

Corneal dendritic cell as a predictor of medical outcome in limbal stem cell deficiency

Junqi Liang^{1,2}, Leying Wang¹, Shangyang Jiang¹, Qingfeng Liang¹

1.Beijing Institute of Ophthalmology, Capital Medical University. 2. University College Hospital

Background & Aim

- Medical therapy is first-line for mild to moderate LSCD, but response is highly variable.
- In vivo confocal microscopy (IVCM) quantifies limbal structure, epithelial integrity, nerves, and inflammation.
- This study asked whether baseline clinical and IVCM findings can predict anatomical improvement after medical therapy.

Primary outcome: reduction in LSCD stage and/or extent of limbal involvement at follow-up.

Methods



Measured at presentation: basal cell density (BCD), superior/inferior Vogt visibility, subbasal nerve length, dendritic cell (DC) density, and DC area.
Subgroup analysis used the ROC-derived DC density cutoff of 109 cells/mm².

Cohort Snapshot

59.0% Achieved anatomical relief with medical therapy	87% Had partial / sectorial LSCD	36.3% Contact lens wear as the leading cause
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Female: 63.6%
Bilateral involvement: 90.9%
Mean limbal involvement: 7.7 ± 3.2 clock hours (85%)
Stage distribution: I 50.8%, II 36.0%, III 13.1%

Etiologic response pattern

- Contact lens-induced LSCD improved in 17/20 eyes (85%).
- Immune-mediated and hereditary etiologies were less likely to improve medically.

Representative Clinical Appearance

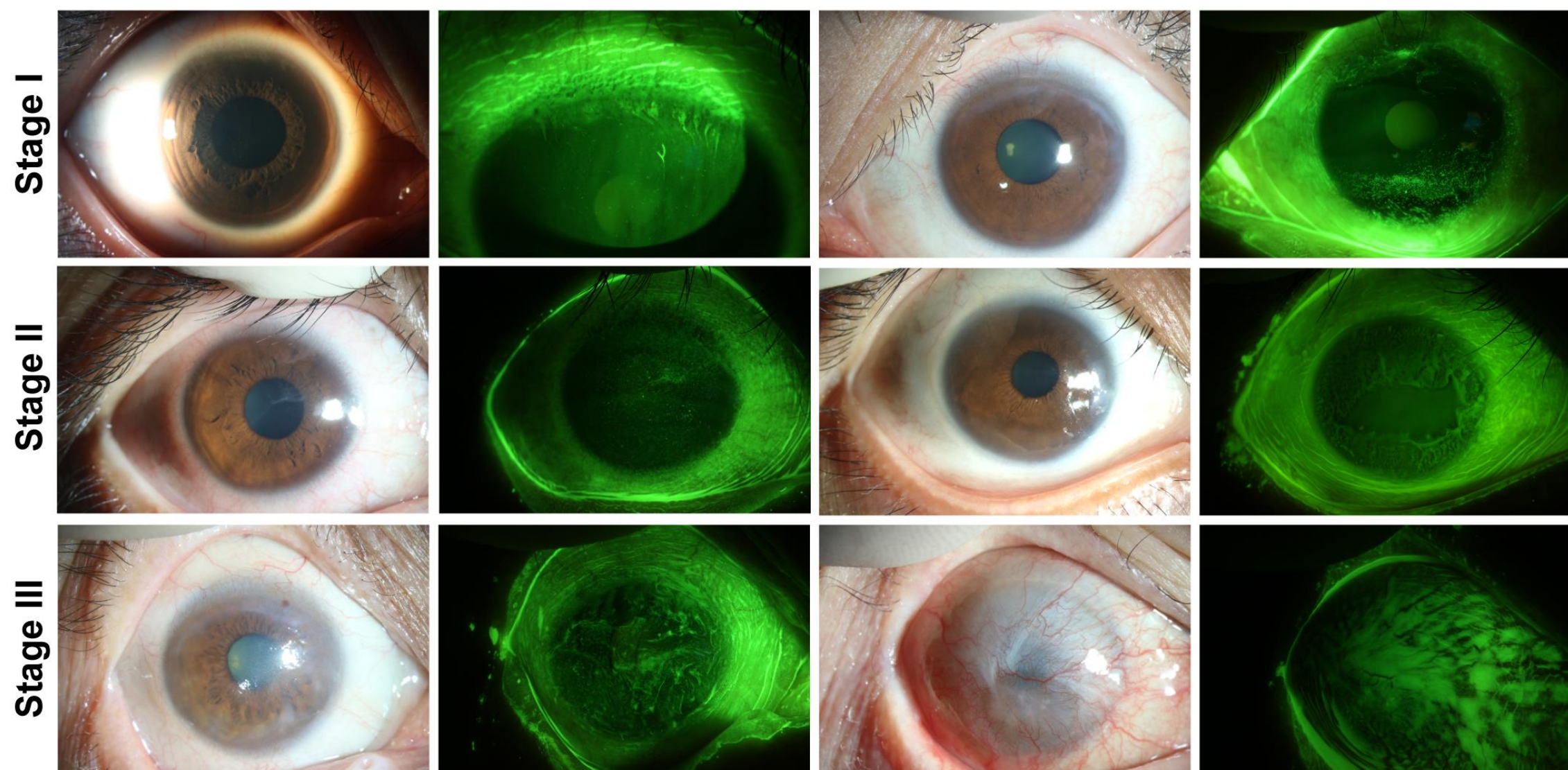


Figure 1. Typical slit-lamp and fluorescein appearances across stage I to III LSCD.

Headline Findings

7.7 → 6.7 Mean limbal involvement improved after therapy (clock hours, P=0.018)	0.808 Best ROC performance: limbal extent for predicting improvement	72.7% vs 23.5% Improvement with DC <109 vs >109 cells/mm ²
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Predictors of Medical Outcome

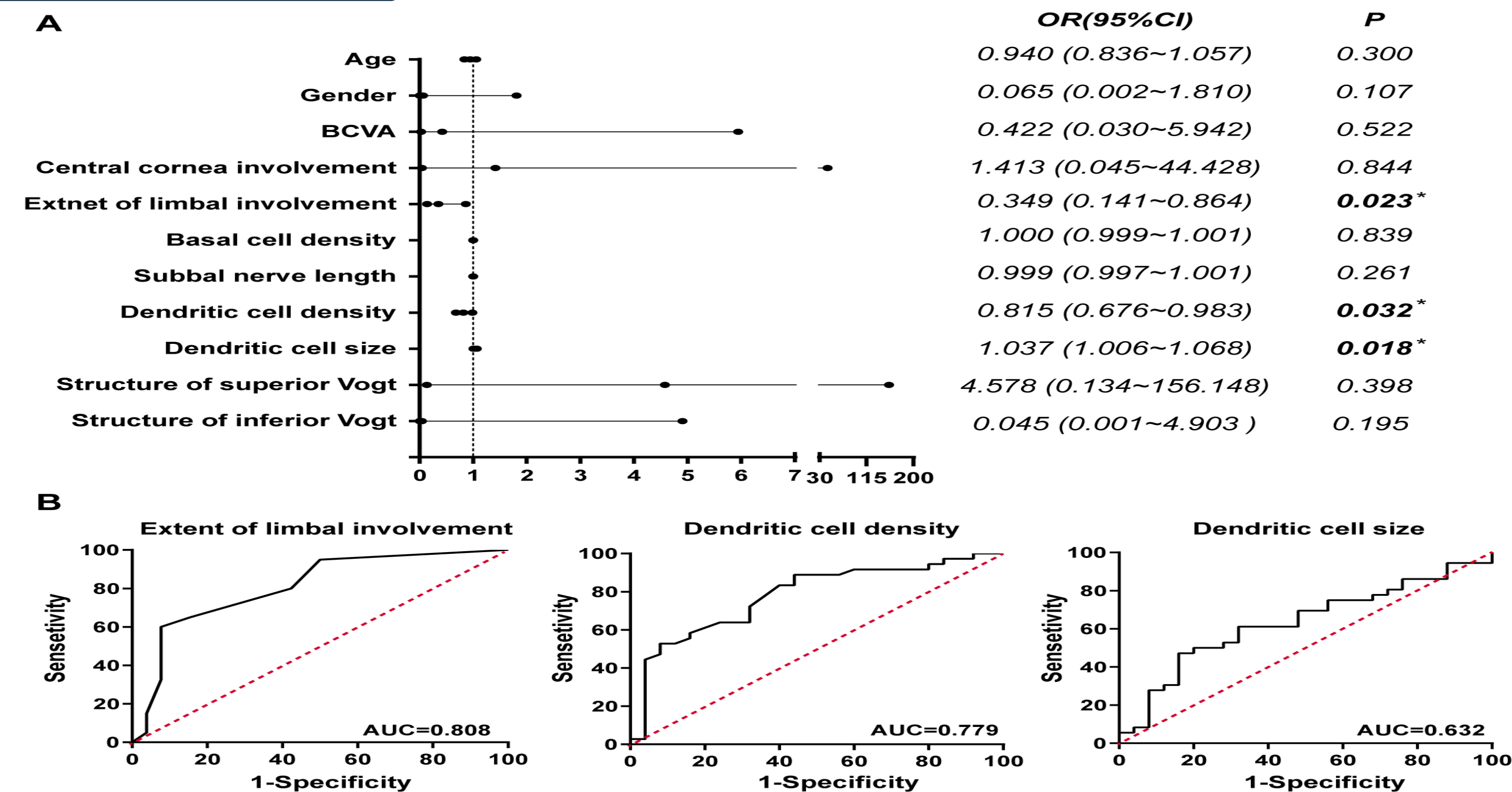


Figure 2. Logistic regression and ROC analysis identified extent of limbal involvement and DC density as the most informative prognostic markers.

Quantitative Summary

Predictor	Cutoff	AUC	Sensitivity	Specificity	Interpretation
Extent of limbal involvement	6.5 clocks	0.808	92.3%	60.0%	Best overall discriminator
DC density	109 cells/mm ²	0.779	56.0%	88.9%	High specificity inflammatory marker
DC area	140.5 μm ²	0.632	47.2%	84.0%	Secondary / weaker marker

IVCM phenotype at presentation (LSCD vs controls)

- BCD: 4860 ± 1704 vs 9243 ± 937 cells/mm²
- Subbasal nerve length: 974 ± 828 vs 19,997 ± 3,123 μm/mm²
- DC density: 89.6 ± 72.5 vs 24.8 ± 7.8 cells/mm²
- DC area: 128.1 ± 93.3 vs 59.8 ± 16.7 μm²

Most LSCD eyes lacked superior/inferior Vogt structures (83.6% and 77.0%).

Stage Shift by DC Density

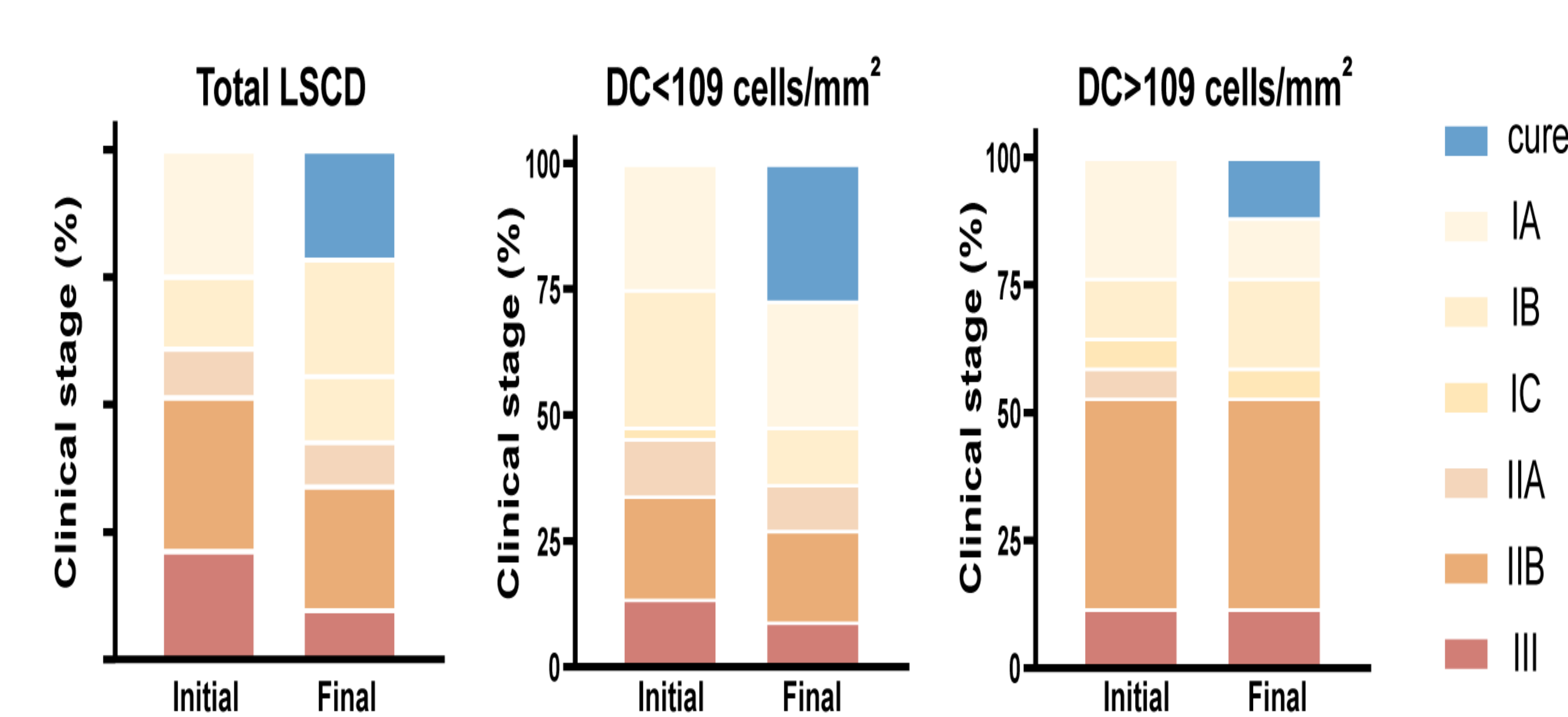


Figure 3. Lower baseline DC density was associated with a more favorable stage distribution after medical therapy.

DC Density Stratifies Response

72.7% Improved when DC density was <109 cells/mm ²	23.5% Improved when DC density was >109 cells/mm ²	P = 0.008 Final limbal involvement lower in the low-DC group
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Baseline limbal involvement was not significantly different between groups (7.3 ± 2.9 vs 8.8 ± 3.6 clock hours; P=0.086), supporting DC density as an independent inflammatory signal.

Final limbal involvement: 5.1 ± 4.1 vs 8.4 ± 4.3 clock hours

Conclusions

- Pre-treatment DC density is a practical IVCM biomarker of inflammation and medical prognosis in LSCD.
- Lower DC density and smaller limbal extent identify eyes more likely to improve with medical therapy.
- Combining disease extent with inflammation status can refine counseling, medical optimization, and timing of surgery.

Clinical significance: IVCM may help select LSCD eyes most likely to benefit from medical therapy before escalating to limbal stem cell transplantation.