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The Knee



Novel techniques

Intra-osseous local anaesthetic patellar pain catheter suppresses osteoarthritic patello-femoral pain☆

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ABSTRACT

Background: The source of pain in patellofemoral osteoarthritis is not fully understood. The purpose of this study was to identify the origin of pain using intraosseous pain catheters and to show early results with an osteotomy that is potentially denervating and hydrostatic pressure-relieving.

Methods: Five patients with patellofemoral osteoarthritis and pain with straight downward patellofemoral compression were included. All underwent arthroscopic placement of two 0.8 mm catheters into the medial and lateral patella prior to subsequent patellar facetectomy with an incomplete horizontal patellar osteotomy. The catheters were first flushed with 0.5 ml saline, then with local anaesthetic to determine pain response. After a mean of 44 months the latest clinical examination was performed.

Results: Instillation of less than 0.5 ml of saline provoked sharp pain, which could be localised by all patients as medial or lateral within the patella. Subsequent instillation of local anaesthetic suppressed the mean patellar tenderness during axial compression from VAS 6 to VAS 1. In one of the five patients, patellar osteotomy did not relieve symptoms and further surgical intervention was required. The remaining four patients experienced a clinical improvement with a mean subjective knee value of 55 (range 40 to 65) out of 100.

Conclusion: This is the first report on intraosseous catheters applying local anaesthetics into bone. There is a surprisingly precise intraosseous spatial resolution of pain perception in the patella and triggering of pain in osteoarthritis appears at least in part to occur through intraosseous increase of hydrostatic pressure.

Level of Evidence: Level IV, Case Series.

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1. Introduction

It is commonly accepted that pain can be associated with osteoarthritis. However it is not known which patients with patellofemoral osteoarthritis will develop pain and the underlying mechanism. Isolated patellofemoral osteoarthritis (PFOA) is relatively common and occurs with an overall prevalence up to 24% in patients over 50 years of age [1,2]. If conservative treatment of symptomatic PFOA fails, there are several surgical options such as realignment procedures, patellar facetectomy [3–6] patellectomy, partial or total patellofemoral or total knee arthroplasty [7–9]. However, the understanding of the pain generation and perception is incomplete and therefore the most reasonable and straight-forward treatment option may not be known.

Cartilage does not have sensory innervation [10]. The landmark study of Dye et al. [11] showed that the palpation of healthy cartilage did not induce pain. However, the subchondral bone shows a rich innervation and there are unmyelinated free nerve endings present, which presumably can generate pain [12–17]. There are other possible sources of pain activating receptors in osteoarthritic joints such as the synovia and ligaments, and pain can be referred [18].

We made the clinical observation that in selected patients with PFOA moderate direct downward pressure on the patella by compressing the bony backsurface of the patella axially to the femoral trochlea without any friction, will provoke the typical symptoms, which the patients often experience as pain within the patella. This finding theoretically eliminates soft tissue around the knee as a source of pain and suggests that the pain arises from within the patella rather than in the femur. We therefore hypothesised that the source of pain is most likely from compression of the bone.

To better understand this mechanism and to explore a new joint-preserving surgical approach we conducted this pilot investigation.

The main study question was:

- (1) Does application of local anaesthetics through intraosseous pain catheters into the patella diminish the pain in isolated patellofemoral osteoarthritis and may therefore be used as a diagnostic tool?

A secondary goal was to show our early results with a combined osteotomy to determine:

- (1) Is a facetectomy of the patella in combination with a horizontal pressure relieving osteotomy a safe and reliable treatment option in these patients?

2. Materials and methods

2.1. Ethical approval

All patients agreed to the use of their data. Approval for retrospective analysis is granted by the institutional review boards waiver (Kanton Zürich, Kantonale Ethikkommission: KEK-StV-Nr: 74/2014) on the condition that all personal patient data is blinded.

2.2. Patients

We reviewed five knees in five patients (four men and one woman) with a mean age of 43 (range, 35 to 50) years in which the exact source of pain was unknown and who were tentatively scheduled for a partial facetectomy (three lateral and two medial) combined with a here described horizontal patellar osteotomy for isolated, symptomatic lateral or medial PFOA between January 2010 and February 2011. The mean follow-up was 44 months (range, 39 to 51) for the four patients who did not receive further operative intervention. In these relatively young patients conservative treatments had failed. In clinical examination they all showed localised pain with isolated axial patella pressure on physical examination, considered to represent the typical pain usually experienced by the patient. Furthermore, they all showed an explicit positive reaction to local intraosseous pain catheters as described below.

Three patients had a previous trauma (two sprains and one lateral patellar dislocation) and underwent the following surgical procedures (two knee arthroscopies with debridement and the one patient with previous patellar dislocation had a lateral release and medial plication).

Preoperatively there was a magnetic resonance image (MRI) in four patients and a computed tomography (CT) scan in one patient performed and in all patients our standard radiographic protocol (standard radiographs anteroposterior (AP) view, lateral view in 30° of knee flexion and axial view of both knees in 30° flexion) was used.

2.3. Arthroscopic and pain-catheter evaluation

In all five patients a diagnostic knee arthroscopy was performed to assess the cartilage degeneration and to plan the further surgical procedure. During their knee arthroscopy two temporary intraosseous dual hole 0.8 mm catheters were inserted into the patella (lateral and medial) through drill holes, from anteroinferiorly reaching the medial and lateral superior edge of the patella. Fluoroscopy was used to control intraosseous position without secondary cortical perforation (Figure 1a and b). We used 0.2

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