TRILION - APPLICATION NOTE
Soft Tissue Mechanical Characterization

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Figure 1. Speckle patterned specimen

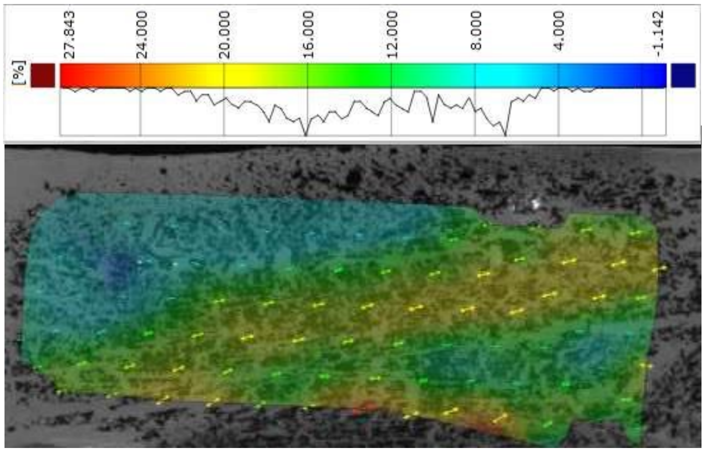

Figure 2. Principal strain distribution & orientation

Problem Overview

Measuring and characterizing the mechanical behavior of soft tissue, which are anisotropic, non-linear and inhomogeneous in nature, is difficult. Accordingly, traditional, and invasive, measurements, fail to provide meaningful information of the actual performances, thereby facilitating the need for alternative methodologies. Optical, non-contact metrology allows for full-field data acquisition to show complex strain gradients and displacements during testing.

Notes

The ARAMIS 3D DIC optical metrology tool was used to measure full-field strain and displacement gradients of a muscle tissue. Contactless measurements enables the measurement of strains without disturbing the local mechanical response of the material. This requirement is particularly important for deformable materials such as soft tissues (liver, intervertebral discs, etc.). ARAMIS employs a stochastic pattern (Figure 1) to illuminate all points of interest on the test article. A specimen was loaded in tension and the resultant principal strain distribution (Figure 2) is presented.

Conclusion

Using the unique ability of ARAMIS to negate translational motion when measuring displacement, the result of the tensile properties of a muscle tissue was able to be directly measured. In this case, ARAMIS was able to track large soft tissue displacements and principal strain distribution. The full-field measurement through visualization of strain gradients and concentrations produces a more complete description of the behavior of biological specimens during in vitro tests. Traditional tools, being invasive, are not able to solve this, so ARAMIS provides the better, or in most cases, the only solution.

Keywords: DIC, Digital Image Correlation, Soft Tissue Mechanical Characterization