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Facet Joint Injection versus Radiofrequency Facet Neurotomy for Treatment of Lumbar Facet Joint Arthropathy

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ABSTRACT

Background Data: The facet arthropathy is the source of persistent low back pain that could refer to both lower limbs. The referred lower limb pain of facet origin may refer to the proximal lower extremities, buttocks, and/or back. The medial branches of the dorsal rami are the main innervations of the facet joints. Blocking pain transmission through these medial branches can be performed by conventional nerve block, intra-articular injection, and radiofrequency ablation.

Purpose: The aim of this study was to compare the therapeutic benefits of the conventional facet joint block and the non pulsed radiofrequency denervation to the medial branches of dorsal rami in the treatment of facet arthropathy in non-surgical patients.

Study Design: This study was a randomized clinical study included 58 patients suffering from chronic back pain due to facet joint arthropathy.

Patients and Methods: Fifty-eight patients were included in this study. The outcome measure was: the visual analogue score (VAS) for low back pain. Patients were randomized into two groups: Group A: included 29 patients who were subjected to conventional facet join injection with steroids. Group B: included 29 patients who were subjected to radiofrequency denervation of the facet joints. All patients were regularly assessed through the follow up period of six months post intervention.

Results: The study included 58 patients, 26 males; the mean age was 42.2±9.57 years. In group A, who had facet steroids injection, the mean preoperative VAS was 4.86±0.97, the mean post injection at one-week VAS was reduced to 4.29±0.94, at three months the mean VAS was 4.11±0.84, and at the sixth months; it dropped to 2.64±0.91. Preoperative and after six months VAS changes were not significant (P=0.1654). In group B, who had facet radiofrequency ablation, the mean preoperative VAS was 4.73±0.2, the mean post injection at one-week VAS was reduced to 3.40±0.12, at three months the mean VAS was 2.63±0.18, and at the sixth months it dropped to 1.8±0.14. Preoperative and after six months VAS changes were significant (P=0.0012).

Conclusion: Both facet joint steroids injection and radiofrequency ablation have a significant result in non-surgical management of low back pain due to facet arthropathies. None-pulsed radiofrequency

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ablation has better results in pain relief at the third and sixth month post intervention when compared to facet steroids injection. (2018ESJ164)

Keywords: facet arthropathy; low back pain; radiofrequency; steroid injection

INTRODUCTION

The facet joints of the lumbar spine can be a persistent cause of low back pain with referred pain to both lower limbs in healthy population.[19] Bogduk N,[2] showed that for any structure to be a cause of back pain, it should be innervated. Facet joints in addition to causing localized spinal pain may also refer pain to adjacent structures. Referred pain patterns of facet joints are well described. Lumbar facet joint pain may refer to the proximal lower extremities, buttocks and back. Referred pain may cause a pseudoradicular pattern, making the diagnosis difficult to be differentiated from other causes of low back pain and radiculopathy.[6]

Innervation of the facet joints are mainly from the medial branches of the dorsal rami. Facet joint pain may be managed by neurolysis of these medial branches, medial branch nerve block and intraarticular injections. However, many conflicting results have been reported for the benefits of the intraarticular injections of facet joints, for medial branch nerve block and radiofrequency neurolysis of medial branches in several systematic and narrative reviews.[15]

PATIENTS AND METHODS

This is a comparative prospective descriptive cohort study, which was held at Ain Shams University from January 2014 to December 2017. The study was performed on consecutive patients in randomized manner, who presented with lumbar facet arthropathy associated with chronic low back pain through this duration.

The study included all adult patients complaining of persistent low back pain with focal tenderness over the back. Patients with or without radicular lower limb pain were included. All patients should have tried conservative treatment in the form of medications and physical therapy for at least a period of three months. Exclusion criteria included patients with radiological signs of instability or spondylodiscitis, or prolapsed lumbar disc or patient with pervious spine surgeries or previous injections into the facet joints. The presence of a blood coagulation disease and known allergy to local anesthetic were also excluded.

All patients were evaluated radiologically by plain x-ray films for the lumbar spine in lateral and antero-posterior, dynamics and oblique views to exclude significant instability and foraminal compromise. Also thin cuts computerized tomography (CT) scan and magnetic resonance image (MRI) were performed and findings obtained to exclude foraminal narrowing at the clinically presumed level (s).

Treatment Assignment:

Patients were furtherly subdivided into two groups; group A who were subjected to steroid injection and group B who were subjected to radiofrequency neurotomy, and patients were randomized in each group. The assignment scheme was generated from a table of random numbers. The randomization was balanced after every 5 patients were enrolled to ensure an approximately equal number in each.

The Procedure:

All lumbar levels targets would be the bony junction of the superior articular process and the transverse process for medial branch nerves L1-L4. For the dorsal ramus of L5, the target point was the junction of the ala of the sacrum and the superior articular process.

Steroid Injection Technique:

We used the technique described by Mooney and Robertson[5]. Lying prone on the fluoroscopic table, the C-arm was rotated in the oblique position until the superior articular process of the target level become in the middle of the above pedicle. The skin overlying the facet joint was prepared, draped, and infiltrated with 1 percent lidocaine. Under

fluoroscopic guidance, a 90-mm, 22-gauge spinal needle was then directed vertically into the joint space. A mixture of 2 ml of 1 percent Lidocaine and 1 ml of Betamethasone 8mg was injected in each facet joint after confirmation that the tip of the needle was in the joint, and was withdrawn then. (Figure 1)

RF Lesioning Technique:

RF lesioning was done using a 20-gauge curved RF cannula (10cm; 10-mm active tip) guided by fluoroscopy. Both the skin and the RF cannula path route were infiltrated with 2%. The RF cannula was directed toward the target point between the transverse process and superior articular process (SAP), guided by fluoroscopy. Final cannula location was confirmed in 3 views: posteroanterior views to ensure the placement of the cannula against the SAP; lateral views to make sure that the tip of the cannula did not pass the transverse process, toward the intervertebral foramen; and oblique view to determine the cannula was parallel to the expected course of the nerve. After correct positioning was confirmed, the needle was removed from the cannula and replaced by the RF electrode, then connected to the RF generator (Cosman RGF-1A; Cosman Medical, Burlington, Massachusetts). After verifying the impedance, sensory stimulation was done for the target nerve (50 Hz up to 1.0 V), then motor stimulation (2 Hz up to 2 V). Paresthesia was elicited during sensory stimulation, whereas motor stimulation elicited palpable as well as visible twitches of the multifidus muscle of the back, correlated with the segmental level. The RF lesioning was created by increasing the temperature at the tip of the electrode to 85oC for 90 seconds. A second lesion was done using the same parameters, after the electrode was withdrawn up along its path for 0.5 cm. Finally, a similar lesioning was done 0.5 cm above the first position, along the SAP. The same procedure was done again at the other segmental levels, as needed. Patients were prescribed ketoprofen, tablets two times daily for 3 days. (Figure 2)

Follow-up and Assessment of Outcome: Post-procedural evaluation included, observation of the vital data and neurological status was done and assessment of pain and motor deficits. Pain was assessed using the visual analogue scale of pain (VAS), at pre-procedure, at procedure, first week, 3rd month, and 6th month. The pain Visual Analogue Scale ranges from 0 (no pain) to 10 (very severe pain).

Statistical analysis was performed using SPSS version 22.0.

RESULTS

Fifty-eight patients were included in the study cohort. The mean age was 42.2±9.57 (Range, 28-63) years. There were 26 males and 32 females with a female to male sex ratio of 1.2:1. Twenty-four patients (41.3%) were smokers. The mean follow-up duration for the patients was 8±4.2 months. The outcome was assessed on the post intervention week-1, the 3rd month and the 6th month.

In **group A**, who had facet steroids injection; the most common treated levels were L4-5 (N=15, 51.7%) followed by L3-4 (N=9, 31%). The mean preoperative Visual Analogue Score (VAS) was 4.86±0.97 (95% CI; 4.48-5.23), the mean post injection at one-week VAS was reduced to 4.29±0.94 (95% CI; 3.92-4.65), at 3 months Vas mean was 4.11±0.84 (Range, 3.78-4.43) and at 6 months it dropped to 2.64±0.91 (95% CI; 2.29-3.00). Preoperative and after 6 months VAS changes were not significant (P=0.1654) (Figure 3).

In **Group B** who had facet radiofrequency ablation; the most common treated levels were L4-5 (N=17, 58.6%) followed by L3-4 (N=8, 27.6%). The mean preoperative visual analogue score (VAS) was 4.73±0.2 (95% CI; 4.27-5.19), the mean post injection at one-week VAS was reduced to 3.40±0.12 (95% CI; 3.15-3.65), at 3 months Vas mean was 2.63±0.18 (Range, 2.27-2.99) and at 6 months it dropped to 1.8±0.14 (95% CI; 1.52-2.08). Preoperative and after 6 months VAS changes were very highly significant (P=0.0012) (Figure 4).

Figure 1. Fluoroscopic view of spinal needle in lumbar facet joint.

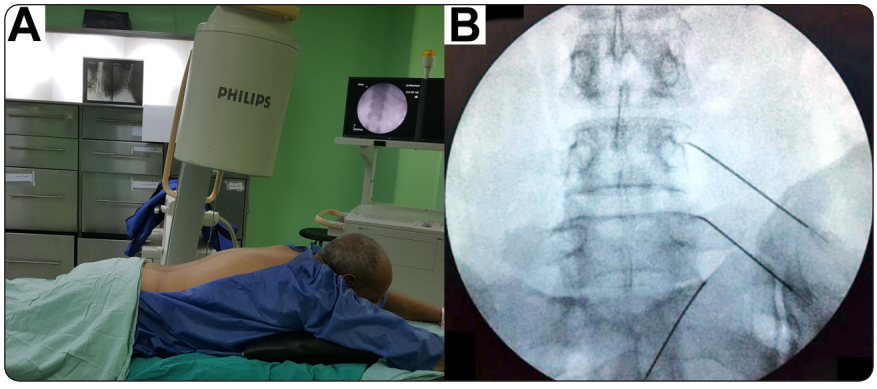

Figure 2. (A) Position for RF and (B) fluoroscopic view of RF needle AP view.

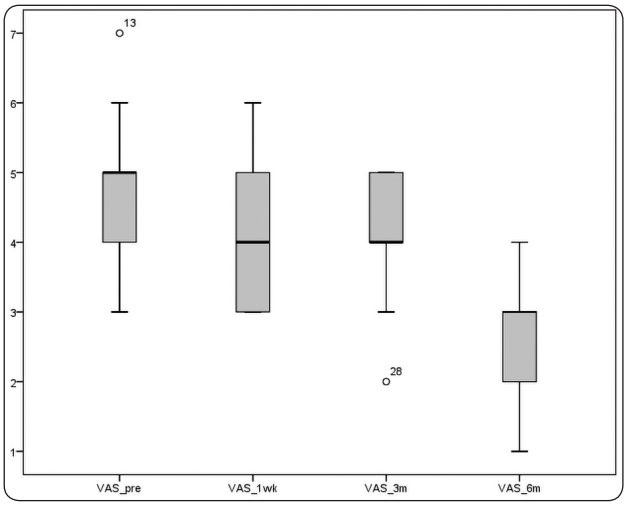

Figure 3. Reported changes in mean VAS during the follow up period in Group A.

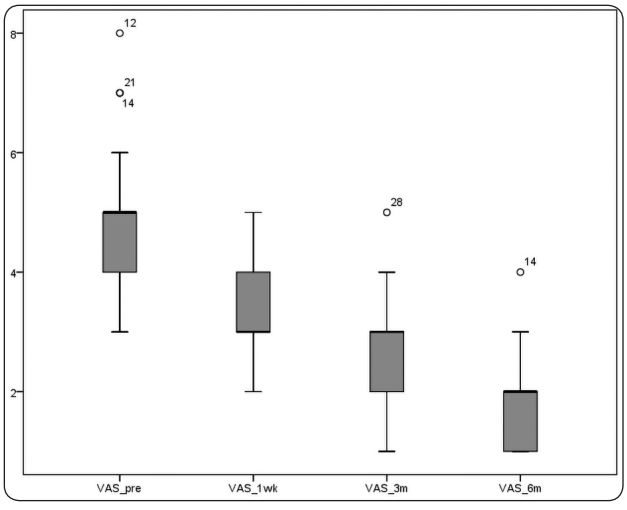

Figure 4. Reported changes in mean VAS during the follow up period in Group B.

DISCUSSION

Low back pain is an important cause of disability and work absence and accounts for high economical costs in western societies.[13] Many studies have been done on the facet joints ability to produce pain, these studies can be summarized that lumbar facet joints have the anatomical capability of producing pain caused through the medial branch nerves. There are no clinical features or imaging techniques can be pathognomonic for facet pain. Controlled diagnostic injections are still the best diagnostic method for facet joint pain.[1] Facet joints can be locally anesthetized either by articular injections of local anesthetic or by blocking the medial branches of the dorsal rami that innervate the target joint. If that fail to improve pain, the joint is considered not to be the source of pain.[12] Shealy CN[14] introduced the concept of conventional RF for the treatment of chronic low back pain, its efficacy has been established in multiple clinical studies.[5,18]

In our study, we compared the Visual Analogue Score pre-operative and six months post interventional in two groups of patients; in group A who received steroid injection there were no significant changes in the mean VAS, while in group B who received RF ablation of medial branch, changes were very highly significant. Christoph et al,[11] concluded in their study on therapeutic efficacy of facet joint block which had mean follow up period of 17 months that a

substantial number of patients benefit from facet joint block in the medium term. In his study group, 33% of patients responded well (more than 50% pain relief) after 3 months. 74% of patients experienced immediate pain relief, after one week 57% patients were still experiencing pain reduction of more than 50%.

Kornick et al,[7] reported using fluoroscopy-guided RF denervation of facets is associated with 1% incidence of complications like temporary neuritic pain, which might be as a result of injury to L3 or L4 ventral ramus. This ventral ramus lies anterior to the point of RF neurotomy and at risk for thermal injury if the electrode was directed ventrally over the transverse process. In our study, no complication was observed related to the procedure up to 6 months of follow up. We agree with many literature reviews that the rate of complication rate is minimal, but RF still an invasive procedure and it should only be considered if conservative treatment fails.

Being a procedure that offers temporary relief of pain by nerve denaturation for nerves that innervate the painful facet joint, the pain returns back once the axons regenerate. However, the relief can be reached again by repeating the RF. Rate of success with RF neurotomy has been mentioned in literature in the range of 17% up-to 90% for management of facet pain.[3,10] Van Kleef et al,[17] published a huge randomized controlled trial showing that lumbar medial branch RF neurotomy was not a placebo. Statistically significant changes were reported in the VAS and analgesic intake as well. These changes persisted at 12 months post procedure.[9,16] In a recent study[8] the authors reported that conventional RF denervation was more significant in reductions of pain for 12 months in patients showing good response to diagnostic block when compared with nerve blocks. In this study, VAS was significantly lower in the radiofrequency ablation group than the steroids injection group 3 and 6 months after intervention which matched also the results of Civelek et al,.[4]

CONCLUSION

None-pulsed radiofrequency ablation has better and long term results in pain relief at the third and sixth month post intervention when compared to facet steroids injection.

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الملخص العربى

الحقن مقابل استخدام الترددالراديوي لجراحة المفصل الوجهي للعلاج من اعتلال المفصل الوجهي القطني

البيانات الخلفية: تعتبر الام اسفل الظهر من اكثر الأعراض التى تسبب التردد على الأطباء وهى بحق تسبب عجز وظيفى للمجتمع ونشاط افراده، تم تقييم نسبة تسبب المفصل الوجية فى الام الظهر بين 15% الى 45% من الأشخاص الذين يعانون من الام اسفل الظهر.

الغرض: مقارنة الفوائد العلاجية بين الحقن الاستيرويدى للمفصل الوجية والتردد الحراري لعلاج الام المفصل القطنية.

تصميم الدراسة: هذه الدراسة صممت على نهج دراسة مستقبلية وصفية ذات مدى محدد.

المرضى والطرق: تمت هذه الدراسة فى مستشفيات جامعة عين شمس على 58 مريض يعانون من الام مزمنة ناتجة عن التهابات المفصل الوجية، خضع 29 منهم للحقن الاستيرويدى بينما خضع 29 اخرون للتردد الحراري. تم متابعة المرضى باستخدام مقياس الالم على مدار ٦ شهور وذلك بعد الاجراء باسبوع وبعد ثلاث وستة أشهر ومقارنتها بالقيم قبل الاجراء و تم معالجة القيم احصائيا مع عقد مقارنة بين كلا الاجرائين.

النتائج: عند مقارنة مقياس الالم لمرضى الحقن الستروبدي ما قبل الاجراء. بالنسبة لما بعد الاجراء وجد ان النتائج غير محددة احصائيا بينما عند مقارنة مقياس الالم لمرضى التردد الحراري بين ماقبل الاجراء بالنسبة لما بعد الاجراء وجد ان النتائج ذات اهمية احصائية بالغة

الاستنتاج: أشارت النتائج الى أن كلا الاجرائين يستطيعان تقليل الام الظهر إلا أن التردد الحراري لها تأثير أفضل وأطول بعد الإجراء.