Skin Elasticity May Serve as Potential Biomarker for Sclerosis

By Jeff Evans

Seattle — Reductions in skin elasticity appear to be a possible biomarker for the progression of amyotrophic lateral sclerosis that deserves further study, according to study results.

The change in the potential biomarker was associated with changes in the Amyotrophic Lateral Sclerosis Functional Rating Scale—Revised and other clinical measures of disease progression, including forced vital capacity.

ALS patients are known to have reduced skin elasticity, in which the skin returns slowly to its original shape and dimensions after being stretched. However, this phenomenon has not been quantified and suffers from substantial intra- and interobserver variability.

Structural and biochemical abnormalities of the skin in ALS also have been identified, including reduced and loosely woven collagen bundles with accumulation of amorphous materials between the bundles, collagen fibrils with irregular diameter, noninflammatory vascu- lopathy, and deposits of beta-amyloid protein close to blood vessels. One study also found a significant negative correlation between the diameter of collagen fibrils and hand function (Neurol Sci 1989;7: 8), Dr. Harvey Arbesman said at the annual meeting of the American Academy of Neurology.

The skin changes that appear in ALS patients could be analogous to changes that are occurring in the CNS because both the CNS and skin arise from the neural crest in development and many diseases affect both systems, suggested Dr. Arbesman, a dermatologist in Williamsville, N.Y.

“Our objective was to test the hypothesis that chronologic, quantitative measurements of skin elasticity could be a useful, noninvasive, biomechanical biomarker of disease progression in patients with ALS and aid in diagnosis,” he said.

Dr. Arbesman and his colleagues measured skin elasticity with a cutometer on the arm and back at baseline in 40 ALS patients and 30 of their family members or caregivers, who served as controls. Most of the control participants were spouses. None of the patients had superoxide dismutase 1 (SOD1) mutations, which are known to cause about 20% of familial ALS cases.

Compared with the controls, skin elasticity in ALS patients was significantly reduced in measurements on the arm with 2-mm and 8-mm Cutometer probes.

The investigators controlled for age at baseline because skin elasticity declines with age. Cutometer measurements with 2-mm probes assessed the elastic properties of the epidermis and papillary dermis, whereas the 8-mm probe evaluated the elastic properties of the whole skin, he said.

“We took into account if the patient had developed, let’s say, right-sided disease first and that was the presenting complaint, then we used the affected side,” if it was bilateral involvement when it was presented, then by default we used the right side,” Dr. Arbesman said.

Because the hydration status of the skin will affect its elasticity, the investigators instructed patients not to make any changes in their skin care habits on the day of each visit. The air temperature and humidity of the clinic were monitored at each visit to ensure that they were the same.

Skin elasticity on the back was significantly correlated with scores on the ALS Functional Rating Scale—Revised, as well as forced vital capacity, at 3 months. The group has collected 6-month follow-up data that are still being analyzed, he said.

The changes in the Cutometer readings between baseline and follow-up measurements were assessed on a plot of the area under the curve for the ratio between the two curves that are generated during the suction and relaxation phases of the elasticity measurement for each anatomic location. This tends to correct for any edema or changes in subcutaneous fat that might have occurred between measurements, he said.

“Further studies are needed to elucidate the relationship of this biomarker to specific biochemical changes relevant to the pathogenesis of ALS,” Dr. Arbesman concluded.

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