Innovative instrumentation for assessing the viscoelastic properties of skin

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I. Abstract
A specific instrument to evaluate the viscoelastic properties of human skin has been developed in this project. This technology combined with the use of ex vivo human skin explants under physiological conditions for several days, should enable to help for the development of products intended for treatments. Indeed, we propose to analyse and evaluate in an objective way:
- the effects of different external stresses (stretch marks, UV rays exposure, chemical exposure, air pollution, injuries, freezing, etc.)
- the effects of medical or dermo-cosmetic products (moisturising creams, anti-stretch mark creams, healing dressings, etc.)
on the viscoelastic properties of human skin.

II. Instrumentation

III. Method

IV. Results

Tensile test ➔ Elastic behaviour of skin ➔ Young’s modulus (E) ➔ Stiffness
Stress relaxation test ➔ Viscoelastic behaviour of skin ➔ Relaxation modulus E(t)
Dynamic tests: Deformation sweep + Frequency sweep ➔ Viscoelastic behaviour of skin ➔ Elastic component E’ ➔ Dissipative component E”

Progress of the project
- A new instrumentation to evaluate the mechanical properties of human skin has been developed.
- A characterisation of the mechanical properties of ex vivo human skin explants has been carried out.
- The 1st results obtained demonstrate the device’s ability to accurately explore the mechanical properties of ex vivo human skin explants.

Perspectives & Applications
- In view of the 1st results, continue the development of the technology:
  - Addition of force sensors to control skin bonding pressure.
  - Possibility of adapting the technology to in vivo measurements.
- Evaluate the effects of different stresses and wound healing on the mechanical properties of human skin.

Reference

Medical & Cosmetics