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REVIEW ARTICLE

Pulsed radiofrequency to treat low back pain*

O uso da radiofrequência pulsátil no tratamento da dor lombar

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SUMMARY

BACKGROUND AND OBJECTIVES: Low back pain treatment may be either conservative or surgical. Current guidelines recommend conservative treatment for most cases, with drugs and rehabilitation, including physical medicine and psychological assistance. Invasive procedures may be justifled if there are evidences of short and long term beneflts, and minimally invasive techniques, such as radiofrequency, are modern and effective to relieve this pain. This study aimed at searching Brazilian literature about the use of pulsed radiofrequency to treat low back pain.

CONTENTS: A literature survey was carried out with articles published from 2004 to 2010 in Portuguese and Spanish in LILACS, Scielo and Cochrane, Cinahl and Medline databases.

CONCLUSION: Pulsed radiofrequency is an effective method to treat chronic low back pain, with low incidence of complications.

Keywords: Low back pain, Pulsed radiofrequency treatment, Spine.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O tratamento da dor lombar pode ser conservador ou cirúrgico. As diretrizes atuais recomendam o tratamento conservador para a maioria dos casos, com medicamentos e reabilitação, incluindo medicina física e ajuda psicológica. Os procedimentos invasivos podem ser justifIcados se existirem evidências de benefícios a curto e longo prazo, e as técnicas minimamente invasivas como a radiofrequência são atuais e eflcazes para alívio desse tipo de dor. O objetivo deste estudo foi buscar publicações na literatura nacional sobre a utilização da radiofrequência pulsátil para tratamento da dor lombar.

CONTEÚDO: Realizou-se um levantamento bibliográflco de artigos publicados no período entre 2004 e 2010 nos idiomas português e espanhol, nas bases de dados LILACS, Scielo, Cochrane, Cinahl e Medline.

CONCLUSÃO: A radiofrequência pulsátil é método eflcaz para tratamento da dor crônica lombar, com reduzido porcentual de complicações.

Descritores: Coluna vertebral, Dor lombar, Tratamento por radiofrequência pulsada.

INTRODUCTION

Low back pain is one of the most frequent reasons for general Orthopedics and Traumatology consultation. Chronic low back pain is deflned as lasting for at least three months. Seventy percent to 80% of adults will have some low back pain episode along life, which is one of the most important medical and socio-economic problems of industrialized countries[1-3].

Treatment of these patients should be individualized, based on an accurate diagnosis obtained through detailed history, adequate physical and neurological evaluation and with complementary tests when needed. Disc or discogenic pain is among the most frequent causes of chronic low back pain, along with facet arthritis, sacroiliitis and nonspeciflc radiculopathies.

Low back pain may be conservatively or surgically treated. In addition to treating the reason for pain whenever possible, some additional resources may be useful. Current guidelines recommend that initial treatment should be conservative for most cases, with drugs in-

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cluding anti-in‡ammatory and non-opioid analgesics, and mild and strong opioids, in general associated to a multidisciplinary rehabilitation program, including physical medicine and psychological assistance[4].

Invasive procedures may be justifled when there are evidences of short and long term beneflts. Minimally invasive techniques are extremely current and have huge future perspectives[1,4,5].

Radiofrequency is nothing more than an electromagnetic wave with frequency between 30 thousand and 3 million cycles/sec (30 Khz to 3000 Khz), that is, within radio waves frequency spectrum. Radiofrequency is applied by a 27 G electrode inserted through a special 22 G needle which exposes only its most distal part. The metal part not distally insulated is called active tip and its length may vary from 2 to 15 mm. The electric current is produced by a specialized generator on its terminals. Patient is connected to a dispersive plate, which sends the current back to the radiofrequency generator; so, the amount of current entering patient's body through the injury electrode should be equal to the current that will leave through the dispersive plate. This way, patient's body works as one element of the electric circuit[4,6].

Shealy was the flrst to use radiofrequency to treat spinal pain in 1975. He injured the medial branch for facet pain in the lumbar or cervical region. The year 1980 was a landmark when small diameter electrodes started to be used to treat spinal pain, allowing injuries to be more circumscribed and making the procedure signifIcantly less painful[6].

The Idea of pulsed radiofrequency was developed in 1997. It is very similar to conventional radiofrequency in terms of producing and distributing energy to neighbor tissues. Its fundamental difference is that the generator, rather than emitting continuous waves, generates pulses of waves at deflned intervals. A classic exposure to pulsed radiofrequency emits waves lasting 20 milliseconds, followed by 480 milliseconds of rest (2 active cycles/sec). During active periods, a wave frequency of approximately 500,00 Hz is flred. This way, the heat wave offered by the short exposure time is compensated by a prolonged wash-out period, enough to prevent signifIcant temperature increase. Seldom the temperature goes beyond 42º C in this type of procedure, thus not causing neuronal injury. Its application fleld is neuropathic pain and its action mechanism is the persistent blockade of nociceptive transmission at medullar level[7,8].

Radiofrequency treatment has been widely used in recent years. It is in general a minimally invasive procedure with selective targets, in general performed in outpatient settings and with very low incidence of complications and adverse effects, when performed by qualifled and duly trained professionals[6].

The understanding of how pulsed radiofrequency and its applications impact low back pain treatment and act on patients' quality of life may be a very important starting point for the search for further information about existing procedures to treat low back pain with minimally invasive techniques.

This study aimed at identifying national and international literature publications about the use of pulsed radiofrequency to treat low back pain.

CONTENTS

This is a descriptive and retrospective literature review, following stages recommended for studies of such nature. Articles published between 2004 and 2010 in Portuguese and Spanish were included. The following databases were queried: LILACS, Scielo, Cochrane, Cinahl and Medline. Narrative literature reviews, systematic literature reviews, fleld research, experience reports and case reports were included, regardless of authors' qualifIcation. Keywords used were: Low back pain, Pain and Radiofrequency.

The authors have developed a semi-structured scheme, as follows: article identifIcation data, methodological features, sample, results and conclusions.

PICO methodology was used, which allows clarifying the issue, identifying needed information to give the answer, translating it in researchable terms, developing and reflninge the research strategy and also recognizing some types of studies more adequate for each analyzed situation: **P** – Patient/population/problem; **I** - Intervention; **C** - Comparison and **O** - Outcomes.

Data were collected throughout the year 2010. After identifying the articles, we have flrst evaluated their abstracts and then the whole article. After reading the articles and deciding to include them in the study, the scheme was fllled out with research data.

RESULTS

Only complete studies addressing pulsed radiofrequency to treat low back pain were selected.

From 10 selected publications, eight were selected to give information about pulsed radiofrequency to treat low back pain.

From six evaluated articles, three were published in the last three years, which shows the increasing interest on the subject, and two were published in the international literature, which shows the need for more Brazilian studies on the subject. In terms of studies design, we have found two literature reviews, one comparative study, one prospective and comparative study, one observational perspective study and one retrospective analysis.
Chart 1 shows the summary of articles included in this research.

Chart 1 – Summary of articles on pulsed radiofrequency (PRF) to treat low back pain.

Title and Publication Year	Population	Intervention	Results	Conclusions & Considerations
Radiofrequência na dor crônica 2009	Literature Review	Literature Review	PRF results are encouraging for their modulatory and non ablative character.	Treatment with PFR is growing and is being widely used in recent years with low incidence of complications and adverse effects if performed by qualifled and duly trained professionals.
Radiofrequência: Conceitos técnicos e aplicações. 2007	Literature Review	Literature Review	Results were still preliminary, but showed satisfactory results of the method.	Conventional and pulse RF may be useful to treat selected chronic pain patients.
Tratamiento de dolor lumbar crônico mediante radiofrecuencia pulsada y aplicación de esteróides em forma epidural. 2010	12 females & 8 males	Pulsed RF	Very similar for both groups, with puncture complications in the steroid group and without complications in the PRF group.	PFR was as effective as steroids.
Uso terapêutico da radiofrequência pulsada no gânglio da raiz de L2 na lombalgia discogênica. 2009	32 females & 18 males	PRF in dorsal root ganglion.	There were no complications related to diagnostic block or the RF application.	PFR over L2 dorsal root ganglion was a safe and effective option to treat disk pain.

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Chart 1 - continuation

Title and Publication Year	Population	Intervention	Results	Conclusions & Considerations
Tratamiento de la radiculopatia lumbar com radiofrecuencia pulsada. 2004	7 mulheres e 10 homens	20 PFR applications.	There has been signiflcant pain improvement for all patients.	PFR technique was sage to treat low back pain.
Tratamiento con ozono intradiscal y radiofrecuencia del gânglio de la raiz dorsal frente a cada una de estas dos técnicas. 2009	10 patients w/o gender distinction	PRF in dorsal root ganglion	There were no technique-related complications and there has been signiflcant pain improvement.	It proposes joint treatment with ozone and PFR.
The efflcacy of repeated radiofrequency medial branch neurotomy for lumbar facet syndrome. 2010	48 females & 12 males	RFP em neurotomia ramo medial em um dos lados em 38 pacientes e nos dois lados em 22 pacientes, envolvendo ao menos três segmentos.	Adequate pain relief in 50 (91%) patients with mean duration of 10.2 months (variation 3-24).	High percentage of pain relief without major side effects during a relatively long period.
Lumbar zygapophysical joint radiofrequency denervation: a long – term clinical outcome study 2008	25 females & 17 males	PRF of lumbar joint	There has been decreased pain intensity in 78% of patients.	RF has promoted long term pain relief with minor morbidity.

DISCUSSION

In evaluated studies, low back pain is mentioned as the most frequent cause of permanent disability in adults around 45 years of age, and as the second most common cause for looking for medical assistance. In some studies, the causes of chronic low back pain are imprecise and controversial when diagnosed only by physical evaluation, simple X-rays, CT, MRI and electroneuromyography. Diagnostic blocks are critical for the accurate diagnosis of low back pain, such as discographies or diagnostic block of the L_2 root ganglion, indicated to conflrm nonspeciflc discogenic pain.

Chronic low back pain specialists should accurately understand the anatomy of the region to identify potential sources of different painful syndromes affecting the back, such as sympathetic nervous system, dorsal root ganglion, lumbo-sacral roots, post-primary posterior branches, radicular veins and arteries, peri-radicular and epidural venous plexuses, upper bone marrow levels, vertebral ligaments and bone components of each mobile segment[3,5,6].

A study from 2004 reports the inexistence in the literature of that time of studies using pulsed radiofrequency to treat lumbar radiculopathy. The selection of ten studies identified in this search shows the increasing interest in interventionist low back pain treatment with pulsed radiofrequency[1].

Some studies classify pulsed radiofrequency as a non neurodestructive technique where tissues are exposed to an established temperature of 42 degrees and to a high-voltage magnetic field of 45 V, resulting in an

intracellular biological effect affecting less myelinated fibers, such as sensory fibers. All evaluated studies, in comparative or randomized character, describe pulsed radiofrequency as an effective method to treat chronic low back pain with few complications[2,3].

This survey shows the increasing interest in understanding interventionist procedures for low back pain through pulsed radiofrequency, however there is the need for further Brazilian studies on this technique to relief chronic low back pain.

CONCLUSION

Pulsed radiofrequency is an effective method to treat chronic low back pain, with few complications.

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