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A protocol for the local mechanical characterisation of metastatic bone

Aurélie Levillain (1), Cyrille Confavreux (2,3,4), François Bermond (1), David Mitton (1), Hélène follet (2)

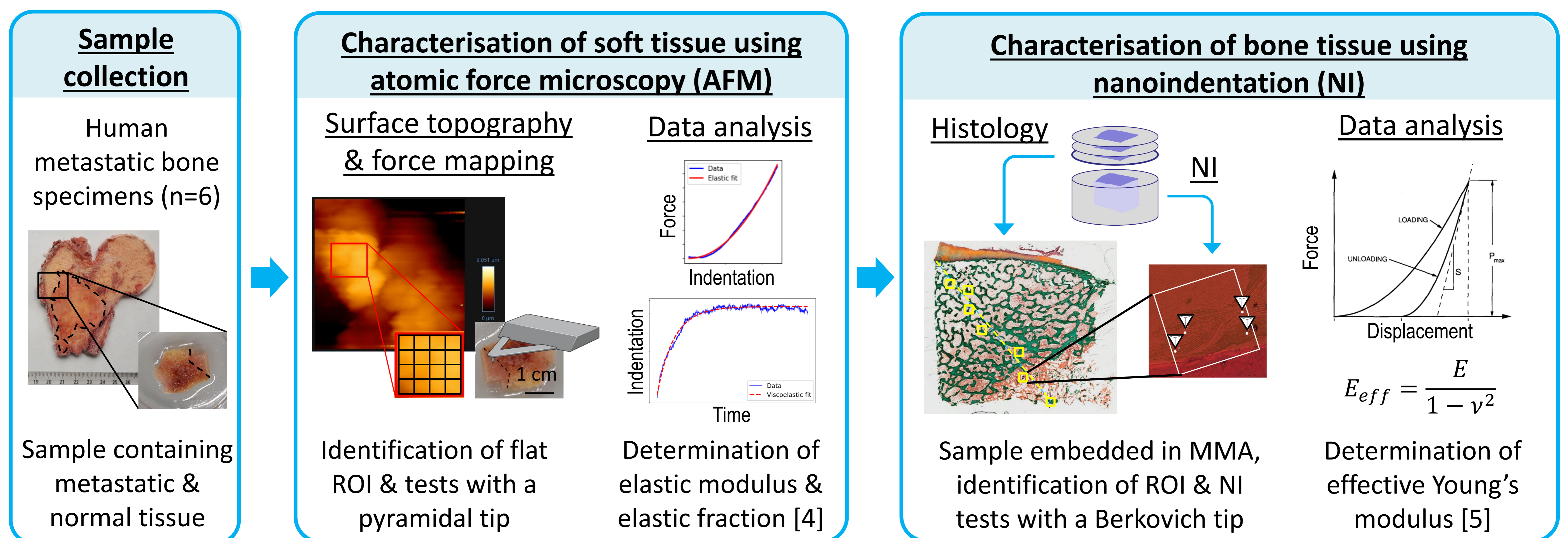
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Context: need for specific mechanical properties in FE models of metastatic bone?

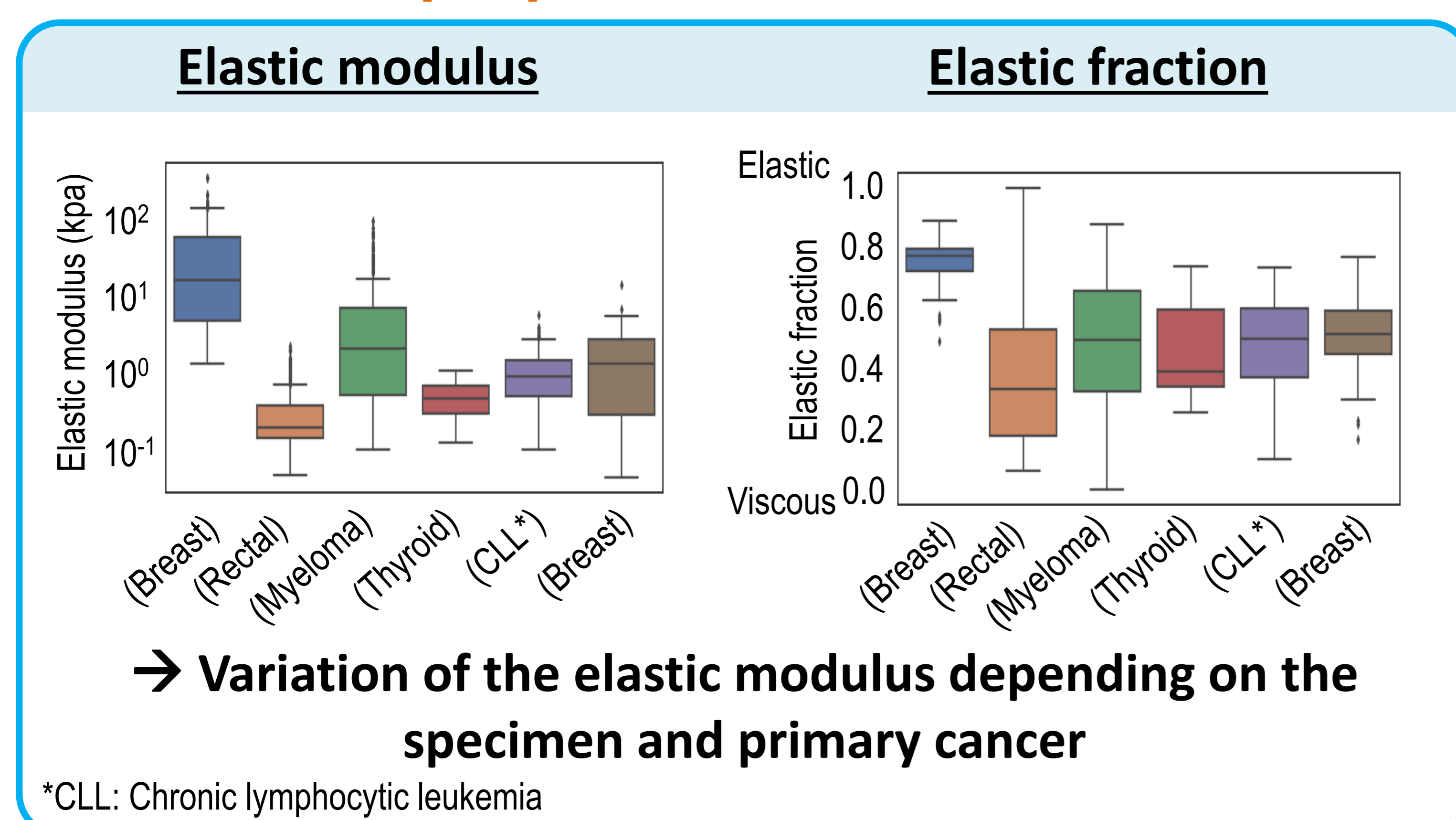
- QCT-based finite element (FE) models assessing the strength of metastatic bone segments can help predicting bone fracture [1] → are density – elasticity relationships [2] still valid for metastatic bone?
- Changing the constitutive law of metastatic and surrounding bone tissues can influence the predicted failure load [3]
- We proposed an experimental protocol to locally characterize the mechanical properties of metastatic and surrounding bone tissue.

Method: mechanical characterisation of metastatic (soft) and bone (hard) tissue

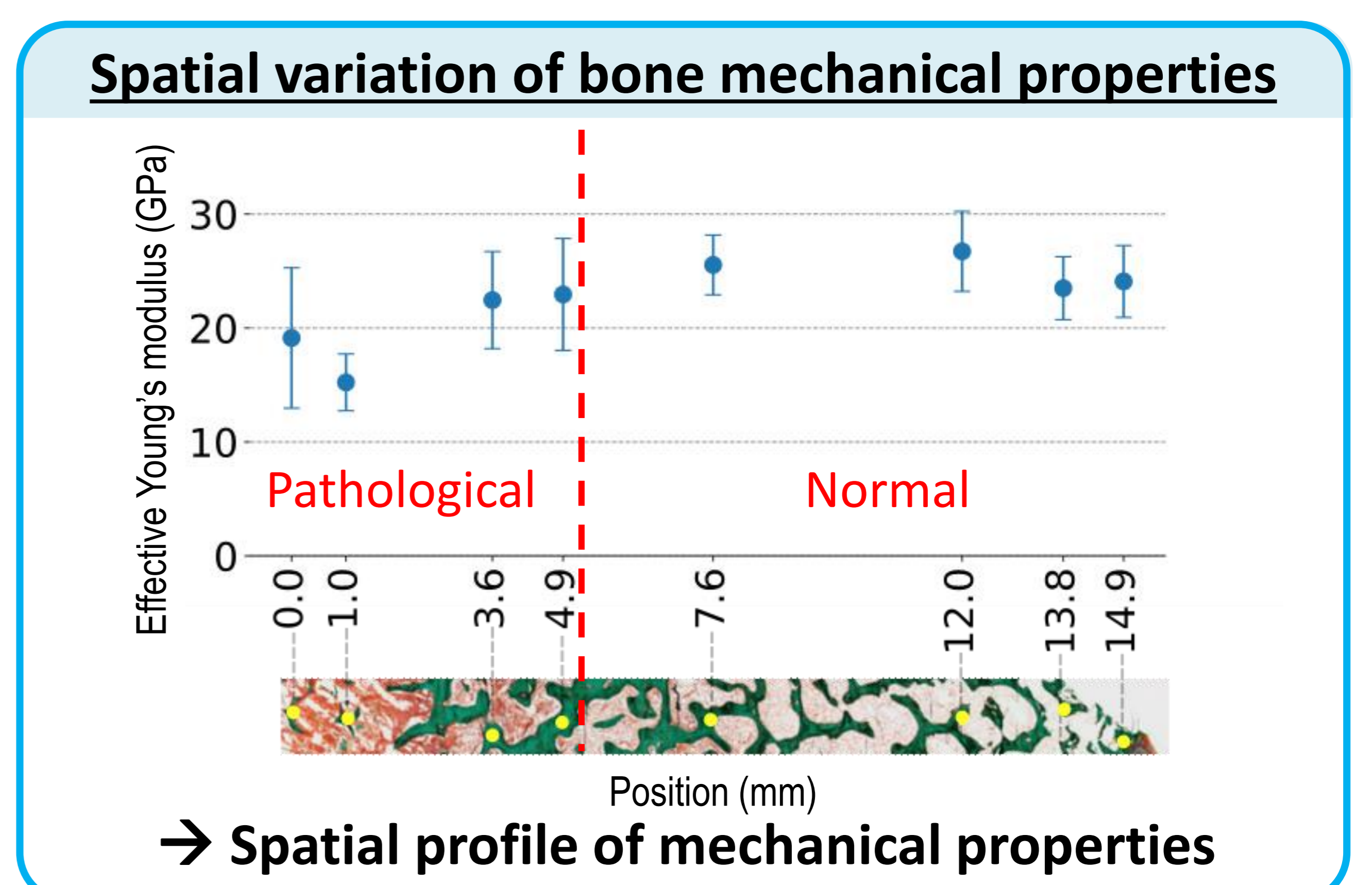
- A dedicated experimental protocol has been developed to account for metastatic bone heterogeneity.



Mechanical properties of metastatic tissue



Mechanical properties of bone tissue



Significance of the work & perspectives

- Mechanical properties of metastatic bone vary depending on primary cancer type and within the specimens.
- A sensitivity study will be conducted to assess the influence of mechanical properties on the failure load predicted by FE models.

Acknowledgements

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References

[1] Eggermont et al., *Bone*, 2020. [2] Keyak et al., *Clin. Orthop. Relat. Res.*, 2005. [3] Falcinelli et al., *JMBBM*, 2019. [4] Levillain et al., *Materialia*, 2002. [5] Oliver, Pharr, *J. Mater. Res.*, 1992