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Comparing the Efficacy of Caudal Injection of Triamcinolone with Dexamethasone in Patients with Chronic Back Pain Caused by Spinal Stenosis

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Abstract

The aim of this study was to compare the efficacy of triamcinolone and dexamethasone in pain controlling as well as their complications, thus discovering the medication with better analgesic effect and less complications. This double-blind clinical trial was conducted within six months in a pain clinic of Shaheed Sadoughi Hospital, Yazd, Iran. Two groups with 30 patients per group were enrolled for the current study. Group 1 was treated by caudal injection of 80 mg of triamcinolone acetonide with 0.125% marcaine in saline solution. Group 2 was treated with 16 mg of dexamethasone with 0.125% marcaine in saline solution. Pain was scored before and 7 days, 1 month, and 3 months after caudal injection. The patients' demographic information, systolic and diastolic blood pressure, and fasting blood sugar were also recorded. The results showed significant pain relief in both groups one and three months after treatment. Triamcinolone group showed greater improvement than the Dexamethasone group, but the difference was not statistically significant. However, 4 of the 30 patients in the triamcinolone group required drug re-injection for pain control, but none in the dexamethasone group. Based on the results, there was no consensus on the preferred drug. Considering that the injectable particulate triamcinolone may cause vascular complications but not by the non-particulate dexamethasone, non-particulate dexamethasone may be more beneficial than triamcinolone to patients with chronic back pain caused by spinal stenosis.

Keywords: Dexamethasone, triamcinolone, caudal injection, chronic back pain, spinal stenosis, steroid

Introduction

Chronic back pain (CBP) is defined as pain that lasts between 7 and 12 weeks (longer than 12 weeks was considered as CBP in the current study). Experts have estimated that approximately 80% of people will experience CBP during their lifetime and the annual prevalence of CBP is 15-45% with a point prevalence of approximately 30% (1). In general, 25% of patients suffer from high pain intensity with disability (Grade II to IV low back pain) (2). Back pain is the most common cause of exclusion from work in Americans younger than 45 years. CBP has been reported as the second most frequent reason to visit physician for chronic conditions, the fifth most common cause for hospitalization, and the third most frequent reason for a surgical procedure (3). The prevalence of spine-related disorders, as the most common cause of CBP, is about 51.7%. Among the musculoskeletal disorders, spinal stenosis is one of the most common causes of back pain and disability for seniors (1). Increasing prevalence of chronic low back pain with or without leg pain is a problem for health. Affecting social and occupational status of patients, the prevalence of chronic low back pain is very high throughout the community (4). Surgical approach is the leading treatment for chronic pain caused by musculoskeletal diseases such as lumbar disc herniation and spinal stenosis. (5-8). The Framingham study has shown that the prevalence of symptomatic lumbar spinal stenosis is 27.2% in the general population. If supportive treatment is not successful, surgery or epidural injection for symptomatic spinal stenosis will be indicated (9, 10). For epidural injection, caudal is chosen as the preferred one over interlaminar and transforaminal (11). Despite the high prevalence of CBP, few studies have focused on relieving the symptoms of spinal stenosis. Various interventions including surgery and interventional techniques such as epidural injections are commonly used for controlling pain associated with central stenosis. However, there are few randomized controlled trials regarding the effectiveness of epidural injections and the type of medications toward spinal stenosis (12). One of the most common treatment approaches to treat CBP is epidural injection in the United States (2). Even though several systematic studies have reported the efficacy of epidural injections in reducing low back pain, the effectiveness, indications, and proper medication for epidural injection are still controversial (13). Nevertheless, epidural injection gains priority because of its fewer risks in comparison with spine surgery, especially in young people with comorbidities. This method was proposed in 1936 and documented in 1952. There has been a steadily increasing use of this method. For this method, local anesthesia and sometimes with anti-inflammatory corticosteroids such as hydrocortisone, prednisolone, methylprednisolone, triamcinolone, dexamethasone, and betamethasone are used. Considering the complications of these corticosteroids as well as the economic and commercial aspects, sometimes one of them is preferred over others. For instance, betamethasone was selected as the preferred medication during 2006-2010. Betamethasone was replaced with triamcinolone because of its rarity in pharmaceutical market. Then, dexamethasone was chosen as the preferred corticosteroid for injection due to concerns on the risks of betamethasone (13).

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Table 1. Demographic and baseline characteristics of the patients in the two groups

Groups		Group 1: Triamcinolone	Group 2: Dexamethasone
Mean age		66.00 ± 2.291	67.48 ± 1.679
Gender	Male	16 (51.6%)	15 (48.4%)
	Female	13 (44.8%)	16 (55.2%)
Duration of pain before injection (month)		3.00 ± 0.183	3.40 ± 0.236
Discs involved	LEVEL 6: L3-L4 L4-L5 L5-L6	14 (45.2%)	11 (37.9%)
	LEVEL 7: L1-L2 L2-L3 L3-L4	3 (9.7%)	1 (3.4%)
	LEVEL 8: L4-L5 L5-S1	7 (22.6%)	12 (41.4%)
	LEVEL 10: L3-L4 L4-L5	3 (9.7%)	1 (3.4%)
	LEVEL 11: L2-L3 L4-L5	1 (3.2%)	0 (0%)
	LEVEL 12: L2-L3 L4-L5 L4-L5	3 (9.7%)	2 (6.9%)
	LEVEL 13: L2-L3 L4-L5 L4-L5 L5-S1	0 (0%)	2 (6.9%)

Due to the high efficacy of epidural steroid injection in treating low back pain caused by herniated disc and lumbar spinal stenosis, its frequent clinical application, use and effectiveness of particulate and non-particulate steroids, different results in various studies, vascular nature of caudal epidural space, and high security of using non-particulate steroids intravenously, we attempted to compare the efficacy of the two steroid types (triamcinolone and dexamethasone) in pain controlling and their complications in order to discover the preferred medication with better analgesic effect and less complications.

Materials and Methods

This double-blind clinical trial was conducted within six months in the Pain Clinic of Shaheed Sadoughi Hospital, Yazd, Iran. Two groups (n = 30 patients/group) were enrolled for the current study. Patients were recruited based on the following inclusion criteria: patients who had chronic pain for three months or longer in the lower back, buttock, and both lower limbs that got worse with standing and walking, had disability resulting from neurogenic claudication, got pain score ≥4 based on the numeric rating scale (NRS), and experienced lumbar canal stenosis on magnetic resonance imaging. NRS involves the questions to estimate pain severity using numbers. This scale is an 11-point scale (0: no pain; 1-3: mild pain; 4-6: moderate pain; and 7-10: severe pain) for patient self-reporting of pain. It is for adults and children 10 years or older (14). Patients with a history of surgery, epidural steroid injections during the last 6 months, spine instability who were candidate of surgery, cognitive impairment following psychosis, cardiovascular disorders and pulmonary vascular dysfunction which limited patients' activities, local or systemic infection, diabetes, coagulopathy disorder, alcohol and drug abuse, anticoagulants taking, sensitivity to local anesthetics and steroids, and progressive neurological impairment in the lower limbs were excluded from the study. The study was approved by ethics committee and informed consent was obtained from patients. Each patient was placed in prone position and standard fluoroscopy was done for locating the caudal space through anteroposterior and lateral images. Skin was probed and local anesthesia was administered by subcutaneous injection of 1% lidocaine. Patients were divided into two groups randomly using random table number: group 1 received 80 mg of triamcinolone acetonide with 0.125% marcaine in saline solution, and group 2 received 16 mg of dexamethasone with 0.125% marcaine in saline solution. Both doctors and patients were blinded about the study. Pain was scored before the study procedure (the maximum pain score when walking). Patients' demographic information, systolic and diastolic blood pressure, fasting blood sugar were also recorded. These information was again recorded on the 7th day, one month, and 3 months after caudal injection. During the three months period, need for re-injection was also recorded.

Results

A total of 60 patients were enrolled for the study. All completed the three month follow-up. The demographic characteristics of the patients before the study were assessed. There were no differences between the two groups regarding age, sex and other demographic parameters (Table 1). Both groups showed a significant improvement from baseline by 7th day, one month, and three months. The scores of pain during walking were 9.58 ± 0.121, 9.58 ± 0.121, 2.06 ± 0.045, 2.23 ± 0.089, 2.42 ± 0.249, and 3.03 ± 0.4 before injection, injection day, after injection, and 7th day, one month, and three months after injection, respectively (Table 2). The score of pain was significantly different before and after drug injection for both groups. However, there was no significant difference between the two groups. The side effects induced by the two drugs (need to re-injection; systolic and diastolic blood pressure change before and after injection, and on the 7th day after injection; and fasting blood glucose change on injection day, after injection, and on the 7th day after injection) were evaluated and the data were summarized in Table 3. In the triamcinolone group, 4 of the 30 patients needed to drug re-injection, while none in the dexamethasone group. There were no significant differences in each group as well as between the two groups for systolic and diastolic blood pressure, and fasting blood glucose before and after injection, and on the 7th day after injection.

Discussion

In this study, the effect of particulate and non-particulate steroids (triamcinolone and dexamethasone) on pain relief in patients with CBP caused by spinal stenosis and their side effects were investigated. Studies by Benyamin *et al*. have provided favorable evidence for local anesthesia and steroid use for secondary radiculitis to disc herniation, and to spinal stenosis, and for local anesthesia with or without steroids for axial pain without herniated disc (15). The results of our study also showed that both particulate and non-particulate steroids (triamcinolone and dexamethasone) had favorable effects on pain relief. The data were consistent with those by El-Yahchouchi *et al*. (13). In the study by Cansever *et al*. on the efficacy of epidural steroid injections in

Table 2. Comparison of the pain scores between triamcinolone and dexamethasone group

Pain score	Group 1: Triamcinolone				Group 2: Dexamethasone			
	Mean	Median	Minimum	Maximum	Mean	Median	Minimum	Maximum
Maximum pain during walking before injection	9.58 ± 0.121	10	8	10	9.76 ± 0.081	10	9	10
Mean pain score on injection day	9.58 ± 0.121	-	-	-	9.76 ± 0.081	-	-	-
Mean pain score after injection	2.06 ± 0.045	2	2	3	2.14 ± 0.065	2	2	3
Pain score on 7th day following injection	2.23 ± 0.089	2	2	4	2.28 ± 0.098	2	2	4
Maximum pain score one month after injection	2.42 ± 0.249	2	2	8	2.62 ± 0.338	2	2	9
Maximum pain score three months after injection	3.03 ± 0.4	2	2	9	2.90 ± 0.425	2	2	9

Table 3. Comparison of side effects between triamcinolone and dexamethasone groups

Need to re-injection	Group 1: Triamcinolone			Group 2: Dexamethasone		
	No	Yes	Total	No	Yes	Total
	27 (87.1%)	4 (12.9%)	31 (87.1%)	29 (100%)	0 (0%)	29 (100%)
Mean of systolic blood pressure before injection	132.42 ± 1.55			130.34 ± 1.46		
Mean of systolic blood pressure after injection	119.38 ± 3.88			122.06 ± 1.20		
Mean of Systolic blood pressure on the 7th day following injection	126.61 ± 1.19			128.62 ± 1.68		
Mean of diastolic blood pressure before injection	84.84 ± 1.14			83.27 ± 1.06		
Mean of diastolic blood pressure after injection	75.96 ± 0.94			76.72 ± 0.79		
Mean of diastolic blood pressure on the 7th day following injection	78.38 ± 0.84			80.86 ± 0.96		
Fasting blood glucose on injection day	92.29 ± 0.78			91.10 ± 0.98		
Blood sugar after injection	93.83 ± 0.94			92.10 ± 0.90		
Blood sugar on the 7th day following surgery	90.93 ± 0.68			90.10 ± 0.79		

treatment of lumbar radicular pain of 173 patients, significant improvement was observed in all patients and this improvement was more noticeable in female and young population. The investigators concluded that epidural steroid injection can be a very powerful treatment option to improve the quality of life for patients with severe systemic disease at an early age to experience the complications of spinal surgery (16). Injection of either steroid led to reduction of pain on the 7th day, 1 month, and 3 months.

These results were consistent with those by Manchikanti *et al*.; in this retrospective study, betamethasone was used for pain relief induced by spinal stenosis and it was concluded that epidural injection of local anesthetic with or without steroid can be considered as an effective treatment for patients with chronic pain or lumbar radicular pain (17). Stanczak *et al*. compared the effect of two steroids (triamcinolone acetonide and betamethasone) on the low back pain of 597 patients, and no difference was observed between the two steroids during the 1st to 3rd day (18). The result of our study also showed that there was no significant difference for the pain score between the two different steroids. Similar to the present study, Shakir *et al*. compared the effectiveness of dexamethasone and triamcinolone by epidural injection, but different to our results, they showed that there was significant difference in pain reduction between the two groups (19). In the systematic study by Parr *et al*., the effect of caudal steroid injections on chronic pain management was assessed. The results of that study also showed that the caudal steroid injections have a good efficacy in short-term and long-term control of pain caused by discopathy. These studies supported the effectiveness of caudal injection on controlling chronic pain caused by discopathy, spinal stenosis, and syndrome indicated after surgery (11). Different studies revealed that adding steroids can increase the duration of analgesia after surgery and reduce the need for analgesic in the first 24 hours following surgery. These studies have shown that steroid administration to the caudal space is recommended to improve the quality of analgesia in patients undergoing total hip replacement (20, 21). The data were similar to ours regarding use of dexamethasone for pain relief. However, some studies have shown that corticosteroid combinations with fewer particles have less risk of developing embolism (22-24). By reviewing these data, it seems that none-particulate dexamethasone is more beneficial than triamcinolone to patients with CBP caused by spinal stenosis.

Conclusion

In this study, we compared the effectiveness of particulate triamcinolone and non-particulate dexamethasone for treatment of CBP caused by spinal stenosis. Both types of steroids showed clinically and statistically significant improvement within three month. Triamcinolone group showed more improvement than dexamethasone group, but this difference was not significant. Theoretically, non-particulate steroids are safer than particulate steroids, therefore, none-particulate dexamethasone may be more beneficial than triamcinolone to patients with CBP caused by spinal stenosis.

Conflicts of Interest: None

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