

THE TRAPEZIOMETACARPAL JOINT: FORM AND FUNCTION OF THE NATIVE AND DISEASED JOINT

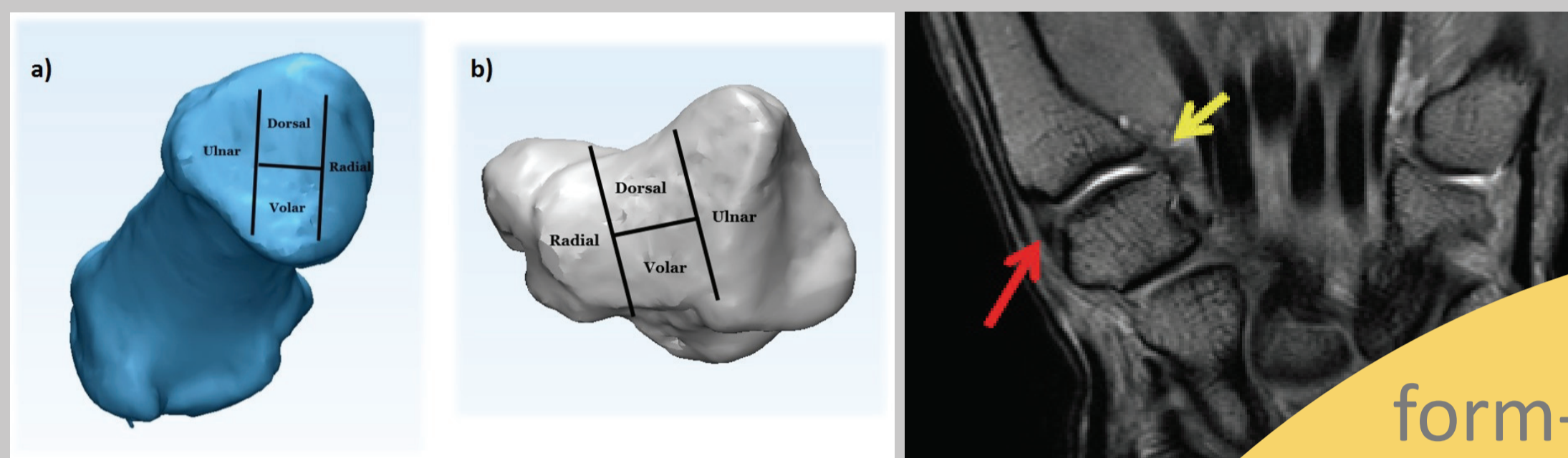
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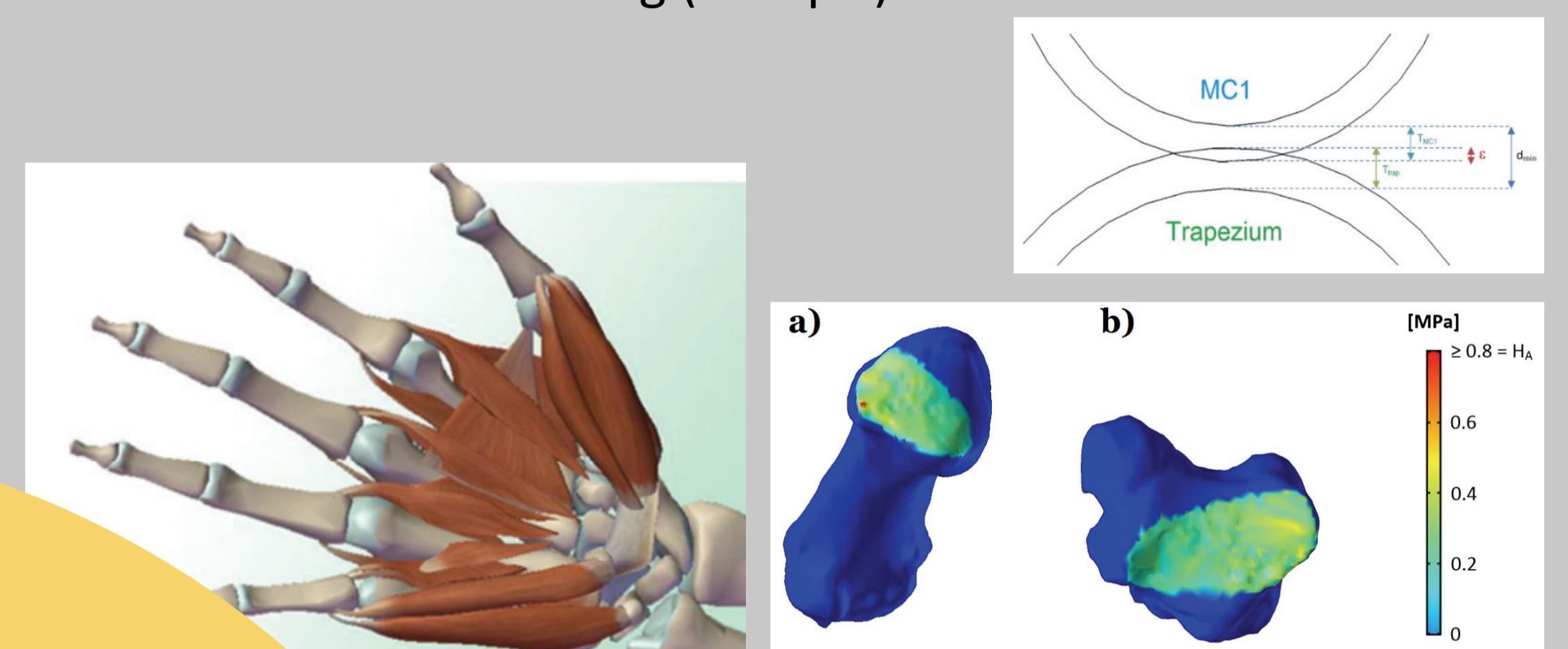
Medical imaging

- dynamic CT scanning
- conventional CT
- conebeam and microCT
- MRI
- in vivo 3D kinematics of TMC joint
- micro-architecture of first metacarpal and trapezium soft-tissue architecture



Computer modeling

- mathematical modeling (Matlab)
- musculoskeletal modeling (OpenSim)
- finite element modeling (Abaqus)

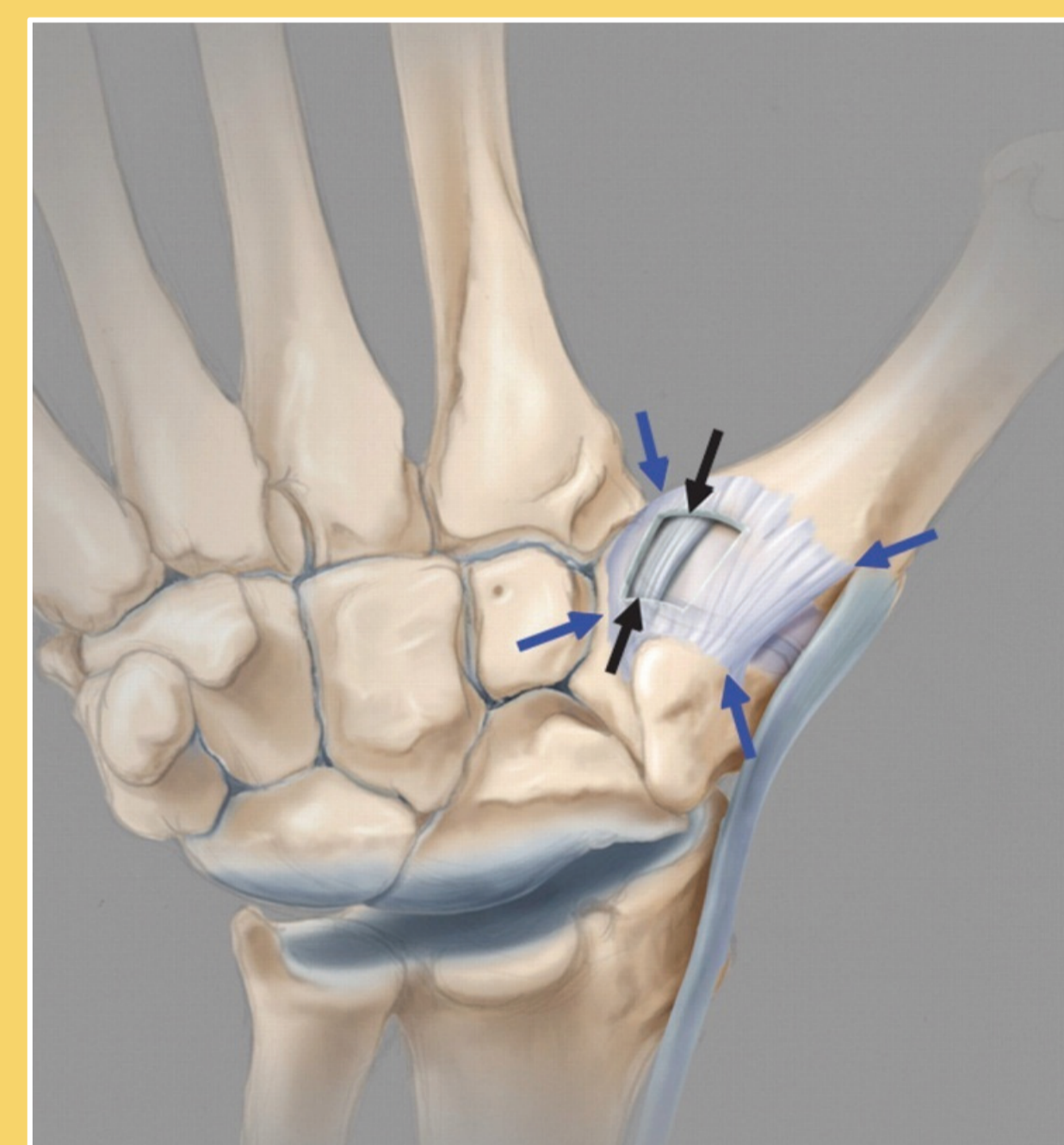


form-function relation

osteoarthritis

anatomy

arthro-kinematics

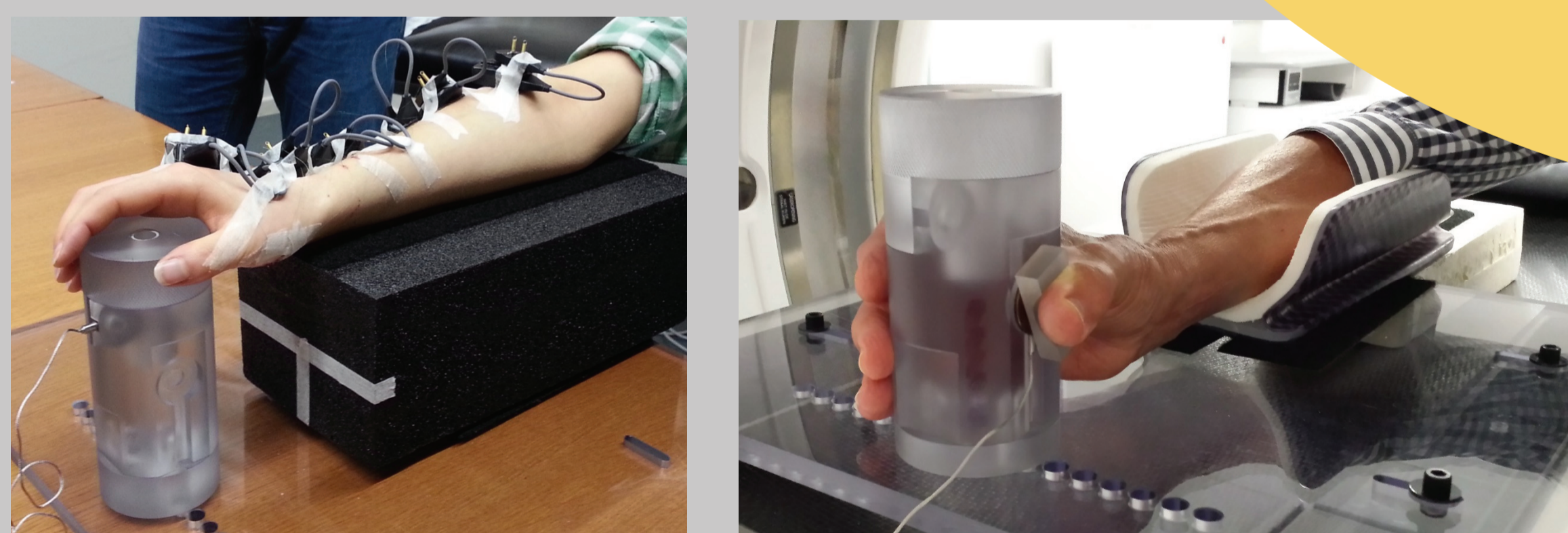


mechanical loading



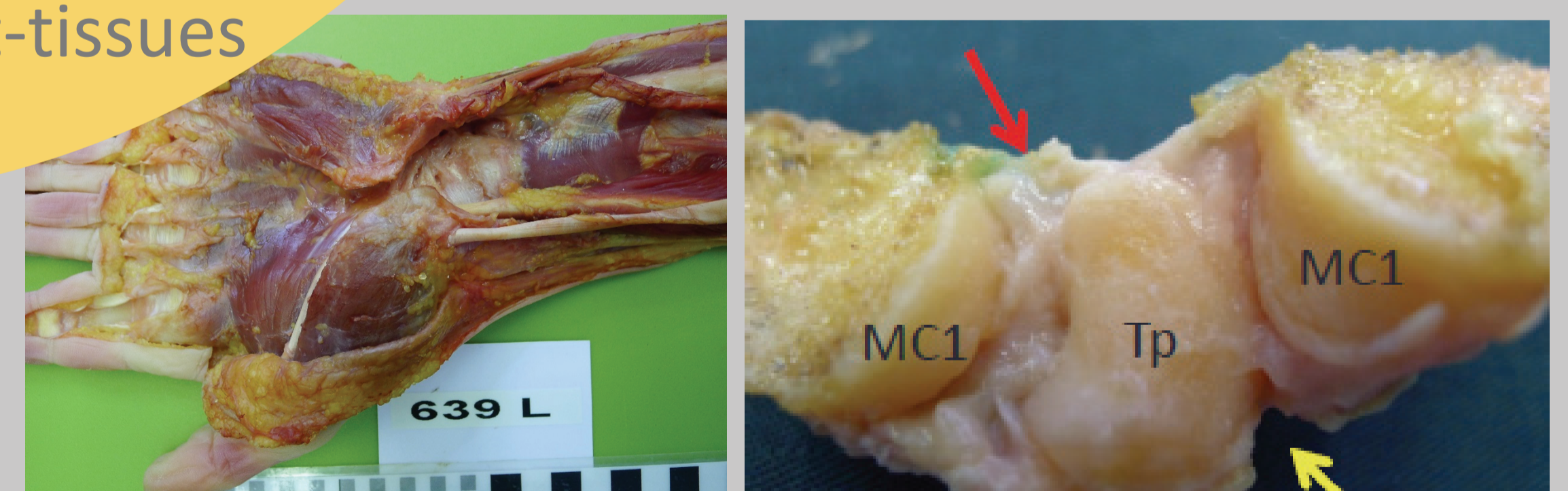
stability vs. mobility

role of soft-tissues



- activation patterns of thumb muscles during functional tasks of the hand
- fine-wire EMG of 4 intrinsic and 4 extrinsic thumb muscles

EMG experiments



- detailed dissections and digitalization of fresh-frozen hand specimens
- quantification of soft-tissue architecture
- mechanical properties of TMC ligaments

Cadaver experiments

Context.

The human basal thumb joint or trapeziometacarpal (TMC) joint is a joint with a high mobility and a low intrinsic stability. The high mobility and specific morphology of the human thumb contribute to our unique manipulation skills, yet they make the TMC joint also prone to injury and disease. Osteoarthritis (OA) is the most common age-related degenerative disorder, which also frequently affects the TMC joint. It has a prevalence of 33% in postmenopausal women and an overall prevalence of 15% in adults. TMC OA leads to severe pain and restriction of joint mobility and has a severe impact on daily activities. OA is a multifactorial disease in which mechanical factors, such as joint loading and joint instability, play an important role.

Central objective.

The central objective of our research group is to combine different approaches to enhance our understanding of TMC joint functioning, both in native and pathological joints.