

Radiomic analysis of endometriomas: predicting volumetric and symptomatic response to hormonal therapy

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Objectives

This study aimed to assess the effectiveness of radiomic analysis of ultrasound images of endometriomas in predicting the volumetric response of these lesions to hormonal therapy. Additionally, the study examined the relationship between radiomic features and changes in symptom burden post-treatment.

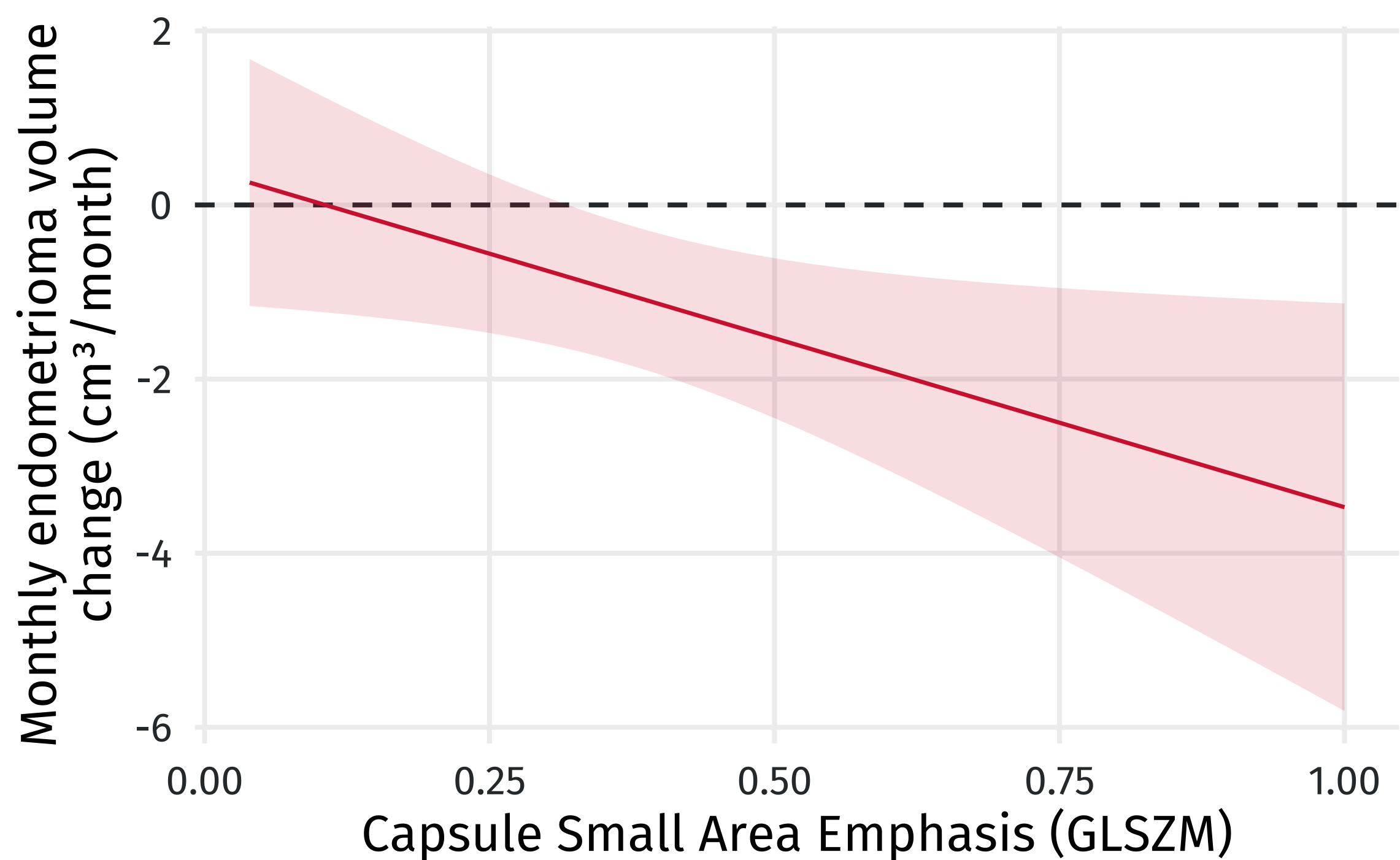


Figure 1. Capsule small area emphasis (GLSZM) versus monthly endometrioma volume change (linear fit, 95% CI).

Methods

This retrospective study involved premenopausal women who attended the Endometriosis outpatient clinic at a University Hospital from 2022 to 2025. Clinical and ultrasonographic data were gathered to evaluate monthly fluctuations in lesion volume and visual analog scale (VAS) pain scores. Gray-scale transvaginal ultrasound images were manually segmented and analyzed using PyRadiomics. Feature selection was conducted utilizing Random Forest algorithms, and the selected variables were integrated into linear regression models.

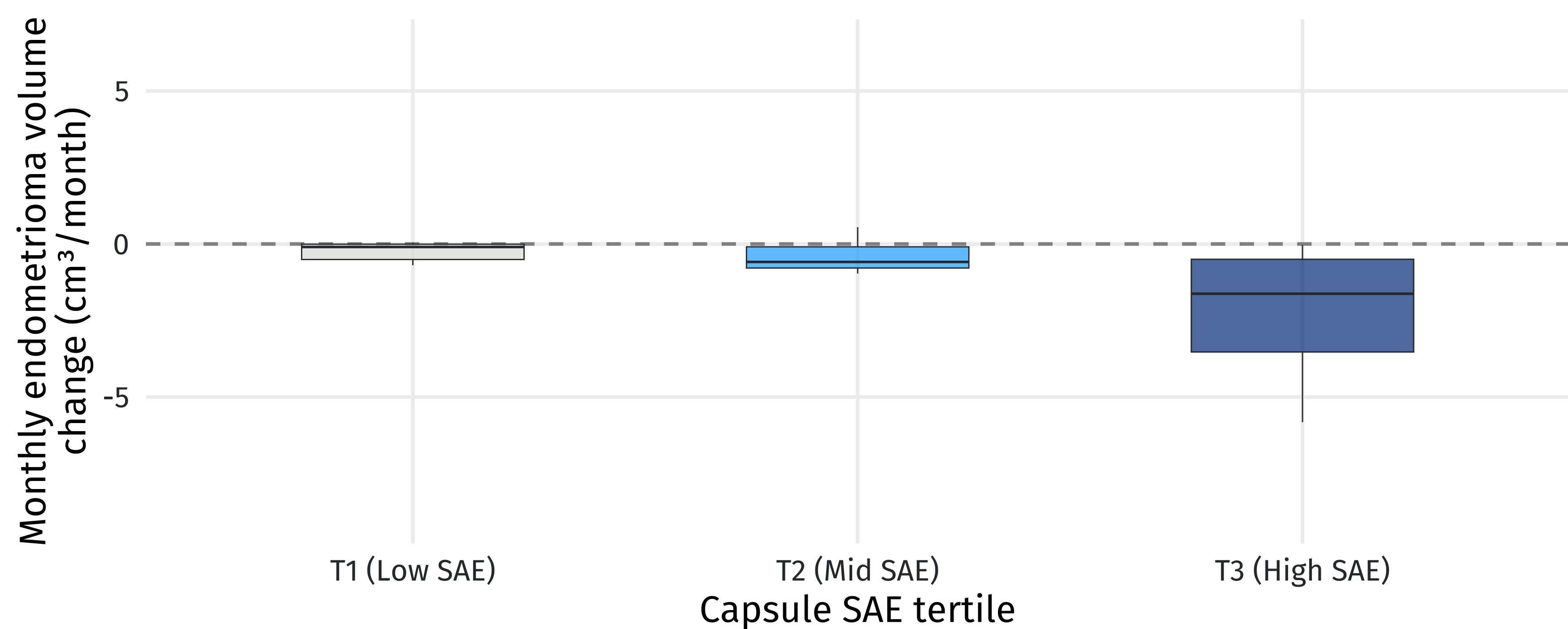


Figure 2. Monthly endometrioma volume change by tertile of capsule small area emphasis (GLSZM).

Results

A total of 85 women were recruited, 33 of whom underwent serial follow-up evaluations during dienogest therapy. The median monthly change in endometrioma volume was $-0.59 \text{ cm}^3/\text{month}$, accompanied by a decrease in symptoms (VAS sum monthly change: -0.71). Radiomic analysis revealed that the *small area emphasis* feature of the capsule area was a significant predictor of volume reduction in response to therapy (effect = -4.221 ; 95% CI: -7.860 to -0.583 ; $p < 0.05$). No conventional ultrasound feature significantly predicted monthly endometrioma volume change.

Conclusion

Radiomic analysis of ultrasound images facilitates the prediction of volumetric changes in endometriomas, with capsular radiomic features indicating these volumetric alterations. These findings highlight the clinical relevance of radiomic signatures in patient stratification related to anatomical response, facilitating the application of customized therapeutic protocols for ovarian endometriosis.