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Assessment of Facet Joint Block in Treatment of Persistent Lower Back Pain in Patients with and without Modic Changes

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ABSTRACT

Background: Lumbar facet joints have been implicated as the source of chronic pain in 15% to 45% of patients with chronic low back pain. Lumbar facet joint block (FJB) has been described in the alleviation of chronic low back pain of facet joint origin. **Objective:** To determine the difference of outcome in lower back pain (LBP) patients with and without Modic changes treated with therapeutic imaging-guided lumbar facet joint injections and the role of those techniques in the future of accurate diagnosis and proper management for such patients.

Patients and methods: This study included 12 patients complaining of persisting LBP, 6 of them had Modic changes and 6 cases without, confirmed by lumbar spine MRI at Neurosurgery Department, Zagazig University Hospital. They were managed by lumbar facet joint block. They were followed up at 6 and 12 weeks after procedure for Visual Analogue Scale (VAS) as well as Oswestry Disability Index (ODI).

Results: There was statistically non-significant relation between the studied groups regarding ODI pre or 6 weeks post-injection. While there was statistically significant difference between groups regarding ODI 12 weeks postoperatively, there was significant change in ODI over times. There was statistically non-significant relation between the studied groups regarding VAS pre or 6 weeks post-injection. While there was statistically significant difference between groups regarding VAS 12 weeks postoperatively. **Conclusion:** The effectiveness of therapeutic lumbar facet joint injections is not altered by the presence or absence of Modic. There were no reported significant differences between study groups for the primary outcome at 6 weeks post-injection.

Keywords: Facet Joint Block, Modic Changes, Persistent Lower Back Pain.

INTRODUCTION

The prevalence of low back pain (LBP) presented with an annual increase of 11.6% [(1)]. The widely held belief that most of the episodes of low back pain are short-lived, with 80% to 90% of these attacks resolving in about 6 weeks [(2,3)].

Multiple structures in the lumbar spine including discs, facet joints, and sacroiliac joints have been considered the major sources of pain in the low back and/or lower extremities [(4)]. Lumbar facet joints have been implicated as the source of chronic pain in 21% to 41% (with an overall prevalence of 31%) in a heterogenous population with chronic low back pain utilizing controlled comparative local anesthetic blocks with 80% pain relief and the ability to perform previously painful movements as the criterion standard[(5-7)].

Based on the responses to controlled diagnostic blocks, false-positive rates of 17% to 19% have been established with an overall false-positive rate of 30% [(8,9)]. Level I or II-1 evidence for the diagnostic accuracy of controlled facet joint nerve blocks is based on the United States Preventive Services Task Force (USPSTF) criteria [(10)]. In addition, there is a strong evidence for the diagnostic accuracy of lumbar facet joint blocks in evaluating low back pain [(11)].

We aimed in this work to determine the difference of outcome in LBP patients with and without Modic changes treated with therapeutic imaging-guided lumbar facet joint injections and the role of those techniques in the future of accurate diagnosis and proper management for such patients.

PATIENTS AND METHODS

This study was carried out in Neurosurgery Department, Zagazig University Hospital. We included in this study 12 cases with persistent lower back pain (LBP) who were managed by lumbar facet joint block, 6 of them had Modic changes while other 6 didn't have.

Inclusion criteria: Patients with LBP more than 6 months with or without sciatic pain.

Exclusion criteria: Patients with active infections: sepsis, osteomyelitis, discitis and epidural or skin abscess, cold abscess, cellulitis or any kind of skin infection in the site of injection. Age less than 18 years and above 70 years. Recent trauma or surgery like surgical fusions, acute traumatic Schmorl's nodes, pregnancy and anticoagulant therapy. Presence of surgical pathology like spinal meningioma or tumors, spine fracture, spondylolisthesis and deformity, huge disc herniation compressing of neural structures, neural canal stenosis, synovial cyst.

Clinical assessment:

Complete clinical picture was taken before intervention as personal history: (name, age, sex, occupational, special habitat, handiness …etc.), complaint of the patient, present history and past history. General physical condition and examination to assess clinical situation and grade of pain and disability during daily activity by using Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) before procedure were

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done. Neurological examination was done to exclude any root injury, complete SCI, incomplete SCI or cauda equina syndrome. Routine labs work up was done including CBC, FBS, PT and INR, CRP and KFT. All patients needed recent lumbosacral spine X- ray and MRI (less than 3 months ago) to detect presence or absence of Modic changes and its type.

Facet joint block:

Lumbar facet joint block was performed as a day case procedure at our institution. The site and level of injection was guided by clinical assessment. In patients with unilateral low back pain, the ipsilateral joints were injected. In patients with bilateral back pain or pain in the midline, both sides were injected. The patient was placed in a prone position. A cushion under the abdomen helps to reduce lumbar lordosis. A 22-gauge lumbar puncture needle was used for joint puncture. We used a modified 14 cm needle instead of the conventional 9 cm needle to allow for deeper penetration in heavily built and obese patients. With conventional technique, the posterior mid joint space was punctured. The superior recess was usually chosen. This lies just above the tip of the superior articular process**.** Care was taken to maintain a straight needle path as fibrous tissue septa readily deviate the long and slender 22-gauge needle.

In a patient with a high riding iliac crest, the L5-S1 joint was punctured with the needle tip slightly bent. This helps negotiate the crest and when the desired depth was reached, the needle could be rotated and aimed for the joint space. With practice, it used to take 10 minutes to enter most facet joints. Once correct needle placement was achieved, the relationship of the needle tip to the joint space was checked. When it was correctly placed, a limited arthrogram was then performed via an extension tubing and using 0.2 ml of 76% urografin to confirm the needles position. This allows for improved visualization with a minimal volume to avoid over distension. Contrast should flow freely from the needle tip, outlining the joint space and recesses (Figure 1). 1.5 ml of 0.5% bupivacaine hydrochloride (Marcaine) and 0.5 ml (20 mg) of methylprednisolone acetate (Depo-medrol) were then slowly injected. The lumbar facet joint usually can hold up to 3 mils of fluid without rupturing. The injection should be monitored fluoroscopically to avoid over distension and rupture. Moderate pressure while injecting and ready reflux of depo-medrol back into the extension tubing were good signs of an intact capsule.

Visual Analogue Scale (VAS):

Simple clinical method to assess the severity of pain by drawing a line on a 10 cm **(VAS)** on paper by patient himself**.** The pain VAS is self-completed by the respondent. The respondent is asked to place a line perpendicular to the VAS line at the point that represents his/her pain intensity. Using a ruler, the score is determined by measuring the distance (mm) on the 10-cm line between the "no pain" anchor and the patient's mark, providing a range of scores from 0–100 mm (0-10 cm). A higher score indicates greater pain intensity. Based on the distribution of pain VAS scores in pre and postsurgical patients who described their pain intensity as none, mild, moderate, or severe. The following cut points on the pain VAS have been recommended: No pain (0–4 mm), mild pain (5– 44 mm), moderate pain (45–74 mm), and severe pain (75–100 mm)**.**

Oswestry Disability Index (ODI):

An index derived from the Oswestry low back pain questionnaire was used to quantify disability for low back pain (0% –20%: Minimal disability; 21%–40%: Moderate disability; 41%–60%: severe disability; 61%–80%: Crippling back pain; 81%–100%) These patients were either bed-bound or have an exaggeration of their symptoms.

Follow up:

After management, patients were followed up for 6 and 12 weeks to assess clinical outcome improvement of pain by using (VAS) scale and restoration of daily activity after procedure was done.

Ethical Consideration:

The study was approved by the Local Ethical Committee of Zagazig University. Written consent was obtained from every patient prior to the procedures. This study has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis:

The data were analyzed using the software SPSS (Statistical Package for the Social Sciences) version 28. Quantitative variables were described using their means and standard deviations. Categorical variables were described using their absolute frequencies and percentage and were compared using Monte Carlo test. Kolmogorov-Smirnov (distribution-type) and Levene (homogeneity of variances) tests were used to verify assumptions for use in parametric tests. To compare quantitative data between two groups, independent sample t test (for normally distributed data) were used. The level of statistical significance was set at $P<0.05$. Highly significant difference was present if $p \leq 0.001$.

RESULTS

Patients' ages ranged from 23 to 67 years. The mean age was 43 years. There was statistically non-significant relation between the studied groups and gender or age **(Table 1)**.

Table (1): Comparison between the studied groups regarding demographic data

	Non-Modic FJB	Modic FJB	p
	N=6 (%)	N=6 (%)	
Gender:			
Male	3 (50%)	3 (50%)	>0.999
Female	3 (50%)	3 (50%)	
Age:			
Mean ± SD	43.17 ± 16.7	47.67 ± 7.2	0.87

There was statistically non-significant relation between the studied groups regarding ODI pre or 6 weeks post-injection. While there was statistically significant difference between groups regarding ODI 12 weeks postoperatively, there was significant change in ODI over times **(Table 2)**.

Table (2): Comparison between the studied groups regarding ODI pre- and post-injection

ODI	Non-Modic FJB	Modic FJB	P
	N=6 (%)	N=6 (%)	
ODI Pre:			
Moderate	2 (33.3%)	2 (33.3%)	
Severe	3 (50%)	3 (50%)	>0.999
Crippling back pain	1 (16.7%)	1 (16.7%)	
ODI 6 weeks:			
Minimal	4 (66.7%)	2 (33.3%)	
Moderate	1 (16.7%)	2 (33.3%)	>0.999
Severe	1 (16.7%)	2 (33.3%)	
Crippling back pain	0 (0%)	0 (0%)	
ODI 12 weeks:			
Minimal	2 (33.3%)	2 (33.3%)	
Moderate	3 (50%)	0 (0%)	<0.001**
Severe	1 (16.7%)	4 (66.7%)	
Crippling back pain	0 (0%)	0 (0%)	
Friedman test	0.015*	0.022*	

*: Significant, **: Highly significant

There was statistically non-significant relation between the studied groups regarding VAS pre or 6 weeks post-injection. While there was statistically significant difference between groups regarding VAS 12 weeks postoperatively (**Table 3)**.

Table (3): Comparison between the studied groups regarding VAS score pre- and post- injection

VAS	Non-Modic FJB	Modic FJB	P
	N=6	N=6	
Pre:			
Mean ± SD	6.83 ± 0.75	6.83 ± 0.75	0.975
6 Weeks post:			
Mean ± SD	5.5 ± 0.84	6.0 ± 0.89	0.669
12 weeks post:			
Mean ± SD	5.83 ± 0.75	6.33 ± 1.03	0.029*
F	0.052	0.052	

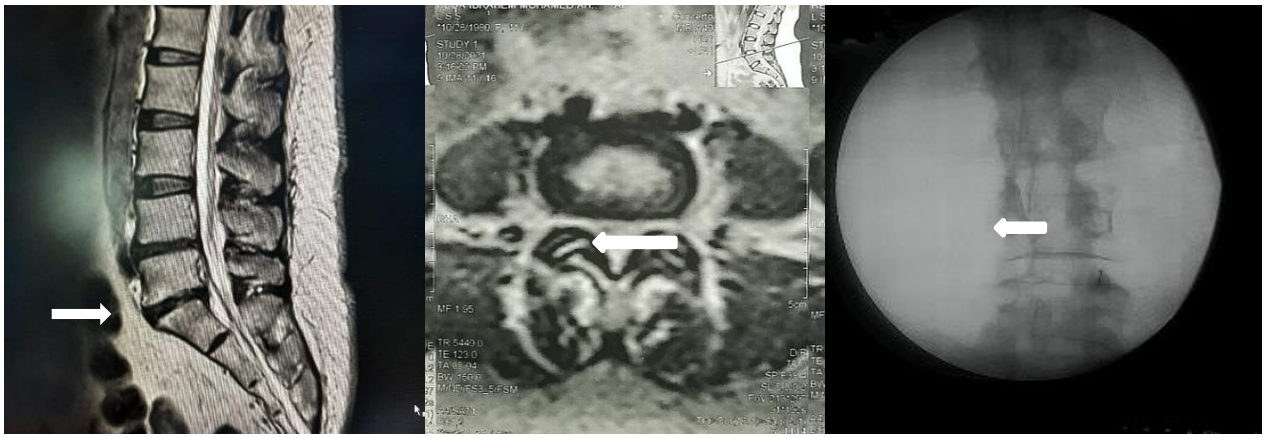

Figure (1): Lumbosacral spine MRI show L5-S1 type 2 Modic changes with L4-L5 facet joint arthropathy, and fluoroscopic guided L4-L5 facet joint block. A 57-year-old male patient, worker, with no history of medical illness or special habits, complaining of moderate chronic LBP associated with sciatica with no history of trauma. Neuroimaging was done and diagnosed as L5-S1 type 2 Modic changes with L4-L5 facet joint arthropathy. Type of operation: L4-L5 facet joint block. Pre-operative: VAS = 8/10. ODI = 65 %. At 6 weeks: VAS = 7/10. ODI = 50 %. At 12 weeks: VAS = 7/10. ODI = 50 %.

DISCUSSION

Significant controversy surrounds the appropriate management of lumbar facet joint pain, with multiple therapeutic techniques established in managing chronic low back pain [12-14]. Modic changes have been linked with low back pain, there could be a difference in outcomes between these specific patients with and without Modic changes, even when there is another known pain generator present such as small lumbar disc herniation, lumbar canal stenosis, or facet joint arthropathy. It was thought that the non-surgical lumbar disc herniation patients with Modic changes, likely had two sources for their back pain, although only one source for their radiculopathy[15,16].

The purpose of our study was to assess how a specific patient population, with Modic changes (either type I or type II), responded to therapeutic imaging-guided lumbar facet joint injections, as compared to patients without Modic.

Datta *et al.* [6] provided level III (limited) evidence for lumbar intraarticular injections, level II-1 evidence for lumbar facet joint nerve blocks and level II-2 evidence for lumbar radiofrequency neurotomy [17,18]. The exact mechanism of the therapeutic effect of lumbar facet joint nerve blocks is not known, whereas radiofrequency neurotomy causes denaturing of the nerves. Consequently, with radiofrequency the pain returns when the axons regenerate requiring repetition of the radiofrequency procedure [19-21].

Similarly, lumbar facet joint nerve blocks may be repeated to reinstate pain relief without any deleterious effects. The basis for intraarticular injections has been the inflammation of the joint [22,23]. Thus, even if they experienced a positive response to the lumbar nerve root block, this treatment should have no influence over any symptoms that may be arising due to the Modic changes and the same for patients who might experience the same response by receiving facet joint block. For this reason, the study protocol included patients with Modic changes at any lumbar spinal level and not patients who only had Modic changes at the same level as their disc herniation or facet arthropathic changes [24,25].

Our study are in agreement with a previous studies that hypothesized that Modic patients were likely to respond poorly as their Modic changes could either be the only pain source or an additional pain source along with the facet articulations or disc disease [26-29].

The results obtained in this study, which had a fairly small sample size, did not find a clinically significant relevant link between Modic changes and the outcomes after therapeutic lumbar facet injections for any of the data collection time points. Although the median VAS score change at 12 weeks for patients without Modic was (5.83 ± 0.75) which is better than the median VAS score change score for patients with Modic (6.33 ± 1.03), at the same follow up time point (i.e., absence of Modic means more pain reduction), this did not quite meet the criteria for statistical significance.

Perhaps a larger sample size would have resulted in this becoming statistically significant, but that would not necessarily mean that it was clinically relevant as the current sample size included (6) patients with Modic. These results are in contrast to **Peterson *et al.*** [30] who reported lumbar disc herniation patients receiving an imaging-guided therapeutic nerve root block where patients with Modic changes (types I and II together) reported significantly worse outcomes compared to lumbar disc herniation patients without Modic changes at the 1 month data collection time point.

According to **Modic *et al.*** [31] the natural course of type I change is replacement with type II over 14 to 36 months. The latter remained stable over 2 to 3 years

follow-up evaluation. The exact etiologic mechanism or mechanisms, while unknown, have been thought related to some type of unusual stresses, micro or macro-instability or microtrauma [29]. Recent studies suggest a genetic predisposition in patients showing the presence of Modic at the same level of disc degeneration or disc herniation [32, 33]. Moreover, **Kjaer *et al.*** [27] suggested that disc degeneration in the presence of Modic has a specific clinical profile and thus they concluded that a degenerated disc per say is a quiet disorder, but it constitutes a true clinical entity when Modic are also present.

A higher percentage of patients without Modic changes reported clinically relevant 'improvement' at 1-month post injection but this did not reach statistical significance. There was a tendency for the subgroup of patients without Modic to maintain improvement obtained by the intervention longer in time as compared to patients with Modic patients. Nevertheless, at one month after the intervention, the proportion of patients that reported a worse outcome increased in all subgroups.

It has been found that Modic type I are related to nonspecific LBP and degenerative disc disease [26-29], but they have never been directly linked to pain arising from the facet joints. The starting hypothesis that patients with Modic type I may have a less favorable outcome from therapeutic imaging-guided facet joint injections, arose from the idea that in those patients part of the LBP may actually arise from the inflammatory changes in the disco vertebral region of the spine instead of, or in addition to, the lumbar facet articulations. Thus, a procedure directed to the zygapophysial joints will not be as effective in decreasing pain. The Modic identified on the MRI scans of these patients were not necessarily at the same level as the facet injections. This is not considered a limitation however as the purpose was to determine whether the presence of Modic anywhere in the lumbar spine may be another source of the patient's LBP.

Additionally, **Friedrich *et al.*** [34] observed that the presence or absence of edema at the injected facet joints themselves was also not investigated. Although facet joint edema is noted, this is not nearly as common as Modic at the disco vertebral junctions. The number of patients with findings of facet joint edema in this current study would have been very small. It would therefore require a very large sample size to obtain enough patient numbers with lumbar facet joint edema to assess outcomes when considering the frequency of this finding.

In agreement with our study result, **Bianchi *et al.*** [35] included 489 patients received imaging-guided lumbar facet joint infiltrations. Of these, 226 who met the inclusion criteria for the study and 61.1 % were female patients. Modic changes were observed in 141 out of the 226 patients examined (62.4 %). Of these, 83 were Modic change type I (36.72 %), 58 were Modic change type II (25.66 %) and 85 (37.61 %) presented with no Modic changes. When using the Chi-squared test to compare gender with the various Modic categories there was no significant difference in the gender ratio between the categories. There were no statistically significant differences in the baseline NRS scores when comparing patients with Modic I, Modic II, and no Modic changes.

Conclusion:

Clinically, the effectiveness of therapeutic lumbar facet joint injections is not altered by the presence or absence of Modic. There were no reported significant differences between study groups for the primary outcome at 6 weeks post-injection.

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