ORTHOSPORTS
QUESTION FOR PHYSIOTHERAPISTS

QUESTION | I AM SOMETIMES ASKED ABOUT A PATIENT'S COARSE CREPITUS IN THEIR KNEES. IT HAS USUALLY BEEN THERE FOR YEARS BUT CAN BE OF RECENT ONSET TOO. IT USUALLY JUST DEVELOPS OVER TIME BUT CAN ALSO BE AS A CONSEQUENCE OF AN INJURY. IT IS ALMOST ALWAYS WORSE WHEN THE PATELLOFEMORAL JOINT IS LOADED UP SUCH AS SQUATTING AND CLIMBING STAIRS. CAN YOU PROVIDE AN OUTLINE OF THE UNDERLYING PATHOLOGY AND ITS CONSEQUENCES AND TELL ME IF IT IS REVERSIBLE?

ANSWER |

Some patients report uncomfortable grating while flexing or extending their knees. This can be occasional or be present with each knee movement. Audible crepitus can often be heard from the end of the examination couch but it may only be palpable i.e. sensed by the patient or felt by gently placing your hand on the patella during flexion and extension.

Audible crepitus is a more common feature of knee osteoarthritis. The degree of crepitus does not relate the amount of problems the patient experiences. There may be no crepitus in patients with significant anterior knee pain but it may also indicate a significant articular lesion or synovitis. Pain associated with crepitus, especially when the articular lesion is under load, may indicate an important source of pain (Fulkerson & Buuck, *Disorders of the Patellofemoral Joint* (p144).

What causes the crepitus?

Crepitus is a symptom caused by vibrations produced by articular cartilage during the flexion-extension movement of the knee. Underlying pathology may be minimal, and if pain free treatment should concentrate on the overall diagnosis.

Vibration waves are produced by the knee joint during flexion-extension movements. When the speed of motion is less than 5˚/sec this vibration is referred to as physiological patellofemoral crepitus, which reflects the integrity of the articular cartilage.

These vibration waves have been studied with **vibration arthrometry**. The values obtained are significantly different in patients who have suffered knee injuries but have normal articular cartilage compared to patients with osteoarthritis. Among the latter, three distinct subgroups may be identified: (1) Articular damage in either the medial or lateral compartment, (2) Damage to the trochlea as well as a

compartment; and (3) Damage to the retropatellar surface in addition to the other two. All these groups differ from the values obtained in normal asymptomatic subjects.

In summary: What do I do if I see a patient with patellofemoral crepitus?

1. Do not treat a sign. Consider this finding in relation to the patient's complaint and treat according to the diagnosis and their symptoms.

2. If the patient has patellofemoral joint syndrome, with maltracking, VMO wasting etc, treat accordingly (Hamstring stretches, taping, strengthening etc).

3. If the problem is osteoarthritis of either the knee or the patellofemoral joint, treat accordingly (see Question for Physiotherapists "Osteoarthritis of the Knee" January 2010)

4. Asymptomatic patellofemoral crepitus is common and does not need treatment.

- Dr Mel Cusi

August, 2010

Physiological patellofemoral crepitus in knee joint disorders.

Department of Orthopaedic Surgery, National Taiwan University Hospital, Taipei, ROC.

Abstract

Vibration waves produced by the knee joint during extension-flexion may be recorded by vibration arthrometry. When the speed of this motion is less than 5 degrees per second, the vibration produced by the patella is referred to as physiological patellofemoral crepitus (PPC), which reflects the integrity of articular cartilage. PPC signals were recorded before a scheduled arthroscopic examination or operations in 17 patients whose patellofemoral joint cartilage was found subsequently to be normal, and in 25 patients (36 knee joints) who underwent arthroscopic debridement, osteotomy, or total knee replacement due to degenerative osteoarthritis. The PPC signals of five normal adults (10 knees) without any knee problems were also recorded as a control group. The root mean square (RMS) values of the PPC signals of the control group, the group with knee injuries, and the osteoarthritic patients were 0.69, 0.17, and 0.04 m/sec2, respectively. Differences among these groups were statistically significant ($P<0.001$). When the time domain pattern and RMS value of the preoperative PPC signals were studied and compared with the corresponding pathological findings in joint cartilage, as noted in the surgical findings, three types of PPC signals of the osteoarthritic knees could be identified. Each indicated pathological changes of a different extent. When the 53 PPC signals were reviewed according to these criteria, the accuracy, sensitivity, and specificity of the diagnosis of osteoarthritic change of the patellofemoral joint by vibration arthrometry were found to be 94.3%, 97.2%, and 88.2%, respectively. Based on these results, the detection of PPC by vibration arthrometry may be considered a reliable and non-invasive diagnostic procedure for the evaluation of the patellofemoral joint cartilage integrity.

PMID: 8829591 [PubMed - indexed for MEDLINE]

1993-1995;53(4):22-6.

Vibration arthrometry in patients with knee joint disorders.

Department of Electrical Engineering, National Taiwan University, Taipei, R.O.C.

Abstract

Physiological patellofemoral crepitus (PPC) is the vibration signal produced by the knee joint during slow motion (less than 5 degrees per second), which can be measured by vibration arthrometry (VAM). By using the autoregressive (AR) model for the PPC signals of patients with knee osteoarthritis, the study analyzes the PPC signals to evaluate the condition of patellar-femoral joint cartilage. Accordingly, we can divide osteoarthritis into three types, type 1: the cartilage of patellar-femoral joint is intact, the osteoarthritis found in the femoral-tibial joint surface; type 2: degeneration occurs in the surface cartilage of both the femoral-tibial joint and the femoral trochlea, but not on the patellar surface; type 3: both patellar-femoral and femoral-tibial joints have osteoarthritis. For the analysis, the intraclass distance of AR coefficients and spectral power ratio of dominant poles are adopted. Based on the proposed method, two cases of type 1, six of type 2, and 28 of type 3 were found in 36 cases of knee osteoarthritis. This is in agreement with the operative findings. For comparison, the PPC signals of 10 subjects with normal knees (without pain or wound history) were also measured. The results of analysis of the 10 normal subjects were consistent and clearly differentiable from those of the osteoarthritis patients. Therefore, the proposed method is efficient for the analysis of the condition of patellar-femoral joint cartilage and VAM may become an alternative way of noninvasive diagnosis of knee osteoarthritis.

PMID: 10943063 [PubMed - indexed for MEDLINE]

2000 Aug;47(8):1131-3.