shown to modulate cytokine production by inhibiting pro-inflammatory mediators such as tumor necrosis factor-alpha (TNF-α) and interleukin-8 (IL-8), both of which are crucial in neutrophil recruitment and activation. Additionally, elafin can interfere with nuclear factor-kappa B (NF-κB) signaling pathways, thereby attenuating inflammatory gene expression. These immunomodulatory effects position elafin as more than a passive inhibitor, but rather as an active regulator of inflammatory responses [34,35].

Elafin also possesses antimicrobial activity, contributing to innate immune defense. It can directly inhibit the growth of bacteria and fungi, and it plays a role in maintaining mucosal barrier integrity. This antimicrobial function is particularly relevant in the context of Behçet's disease, where microbial triggers have been implicated in disease initiation and exacerbation. By modulating both microbial load and inflammatory responses, elafin serves as a bridge between host defense and immune regulation [36,37].

The expression of elafin is tightly regulated and is typically low under physiological conditions but markedly upregulated during inflammation. Pro-inflammatory cytokines such as IL-1β and TNF-α stimulate elafin production, while bacterial components can further enhance its expression through activation of pattern recognition receptors. This inducible expression pattern suggests that elafin acts as

part of a protective feedback mechanism aimed at limiting excessive inflammation and tissue damage [38,39].

In inflammatory diseases, elevated levels of elafin have been observed both locally at sites of inflammation and systemically in circulation. For instance, increased elafin expression has been reported in psoriasis, inflammatory bowel disease, and chronic obstructive pulmonary disease, all of which share features of neutrophil-driven inflammation. However, the relationship between elafin levels and disease activity varies, with some studies suggesting a protective role while others indicate that elevated levels may simply reflect ongoing inflammation [40,41].

A unique feature of elafin is its ability to bind to extracellular matrix proteins such as elastin and fibronectin, which allows it to localize at sites of tissue injury. This property enhances its effectiveness in inhibiting proteases directly within affected tissues. By anchoring to the extracellular matrix, elafin provides targeted protection against proteolytic degradation, which is particularly important in vascular and mucocutaneous lesions observed in Behçet's disease [42,43].

Despite its protective functions, the role of elafin in chronic inflammatory diseases is complex. In some contexts, persistent elevation of elafin may indicate an ongoing imbalance between proteases and anti-proteases, where compensatory mechanisms are insufficient to fully control tissue damage. This raises the question of whether elafin is merely a marker of inflammation or an active participant in disease modulation. Understanding this distinction is crucial for evaluating its potential as a biomarker in Behçet's disease [44,45].

In the context of neutrophil-mediated diseases, the balance between neutrophil elastase and its inhibitors, including elafin, is critical for maintaining tissue homeostasis. Disruption of this balance leads to unchecked proteolytic activity, resulting in tissue injury and amplification of inflammation. Given the central role of neutrophils in Behçet's disease, investigating elafin dynamics provides valuable insight into disease mechanisms and potential therapeutic targets [46].

Overall, elafin represents a multifunctional molecule with anti-protease, anti-inflammatory, and antimicrobial properties, all of which are highly relevant to the pathophysiology of Behçet's disease. Its inducible expression in response to inflammatory stimuli and its close association with neutrophil activity make it a promising candidate for further investigation as a biomarker of disease activity. Future research should aim to clarify its precise role and determine whether it can be effectively utilized in clinical practice [47].

Elafin in Inflammatory and Autoimmune Diseases

Before focusing specifically on Behçet's disease, it is important to recognize that elafin has already been studied across several inflammatory disorders in which neutrophils, proteases, and barrier injury are central pathogenic themes. This broader literature is useful because it shows that elafin behaves neither as a purely static protective molecule nor as a universally consistent biomarker. Rather, its levels appear to depend on the tissue studied, the inflammatory compartment assessed, and the balance between protease burden and compensatory anti-protease responses. That conceptual framework is highly relevant to BD, where neutrophil hyperreactivity and endothelial injury are dominant mechanisms [48,49].

Psoriasis provided some of the earliest clinically relevant evidence supporting elafin as a disease-activity marker. Elafin/SKALP is strongly linked to inflamed epidermis, and classic clinical work demonstrated that serum SKALP/elafin levels decreased during cyclosporin A treatment in severe psoriasis and correlated with PASI scores. This finding suggested that circulating elafin may reflect the intensity of cutaneous inflammation rather than serving only as a local epidermal defense peptide. From a translational standpoint, psoriasis established the precedent that elafin can function as a measurable systemic biomarker of inflammatory burden [50,51].

Inflammatory bowel disease has produced more complex and highly informative results. Studies have shown that elafin expression in inflamed colonic mucosa may be reduced in active disease, while peripheral blood leukocyte elafin expression negatively correlates with inflammatory markers such as ESR and CRP. Conversely, other reports indicate that circulating elafin may be elevated in certain IBD

phenotypes, particularly ulcerative colitis and stricturing Crohn's disease. These findings highlight that elafin biology is compartment-specific, where local deficiency may coexist with systemic elevation, likely reflecting compensatory immune responses [52,53].

Airway and lung inflammation studies further strengthened the biological plausibility of elafin as an anti-inflammatory mediator. Experimental models have shown that elafin reduces neutrophil recruitment, protease activity, and pro-inflammatory cytokine signaling. However, in conditions such as cystic fibrosis, excessive neutrophil elastase can degrade elafin, impairing its protective function. These observations indicate that elafin levels alone may not fully represent its functional capacity, especially in highly proteolytic environments [54,55].

Evidence from inflammatory arthritis also supports the association between elafin and neutrophil-driven inflammation. Research has demonstrated that activated neutrophils can produce elafin via NF-κB–dependent pathways, with higher levels observed in synovial fluid of patients with inflammatory arthritis compared to non-inflammatory conditions. This suggests that elafin production is locally upregulated within inflamed tissues and may reflect the intensity of ongoing inflammation [56].

Dermatologic and vasculitic conditions characterized by neutrophilic infiltration provide additional insights into elafin expression. Strong epidermal elafin expression has been observed in neutrophil-rich dermatoses such as Sweet syndrome, pyoderma gangrenosum, and cutaneous vasculitis, whereas lymphocyte-dominant conditions show minimal expression. This pattern supports the concept that elafin is preferentially associated with neutrophil-mediated inflammation rather than generalized immune activation [57].

Collectively, these findings suggest that elafin plays a dual role as both a protective anti-protease molecule and a biomarker reflecting inflammatory burden. Importantly, its expression appears to be dynamic and context-dependent, influenced by the severity of inflammation, tissue involvement, and protease activity. Therefore, interpretation of elafin levels requires integration with clinical and laboratory parameters rather than reliance on absolute values alone [58,59].

From a translational perspective, these observations are highly relevant to Behçet's disease. Given the central role of neutrophils in BD pathogenesis, elafin may serve as a biologically meaningful indicator of the balance between proteolytic damage and protective anti-protease mechanisms. Understanding how elafin behaves in other inflammatory diseases provides a critical foundation for evaluating its potential as a biomarker in BD [60,61].

Elafin in Behçet's Disease: Current Clinical Evidence and Correlation With Disease Activity

The investigation of elafin in Behçet's disease is relatively recent compared to other inflammatory biomarkers, yet it has gained increasing attention due to its direct association with neutrophil activity and protease regulation. Given that neutrophilic hyperactivation is a hallmark of BD, studying molecules such as elafin that counterbalance neutrophil elastase provides a biologically plausible approach to understanding disease activity. Early clinical observations suggest that serum elafin levels may be altered in BD patients, particularly during active phases of the disease, supporting its potential role as a dynamic biomarker [62,63].

Several studies have demonstrated that patients with active Behçet's disease exhibit significantly higher serum elafin levels compared to those in remission and healthy controls. This elevation is thought to reflect a compensatory response to increased neutrophil elastase release during inflammatory flares. As neutrophils become activated and release proteolytic enzymes, elafin production is upregulated in an attempt to limit tissue damage. Therefore, elevated serum elafin may serve as an indirect indicator of heightened neutrophil-driven inflammation [64,65].

Importantly, correlations have been identified between serum elafin levels and established markers of disease activity in BD. Studies have reported positive associations between elafin concentrations and acute phase reactants such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). In addition, higher elafin levels have been linked to increased disease activity scores, suggesting that elafin may reflect the overall inflammatory burden. These findings reinforce the concept that elafin is not merely a structural protein but a responsive biomarker linked to systemic inflammation [66,67].

Beyond general disease activity, elafin levels may also correlate with specific clinical manifestations of Behçet's disease. For example, patients with active mucocutaneous lesions, such as oral and genital ulcers, as well as those with active skin involvement, tend to exhibit higher elafin levels. This is consistent with the fact that epithelial tissues are major sources of elafin production. Similarly, vascular and ocular involvement—both of which are associated with intense neutrophilic infiltration—may also be linked to increased circulating elafin, although data in these subgroups remain limited [68,69].

The relationship between elafin and neutrophil-mediated mechanisms further supports its relevance in BD. Elevated elafin levels have been observed alongside increased neutrophil counts, enhanced neutrophil-to-lymphocyte ratios, and markers of neutrophil activation. This suggests that elafin is closely tied to the underlying immunopathology of the disease. Moreover, since neutrophil elastase plays a central role in endothelial damage and thrombosis in BD, elafin may reflect the body's attempt to counteract these pathogenic processes [70,71].

However, not all findings are entirely consistent, and some variability exists in reported elafin levels across different studies. These discrepancies may be attributed to differences in study design, patient populations, disease phenotypes, and methods of elafin measurement. Additionally, factors such as treatment status, disease duration, and comorbid conditions may influence circulating elafin levels. This variability highlights the need for standardized methodologies and larger cohort studies to validate current observations [72,73].

An important consideration is whether elafin serves purely as a marker of inflammation or whether it plays a protective role in modulating disease activity. Some evidence suggests that higher elafin levels may be associated with less severe tissue damage, implying a protective compensatory response. Conversely, persistently elevated elafin may also indicate ongoing, uncontrolled inflammation. This dual interpretation underscores the complexity of elafin biology and the need for longitudinal studies to clarify its clinical significance [74,75].

Another emerging area of interest is the potential role of elafin as a predictor of disease flares. Since BD is characterized by episodic exacerbations, identifying biomarkers that can anticipate flares is of great clinical value. Preliminary data suggest that rising elafin levels may precede clinical worsening, reflecting early activation of neutrophilic pathways. If confirmed, this would position elafin as a useful tool not only for monitoring disease activity but also for predicting disease course [76,77].

From a clinical perspective, the use of serum elafin as a biomarker offers several advantages. It is minimally invasive, relatively easy to measure, and directly مرتبط(linked) to key pathogenic mechanisms in BD. Compared to traditional markers such as ESR and CRP, which are nonspecific, elafin may provide more disease-relevant information, particularly in cases where conventional markers fail to reflect clinical activity accurately [78,79].

In summary, current evidence suggests that serum elafin is elevated in active Behçet's disease and correlates with disease activity and neutrophil-mediated inflammation. While promising, these findings remain preliminary and require further validation through large-scale, longitudinal studies. Understanding the precise role of elafin—whether as a biomarker, a protective mediator, or both—will be essential for determining its place in clinical practice and its potential as a therapeutic target in Behçet's disease [80].

Conclusion

Elafin has emerged as a biologically compelling molecule in the context of Behçet's disease, offering a unique link between neutrophilic inflammation and measurable disease activity. As an endogenous inhibitor of neutrophil elastase and proteinase-3, elafin occupies a central position in the regulation of protease-mediated tissue damage, which is a key pathological feature of BD. Its inducible expression in response to inflammatory stimuli further reinforces its relevance as a dynamic component of the innate immune response rather than a passive bystander.

The current body of evidence suggests that serum elafin levels tend to increase during active phases of Behçet's disease, reflecting heightened neutrophil activation and inflammatory burden. This relationship supports the concept that elafin may function as a compensatory anti-protease response aimed at limiting

tissue injury. At the same time, its correlation with established inflammatory markers and clinical manifestations highlights its potential utility as a biomarker for disease activity. Compared to conventional markers such as ESR and CRP, elafin offers a more mechanistically targeted reflection of the underlying neutrophil-driven pathology.

However, the role of elafin in Behçet's disease is not entirely straightforward. Its elevation may represent either an effective protective response or an insufficient attempt to counterbalance overwhelming protease activity. This duality underscores the complexity of interpreting elafin levels in clinical practice. Additionally, variability across studies suggests that factors such as disease phenotype, organ involvement, and treatment status may influence circulating levels, necessitating careful contextual interpretation.

From a clinical standpoint, elafin holds promise as a non-invasive biomarker that could enhance disease monitoring, particularly in patients where traditional inflammatory markers are inconclusive. Its potential role in predicting disease flares is especially intriguing, as early identification of increased inflammatory activity could allow for timely therapeutic intervention and improved patient outcomes.

Despite these promising insights, significant gaps remain. Large-scale, longitudinal studies are needed to validate the diagnostic and prognostic value of serum elafin in Behçet's disease. Future research should also explore its integration into multimarker panels, combining it with other indicators of neutrophil activation and immune dysregulation to achieve a more comprehensive assessment of disease activity.

In conclusion, elafin represents a promising biomarker that reflects the interplay between neutrophilic inflammation and disease activity in Behçet's disease. Its biological relevance, coupled with its potential clinical applicability, makes it an important target for further investigation in both research and clinical settings.

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