

ABSTRACT

Introduction: Hidradenitis suppurativa (HS) is a chronic inflammatory disease of the hair follicle with systemic manifestations and a significant impact on quality of life. Immunohistochemistry of HS biopsies showed that tunnels are a source of inflammation, with an increased expression of interleukin (IL) 17A/C/F and IL36 [1]. Ultra-high frequency ultrasound (UHFUS) has been demonstrated to highlight the presence of hair follicles within the fluid collections and is useful to precisely identify small lesions, thanks to the greater axial and lateral resolution [2]. This study evaluates the effectiveness of UHFUS-guided biopsies in characterizing HS lesions and investigates inflammatory cytokine expression profiles across lesion types.

Methods: Eleven biopsies from HS lesions (tunnels, nodules, cysts, and tombstones) were obtained from patients (n=3) using UHFUS-guided mapping. Immunohistochemical staining was performed to analyze expression and localization of cytokines previously suggested to be associated with HS (IL-17A, IL-17F, IL-23, IL-36 γ , TNF- α), followed by quantification of obtained signal via bioimage analysis software (QuPath). Statistical significance was assessed through two-way ANOVA, followed by Tukey's multiple comparisons test.

Results: IL-23 expression was consistently elevated across all lesion types, irrespective of morphology, and significantly higher than IL-17A, IL-17F, IL-36, and TNF- α (p-value < 0.0001). No significant differences in cytokine expression were observed among different lesion types (tunnels, nodules, cysts, tombstones). Inter-patient analysis revealed consistently high IL-23 levels, regardless of lesion heterogeneity.

Conclusion: UHFUS is a valuable tool for accurately identifying HS lesion morphology and guiding biopsies. Elevated IL-23 expression across different lesion types underscores its potential role in HS pathogenesis, even if to date targeting IL-23 is not a recognized and effective option of treatment [3]. Further studies with larger sample sizes are needed to validate UHFUS-guided biopsies and refine cytokine-targeted treatments in HS management.

REFERENCES

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METHODS

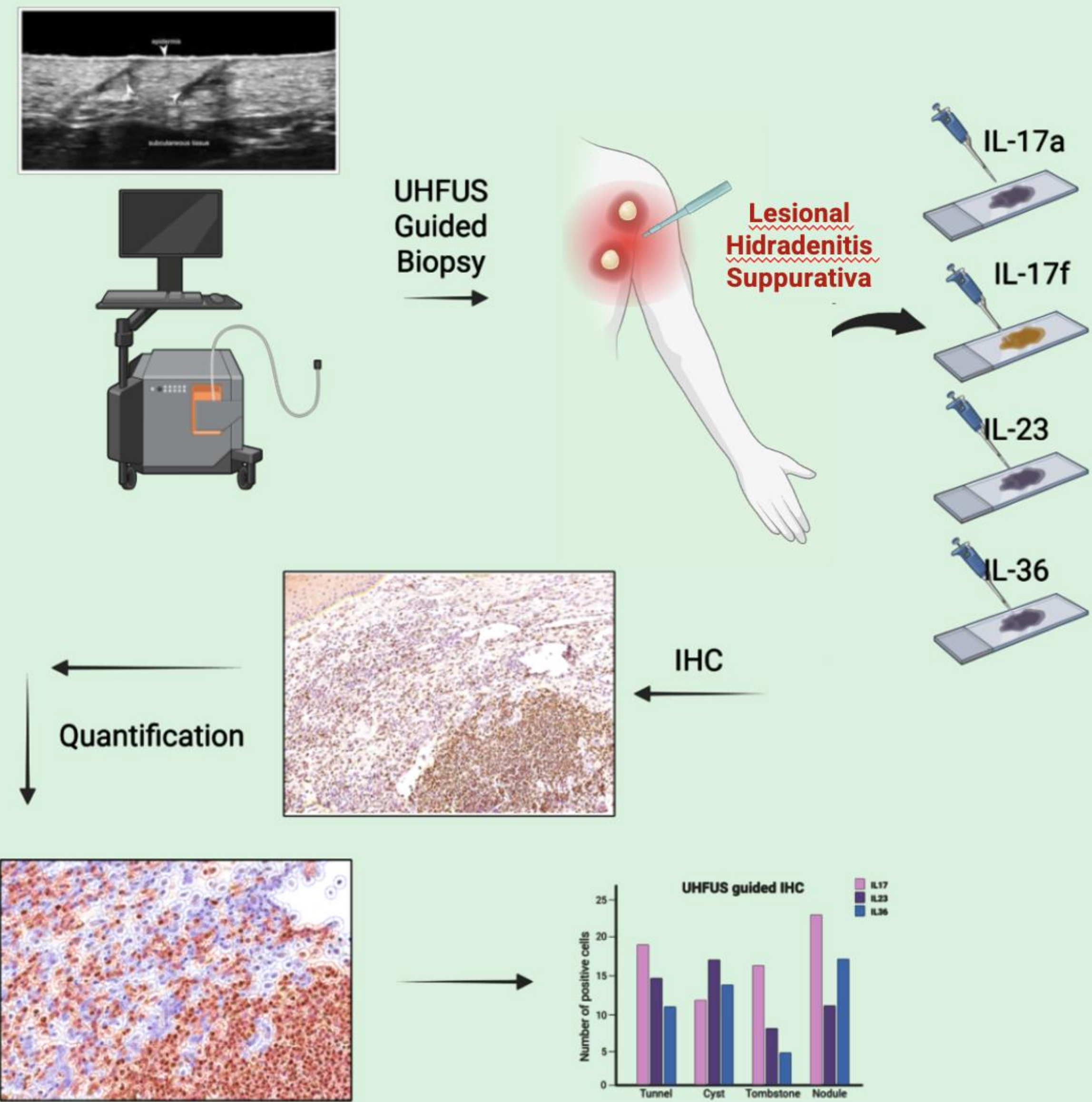


Figure 1. Study Design. Ultra-high frequency ultrasound (UHFUS) with 70MHz linear probe (Vevo MD) was used to detect clinical and sub-clinical HS lesions, followed by a 7mm punch biopsy (formalin-fixed and paraffin embedded), sectioned at 10um and subject to IHC staining, followed by quantification of positive staining using QuPath.

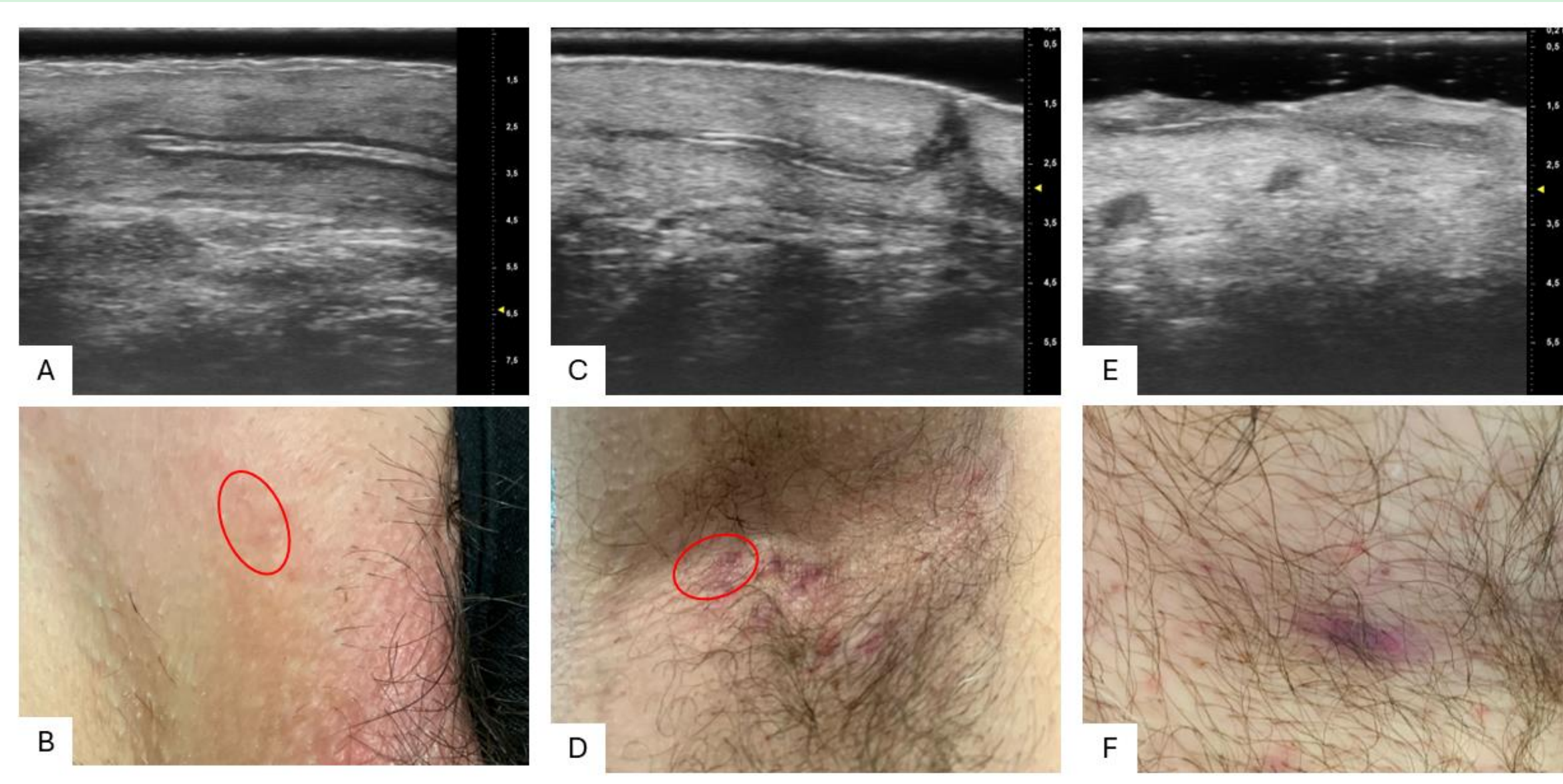


Figure 2. Ultra-High Frequency Ultrasound (UHFUS) Guided Approach for determining precise location of HS tunnels.

UHFUS GUIDED BIOPSY IMMUNOSTAINING AND QUANTIFICATION

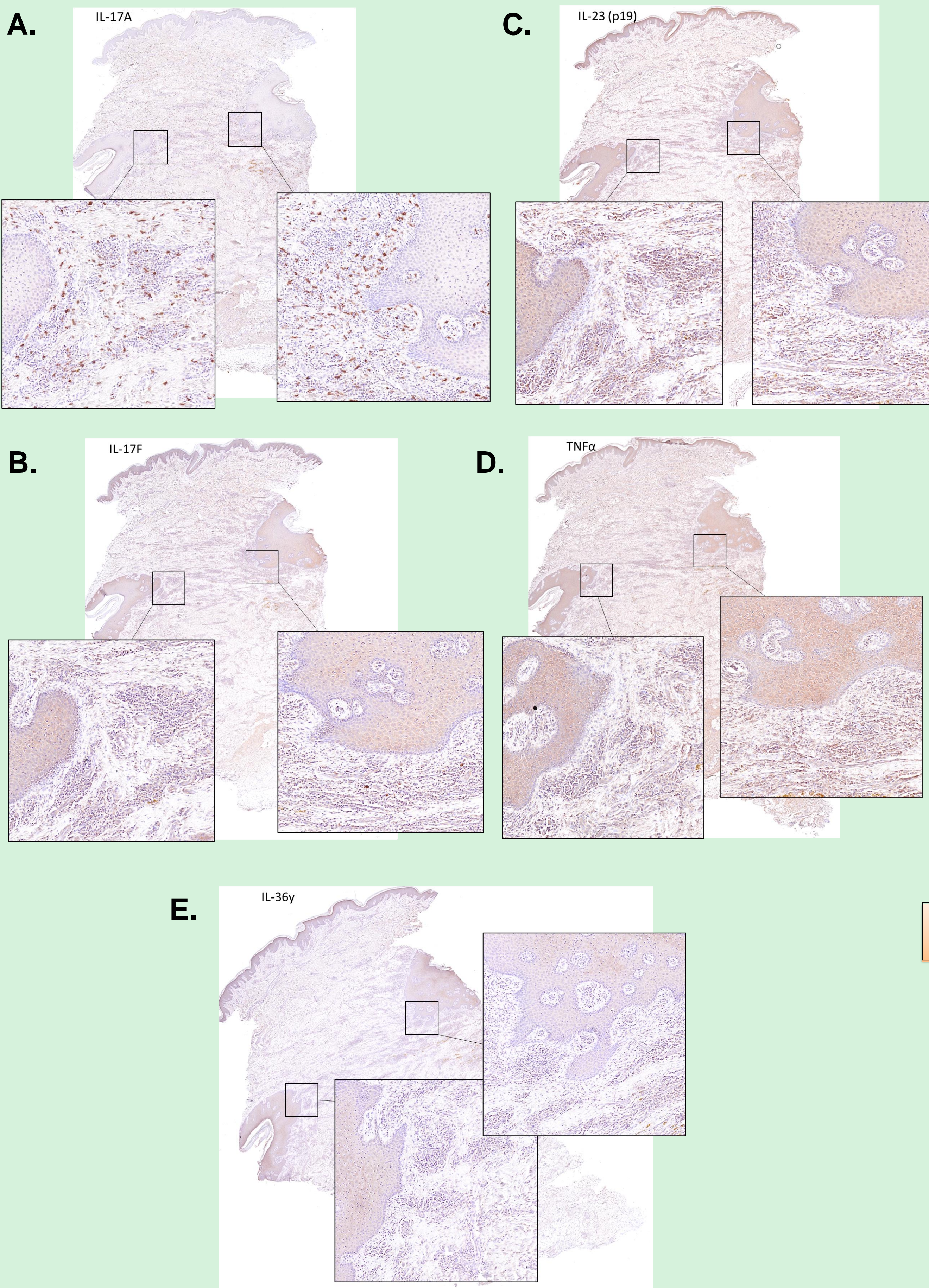


Figure 3. Immunostaining of UHFUS guided HS biopsies with inflammatory cytokines commonly associated with HS lesions. Samples were immunostained against A) IL-17a, B) IL-17f, C) IL-23-p19, D) TNF α and E) IL-36 γ with positive staining quantified using QuPath image analysis software, and reported as number of positive cells/mm². IHC images demonstrate changes in expression and localization of multiple inflammatory cytokines.

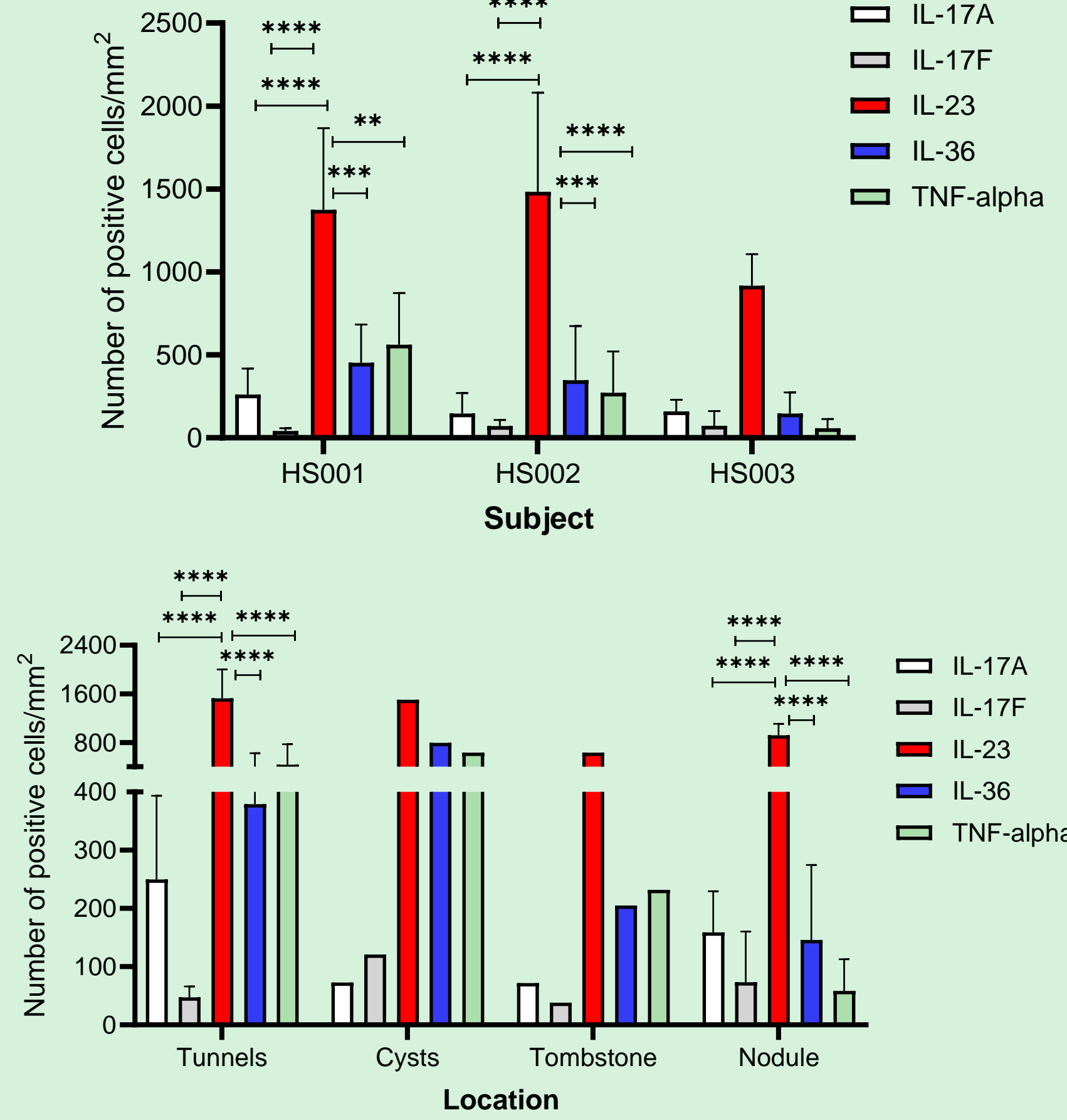


Figure 4. Immunostaining quantification demonstrating location and cytokine specific changes in UHFUS guided HS biopsies (n=3; 2-way ANOVA, **p<0.01, ***p<0.001, ****p<0.0001).

TAKE HOME MESSAGES

- *UHFUS is an invaluable tool for accurately identifying different HS lesions.*
- *Inflammatory cytokines exhibited spatial distribution in HS lesions.*
- *IL-23 exhibited elevated levels in every type of lesional biopsy tested.*

ACKNOWLEDGMENTS

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