

Early morphologic changes in trapeziometacarpal joint bones with osteoarthritis

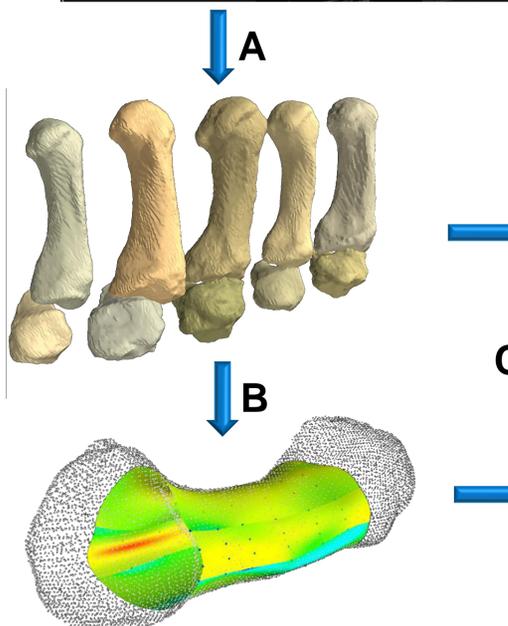
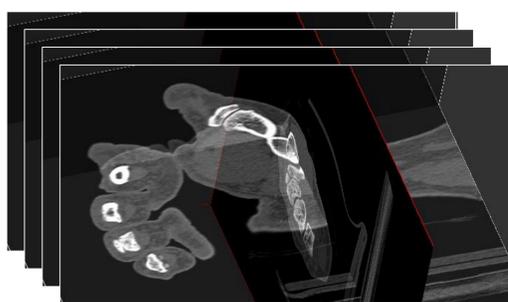
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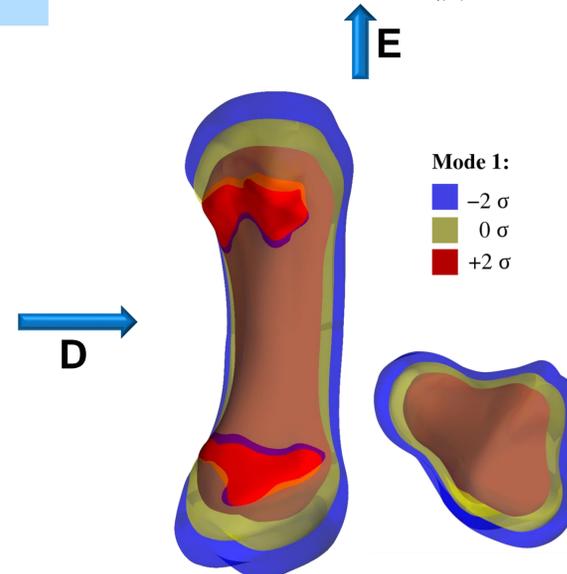
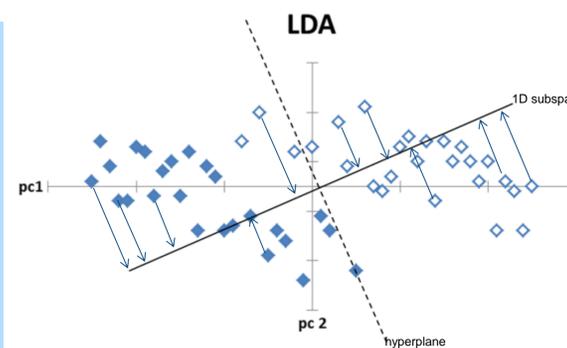
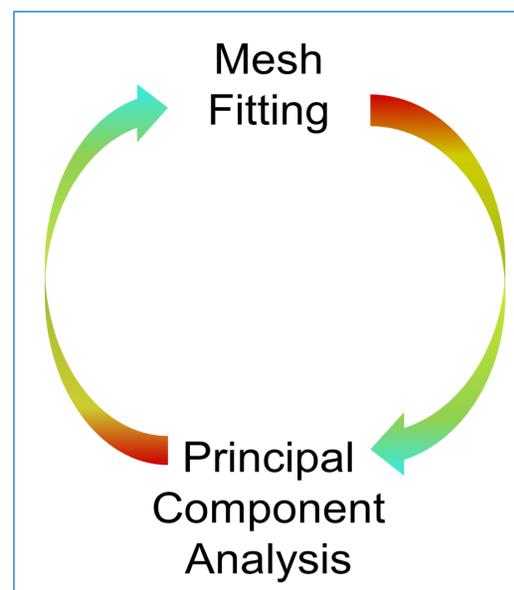
Introduction

- Widespread trapeziometacarpal joint osteoarthritis (OA) [1] can impair the upper extremity by up to 50 % [2]. Morphology is an important factor that plays a role in contact mechanics, kinematics, and has been implicated in the pathogenesis of trapeziometacarpal osteoarthritis [3].
- Statistical shape models (SSMs) can efficiently describe morphological variation across a population. Providing clinicians with tools to identify early onset of osteoarthritis would enable better management and treatment of the disease.
- Here we present a statistical shape model (SSM) classifier to differentiate morphological differences between healthy and early osteoarthritic trapeziometacarpal joint bones.

Methods

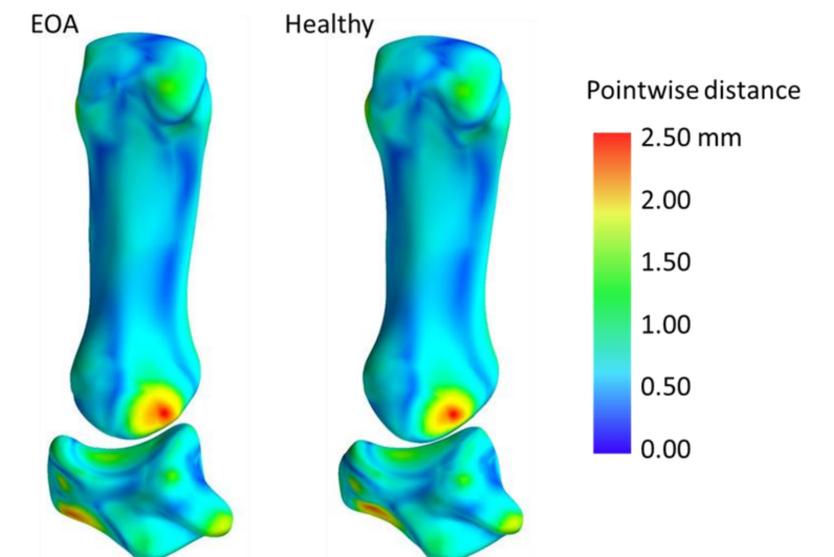


- CT data consisting of healthy (n=49) and early OA (n=75) subjects were segmented.
- Custom template mesh was created.
- Template was fitted to segmented training set.
- PCA was performed to obtain SSM.
- Linear Discriminant Analysis (LDA) classifier was created for healthy and early OA subjects.



Results

- Local morphology varied by as much as 2.5 mm ($p = 0.0015$).
- The articular surface was, on average, 1.5 mm deeper in EOA trapezia than in healthy trapezia.
- Protrusions along the ridges of the articular surface were present in early osteoarthritic subjects, with the volar beak of the metacarpal exhibiting 2.5 mm protrusions.



Discussion

Such bony changes have been previously reported and are believed to be a result of volar beak ligament degeneration. Protrusions of a similar size were also identified on the scaphoid facet of the trapezium. These protrusions may be early stage osteophytes that may not be visible on x-rays.

References

- Haara MM et al., *J Bone Joint Surg.* **86**:1452-7, 2004.
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- Hunter et al., *Osteoarthritis Cartilage.* **13**:953-7, 2005.

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