Risk factors for retinal thinning in sickle cell versus control eyes: Analysis of a prospective study using SDOCT Imaging

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Purpose:
To identify risk factors associated with macular thinning in sickle cell versus control eyes using spectral domain optical coherence tomography (SDOCT).

Methods:
Clinical and SDOCT data were analyzed for sickle cell and control eyes of patients with at least one year of follow-up in a prospective observational study. Rates of progression of sickle cell retinopathy and rates of thinning of SDOCT ETDRS subfield measurements were calculated. Associations between rates of retinal thinning and ocular and systemic conditions were determined.

Results:
344 sickle cell (177 patients) and 42 control eyes (28 patients) were followed for 51 months and 41 months respectively. Sickle cell stage progressed in 4% of eyes by year 1 and 14% by year 5. ETDRS subfield measurements thinned significantly over time in sickle cell eyes versus control eyes for CST [-0.21 (0.10)u/yr vs. 0.60 (0.37)u/yr, p = 0.004], inner nasal [-1.01 (0.10)u/yr vs. 0.37 (0.47)u/yr, p <0.001], inner superior [-1.47 (0.17)u/yr vs. -0.22 (0.72)u/yr, p = 0.015], inner temporal [-1.02 (0.11)u/yr vs. -0.16 (0.34 u/yr, p=0.011]), inner inferior [-0.93 (0.09)u/yr vs. -0.34 (0.28)u/yr, p = 0.038] and outer nasal [-0.91 (0.08)u/yr vs. -0.34 (0.24), p=0.022] subfields. Rates of thinning differed for inner ETDRS subfields amongst Hgb subtypes for CST [-1.11 (0.35) u/yr in SThal, -0.07 (0.13)u/yr in SS, and -0.21 (0.27) u/yr in SC, p = 0.016], inner nasal [-1.67 (0.44)u/yr in SThal, -0.84 (0.12)u/yr in SS, and -1.14 (0.18) u/yr in SC, p = 0.044], and inner temporal subfields [-1.76 (0.53)u/yr in SThal, -0.81 (0.13) in SS, and -1.18 (0.20) u/yr in SC, p = 0.035]. Rates of retinal thinning were associated with baseline retinal thickness (quartile thickness analysis, p<0.001). Greater rates of thinning were seen in patients with sickle cell stage progression (Hgb SC: CST p=0.01; inner nasal p=0.03, inner superior/inferior/temporal p<0.002; Hgb SS outer nasal P=0.018, inferior p<0.001), systemic hypertension(CST, inner nasal/temporal subfields (p < 0.001)) or prior acute chest syndrome (ACS) (CST, p = 0.037). Lower rates of thinning were associated with a history of hydroxurea (HU) treatment (p<0.001).

Conclusions:
Rates of retinal thinning in sickle cell eyes of adult patients are higher for patients with Hgb SC or SThal subtype, thicker ETDRS subfields at baseline, systemic hypertension or prior ACS and lower with HU treatment.