AESTHETIC AND COSMETIC DERMATOLOGY (LASERS SEPARATE CATEGORY)

PILOT, COMPARATIVE STUDY OF ABSORBABLE POLYMERIC SUSPENSION THREADS: KEY BIOMECHANICAL PROPERTIES AND THEIR RELEVANCE TO CLINICAL APPLICATIONS

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Background: Absorbable suspension threads are advocated for two-dimensional tissue lifting. Recent anatomical understanding mandates more three-dimensional correction of facial aging or trauma. This pilot comparative study evaluated key parameters of 45 absorbable threads within three major categories: poly-L-lactic acid-co-ε-caprolactone, poly-L-lactic/glycolic acid, and polydioxanone.

Objective: To advance evidence-based applications of threads, as rheology has advanced filler applications.

Materials and Methods: Tested threads comprised poly-L-lactic acid-co-ε-caprolactone (PLLA-co-PCL) with 23.2cm and 12cm lengths from one source and 10cm from another (30 specimens), poly-L-lactic/glycolic acid (Lac/Gly) with 27.5cm length (10 specimens), and polydioxanone (PDO) with 10cm length (5 specimens). Stereomicroscopy was performed at four magnifications. Tensile Strength and Rheological Creep & Recovery were measured in a dynamic mechanical analysis device with tension fixture clamps. Elastic behavior (ability to resume original length) and plastic behavior (tendency to maintain residual elongation) were quantified.

Results: Stereomicroscopy showed significant structural differences. PLLA-co-PCL notching created periodic, bi-directional barbs with source-specific orientation. PDO had arrow-shaped anchors. Lac/Gly had sliding cones, torus knots and linear segments. With increasing tensile force, PLLA-co-PCL behaved elastically up to yield point, then plastically until rupture. Lac/Gly had three yield points with progressive increase in plastic over elastic behavior until rupture. PDO behaved elastically until rupture. Tensile load application and removal revealed distinct kinetics/magnitudes of elastic and plastic behavior. 80 minutes after load removal, recovery/reversal of plastic deformation was 48.5% and 47% for PLLA-co-PCL 12cm and 23.2cm, versus 11% for Lac/Gly.

Conclusions: This first biomechanical thread study defines static and dynamic capabilities

to restore three-dimensional facial support and is relevant to facial muscular contractions over thread lifespan. Biomechanically-tailored threads minimize complications from excessive/supra-physiological tension and skin traction e.g. pain, inflammation, extrusion, contour irregularities. Evidence-based combination of threads with fillers or surgery can overcome challenges and optimize physiological correction of frontal projection, sagittal width and gravitational ptosis.