Radiofrequency denervation of the facet joints in chronic low back pain- a short review

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Abstract

Low back pain is the most common pain syndrome and a global health burden. The etiology in most cases is multifactorial and the facet joints can be a source of low back pain. Radiofrequency denervation showed efficacy in open as well as in placebo-controlled trials and could be a treatment option in carefully selected patients. In this review the anatomy of the facet joints, the pathophysiology and diagnosis of facet joint syndrome in chronic low back pain and results of radiofrequency deneververvation are discussed, with emphasize on the recently published literature.

INTRODUCTION

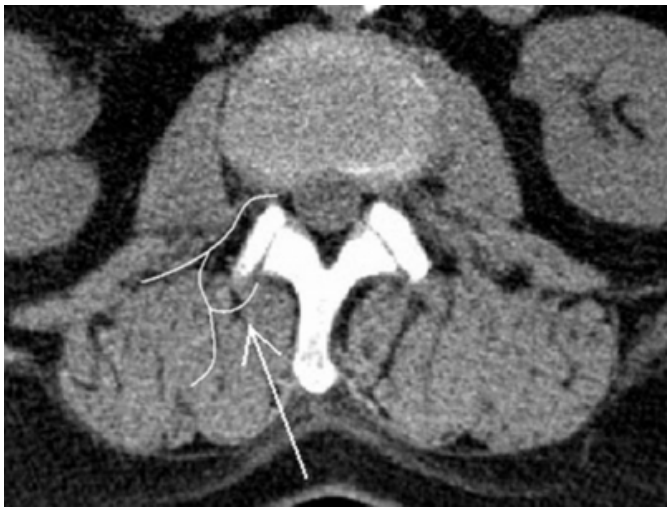
Low back pain (LBP) is the most common pain syndrome and a global health burden. Beside personal discomfort with often chronic pain and restrictions in quality of life, LBP is a common cause for work inability in industrialized countries [1]. In about 90% of patients the pain disappears in about 6 weeks, but nonetheless in a large number of patients the pain becomes chronic [2]. Potentially pain can arise from every part of the spinal column, so determining the exact etiology of LBP is not possible and multifactoral in most cases . As first described by Goldtwaith in 1911 the facet joints can be a source of low back pain [3]. In this review after a short overlook of the anatomy of the facet joints, the contribution of facet joints in chronic low back pain and a discussion of diagnostic methods, an overview of radiofrequency deneververvation of the facet joints is given, with emphasize on the recently published literature.

ANATOMY, PATHOPHYSIOLOGY AND DIAGNOSIS

The facet joint is part of the motion segment and consists of two articular surfaces, which are orientated almost vertically in the lumbar spine. Both the synovial folds and the capsule contain nociceptive nerve endings [4]. The facet joint is innervated by the medial branch of the dorsal ramus of the spinal nerve (see schematic drawings on Figure 1).

Figure 1

Figure 1: Schematic drawings on a computed tomography image of the human spine showing the course of the medial branch of the dorsal ramus of spinal nerve, which innervates the facet joint (arrow).



Each facet joint receives nerve endings from two heights. For example the facet joint L4- L5 receives nerve endings from the dorsal ramus from the 4th spinal nerve for the upper parts und from the 5th spinal nerve from the lower parts. The anatomy has been discussed in detail by Binder and Nampiaparampil [5]. The contribution of facet joints to low back pain is thought to linked to intervertebral disc degeneration in the concept of ‘segmental instability’. As with degenerative changes the height of the intervertebral disc lowers there is more stress on the facet joints and the joint capsule with occurring osteoarthritic changes of the

facet joint and possible pain generation.

As degenerative changes occur in almost every person, facet joint osteoarthritis can be found in about 90% of all patients older than 50 years, but like in other locations there is little correlation between the extent of osteoarthritic changes and perceived grief [6]. So the simple morphological judgment is not helpful. The clinical picture of non radiating low back pain is also not specific. Diagnostic blocks remain the mainstay in the diagnosis of facet joint syndrome and are used in most studies [7], even if they are questioned because of their sensitivity and specifity [8]. A resolution or improvement of pain after image guided injection of local anesthetics around the joint capsule corresponding to the presumed time of action of the used local anesthetic makes the involvement of the facet joint probably. In a study of patients with low back pain by Manchikanti et al. the facet joints were involved in about 31% of patients using double- blind diagnostic blocks. In this study the rate of false- positive blocks at the lumbar spine was 26% [9]. To improve sensitivity some studies use repeated blocks and sometimes saline injection as a control, an approach not easily to perform in everyday practice. Another interesting experimental approach comes from a study by Pneumaticos et al.. They used bone scintigraphy with SPECT to obtain the 'acitivity' of the osteoarthritic process. In patients with 'active' facet joint osteoarthritis, therapeutic blocks were more likely to obtain pain improvement [10].

Because of the multifactoral etiology of LBP a pragmatic approach is needed. In patients with unspecific chronic low back pain and unsuccessful conservative therapy (non steroidal anti-inflammatory drugs (NSAID), physiotherapy) involvement of the facet joint should be considered and confirmed or ruled out with diagnostic blocks. After positive diagnostic blocks, denervation or therapeutic blocks with long acting local anesthetics and corticoids should be tried. Even if there is no resolution of pain a gradual improvement could help to overcome the vitious circle of pain and progressive immobility and may help to reduce drug intake and to increase quality of life.

OVERVIEW OF THE TECHNIQUE OF RADIOFREQUENCY DENERVATION

There are different described techniques in the literature for the denervation of the facet joint, including ethanol injection, kryoablation, radiofrequency denervation and gamma knife surgery [7,11]. Some advocate the use of repeated therapeutic blocks with long acting local anesthetics and corticoids. The most extensively studied technique is radiofrequency denervation, which is easy to perform, safe and a patient – friendly 'single- session' technique which can be performed at an outpatient basis. For the treatment the patient is positioned prone and after disinfection and sterile covering the needle tip of the radiofrequency needle is placed either at the cranial or caudal part of the facet joint, because of the 2-segment innervation. The needle placement should be imaged guided (CT- or fluoroscopic guidance). After the documentation of the right needle placement (Figure 2) denervation is performed using a temperature of 90 C for 1 minute.

Figure 2

Figure 2: Computed tomography image showing the correct placement of the needle tip before denervation.

Each facet joint is denervated on the cranial and the caudal part. After cessation of therapy the needle is removed. After the procedure no bed rest is necessary. Local pain can be managed using NSAID.

RESULTS

There is a large amount of literature about radiofrequency denervation of the facet joints. Most data is from uncontrolled studies [7]. Between 35 und 87% of treated

patients are showing a pain improvement of 50% ore more on a visual analogue scale (VAS). But the studies are inhomogenous with sample sizes between 15 and 252 patients, different criteria, diagnostic procedures and techniques. Improvement lasts at mean between 11 and 16 month. This is a phenomenon explained by re-innervation of the facet joints. Schoffermann and Kine reported of 20 patients with relapsing facet joint syndrome, they were treated with repeated radiofrequency denervation for a second or even third time with good success [12].

More comprehensive data comes from randomized controlled trials. An important study was recently published by Nath et al. They performed a placebo- controlled prospective trial of radiofrequency denervation for facet joint syndrome. 40 Patients were included after 3 positive guided diagnostic blocks, including placebo blocks with saline. 20 patients were treated with radiofrequency denervation, while in other 20 patients only the needles were inserted but no denervation was performed. 6 months after the denervation the active treatment group showed significantly less pain and had a better mobility ($p<0.05$). The active group also had a better outcome concerning quality of life variables and took less analgesics [13]. There is another placebo- controlled trial by van Kleef et al. showing efficacy of radiofrequency denervation in selected patients [14].

Another interesting study reported of the 10- year outcome of radiofrequency denervation. Two third of patients reported a good or excellent pain relief (defined as 50 or 80% pain relief on a VAS) for up to 24 months [15]. Van der Wijk et al. reported about the influence of psychological factors on outcome after minimal invasive spine procedures and so called 'psychologic vulnerable' patients (for example disturbed mood, catastrophizing or high anxiety levels) seem to have worse outcomes, a fact known from other spinal surgical procedures [16].

The postinterventional patient management after facet joint denervation has received little attention in the literature. Especially there are no studies comparing different postinterventional treatment regimes, for example physiotherapy against no treatment. But the inclusion of minimal invasive treatment options in an overall treatment concept for patients with low back pain seems self- evident.

CONCLUSION

Radiofrequency denervation of the facet joints is a minimal invasive method with shown efficacy in placebo- controlled trials. So it seems that it could be a useful tool in patients with chronic low back pain, but careful patient selection and embedment in an overall treatment concept is crucial.

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