Three Dimensional Mathematical Models for the Deformation of Human fascia

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BACKGROUND: While mathematical models have been developed for bony movement during chiropractic manipulation, such models are not available for motion of soft tissues during other forms of manipulation and osteopathy.
METHODS: An elastic theory for finite deformation is employed to develop a three dimensional mathematical model for exploring the relationship between mechanical forces and deformation of human fascia in manual therapy. Also the basic field equations for viscoelastic soft tissues are employed for exploring the relationship between time varying mechanical stresses and dynamic deformations of human fasciae in manual therapy.The Neurocom Equitest apparatus and the Xsensor cushion mapping device are used to measure pressure and shear stress.
RESULTS: The time history of amount of compression and shear produced on the fasciae during manual therapy are determined under prescribed forces. The plantar fascia and fascia lata need very large forces, outside the physiological range, even to produce 1% compression and 1% shear, although this is not the case with superficial nasal fascia. Stresses increase as the deformation increases with time. Greater stresses are produced with higher rate of deformation.
CONCLUSIONS: The palpable sensation of a tissue release which is reported by manual therapists is not due to deformations produced in plantar fascia and fascia lata but this could possibly be due to deformations in softer tissues such as nasal fascia. Fascia lata and plantar fascia require similar forces for the same amount of deformation.
In order to achieve a viscoelastic deformation without causing tissue damage it is not recommended to slowly increase the applied force during a manual intervention. Rather it is recommended to keep a fairly constant force for up to 60 seconds in order to allow for a plastic stress relaxation response of the tissue.
Greater loads are needed to produce the same strain in quick maneuvers.

REFERENCES:
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