

# FRACTURE TOUGHNESS OF THE CANCELLOUS BONE OF *FNF* FEMORAL HEADS IN RELATION TO ITS MICROARCHITECTURE

C Greenwood (1) JG Clement (2) AJ Dicken (3) JPO Evans (3) I.D. Lyburn (4) RM Martin (5) KD Rogers (1) N Stone (6) G Adams (1) P Zioupos (1)

1. Cranfield Forensic Institute, Cranfield University, Defence Academy of the UK, UK; 2. Forensic Odontology, University of Melbourne, Australia; 3. The Imaging Science Group, Nottingham Trent University, UK; 4. Cobalt Health, Cheltenham, UK; 5. Social and Community Medicine, Bristol University, UK; 6. Physics and Astronomy, Exeter University, UK.

## Introduction

This study considers the relationship between microarchitecture and mechanical properties for cancellous bone specimens collected from a cohort of patients who had suffered fractured necks of femur. OP is an acute skeletal condition with huge socioeconomic impact [1] and it is associated with changes in both bone quantity and quality [2], which affect greatly the strength and toughness of the tissue [3].

## Methods

Over 88 samples from 37 femoral heads were dissected mechanically characterised for fracture toughness [3] and microCT scanned Nikon CT H225 (X-Tek Ltd) to derive the full gamut of microarchitectural parameters of the cancellous bone.

## Results

The findings support a model where reduced bone mass results in a reduction in the number of trabeculae and trabeculae thickness and an increase in trabeculae spacing with concomitant changes in FT (Figure 1).

## Conclusions

This study has crucially shown that TbTh, TbSp, SMI and TbN may provide a proxy or surrogate for BV/TV. Correlations were found between FT values and BV/TV, BS/TV, TbN, BS/BV and SMI. Overall, this study has highlighted that the fracture model based upon BMD could potentially be improved with inclusion of other microarchitecture parameters.

## References

1. International Osteoporosis Foundation, <http://www.iofbonehealth.org/facts-statistics>
2. Hildebrand T, et al. J Bone Min Res, 14: 1167–74, 1999.
3. Cook RB & Zioupos P, J Biomechanics, 42: 2054–60, 2009.

## Acknowledgements

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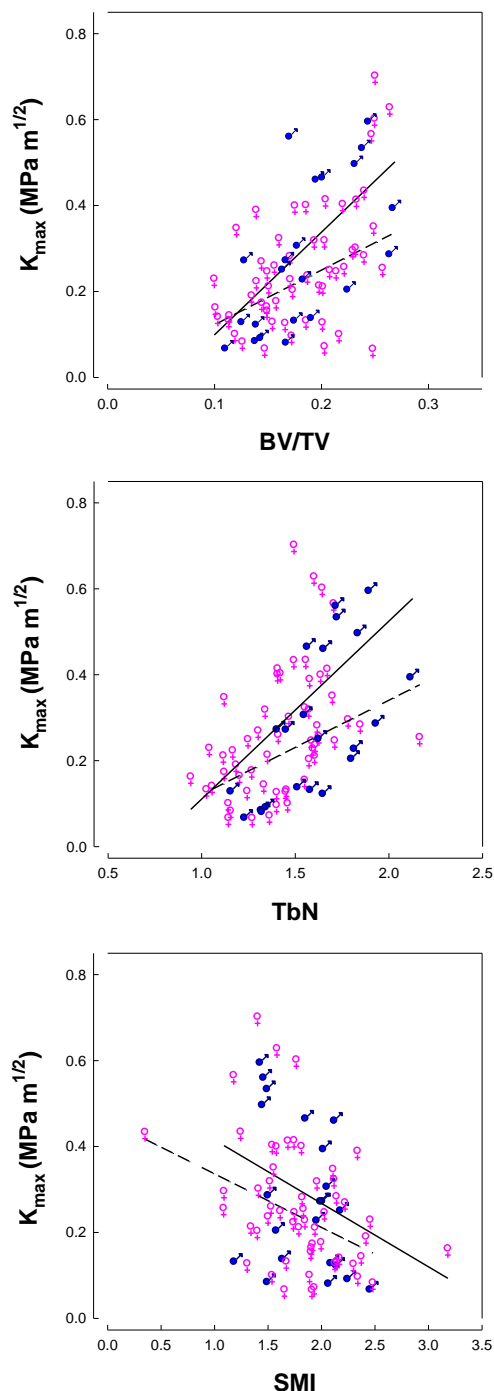


Figure 1: Critical stress intensity ( $K_C$ ) as a function of various microarchitectural properties: (A) BV/TV; (B) TbN; (C) SMI. Male (♂) Female (♀).



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Greenwood, Charlene

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