



VIBRATION EMISSION PATTERNS OF HUMAN KNEE JOINTS

Beverland, DE., MCCOY, GF., Kernohan, W. G., & Mollan, RAB. (1985). *VIBRATION EMISSION PATTERNS OF HUMAN KNEE JOINTS*. 1-3. Abstract from Annual Irish American Orthopaedic Society Meeting, Galway, Ireland.

[Link to publication record in Ulster University Research Portal](#)

Publication Status:

Published (in print/issue): 30/06/1985

Document Version

Author Accepted version

General rights

The copyright and moral rights to the output are retained by the output author(s), unless otherwise stated by the document licence.

Unless otherwise stated, users are permitted to download a copy of the output for personal study or non-commercial research and are permitted to freely distribute the URL of the output. They are not permitted to alter, reproduce, distribute or make any commercial use of the output without obtaining the permission of the author(s).

If the document is licenced under Creative Commons, the rights of users of the documents can be found at <https://creativecommons.org/share-your-work/ccllicenses/>.

Take down policy

The Research Portal is Ulster University's institutional repository that provides access to Ulster's research outputs. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact pure-support@ulster.ac.uk

VIBRATION EMISSION PATTERNS OF HUMAN KNEE JOINTS

Abstract submitted for the Irish American Orthopaedic
Society Meeting, Galway 27th to 29th June 1985

Beverland, D.E., McCoy, G.F., Kernohan, W.G.,
Mollan, R.A.B.

Department of Orthopaedic Surgery
The Queen's University of Belfast
Musgrave Park Hospital
Belfast, BT9. 7JB

The diagnosis of internal derangements of the knee by non-invasive means is notoriously difficult. Attempts have been made to correlate joint vibration with underlying pathology for many years. Until the recent past all measurement of vibration from symptomatic joints relied on acoustic techniques^{1, 2, 3, 4}. Such methods have had little success. One important limitation is that many joint vibrations are palpable but not audible i.e. they are sub-acoustic. There was therefore an obvious need for a sensitive non-invasive system which could detect the full spectrum of joint vibration. This paper discusses the application of such a system to clinical examination of the knee known as "vibration arthrography". The vibration sensors used are accelerometers and these are taped onto bony prominences around the knee.

Using this technique 250 patients, referred on clinical grounds to our centre for arthroscopy, were examined. Arthroscopy provided a definitive diagnosis on which interpretation of results could be based. Recordings were made, from each knee, during a series of active joint cycles and passive stress cycles including McMurray's testing. Meniscal lesions produced characteristic signal patterns

and allowed lateralisation in all positive cases. Differences were observed that allowed discrimination between posterior horn and bucket handle tears⁵. Arthroscopic meniscectomy was found to greatly reduce or abolish the signals.

The normal knee also produces vibration signals. Of particular interest is a phenomenon which we have called "physiological patello-femoral crepitus" (P.P.C.). This has been shown to be produced as a result of "stick slip" friction between the articular surface of the patella and trochlea. It is found in all normal knees when they are moved slowly. Its importance lies in the fact that it allows non-invasive measurement of the physical properties of articular cartilage. For example patients with advanced patello-femoral osteo-arthritis do not produce P.P.C. The clinical potential for this technique as a diagnostic aid in chondromalacia patellae is being investigated.

REFERENCES

- 1 Heuter, C. Grundriss der Chirurgie, 3rd Ed. Leipzig F.C.W. Vogel, 1885.
- 2 Blodgett, W.E. Auscultation of the Knee Joint. Boston Medical and Surgical Journal, 1902: 146; 63-66.
- 3 Bircher, E. Zur Diagnose der Meniscusluxation und des Meniscusabrisses. Zentralbl. f. Chirurgie, 1913: 40; 1852-1853.
- 4 Erb, K.H. Registrierung von Gelenkgeräuschen. Archiv. Klin. Chur. 1933: 177; 475-482.

- 5 McCrea, J. D., McCoy, G. F., Kernohan, W. G.,
McClelland, C. J., Mollan, R.A.B. Vibrationsarthrographie
in der Diagnostik von Kniegelenkskrankheiten.
Z. Orthop. 1985: **123**; 17-22.