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Research

Transforaminal Epidural Injections in Neurosurgical Clinical Practice: A Single Surgeon's Experience

Nöroşirürji Klinik Pratiğinde Transforaminal Epidural Enjeksiyon Uygulamaları; Tek Cerrah Deneyimi

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ABSTRACT

Objective: The aim of this study was to retrospectively evaluate the success of transforaminal epidural injection (TFEI) in pain control among patients who presented with radicular pain based on a single surgeon's experience.

Methods: A total of 134 patients who presented to the Neurosurgery Clinic of Haydarpaşa Numune Training and Research Hospital, University of Health Sciences Türkiye between 2021 and 2022 and underwent TFEI procedures by the same surgeon were retrospectively evaluated. Patients were analyzed according to age, gender, Verbal Pain scale (VPS) values before and 5-7 days after the procedure, primary pathology, number of repetitions, history of spinal surgery before the procedure, and whether surgery was necessary after the procedure.

Results: The mean VPS evaluated before the procedure was 9.04 (10-6) among all patients. The mean VPS value was 3.48 (8-1) in the follow-up on the 5th-7th days after the procedure. Among the patients, 11 (8.2%) underwent surgery because pain control was not achieved. Two of these patients had spinal stenosis and nine had disk herniation.

Conclusion: TFEI is a successful method for ensuring pain management in suitable patients. It should be considered for lumbar radicular pain management in patients with different pathologies in the clinical practice of neurosurgery.

Keywords: Transforaminal epidural injection, pain, disk herniation, spinal

ÖZ

Amaç: Radiküler ağrı nedeniyle başvuran hastalara uygulanan transforaminal epidural enjeksiyonun (TFEE) ağrı kontrolündeki başarısının tek cerrah deneyimi üzerinden retrospektif olarak değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Sağlık Bilimleri Üniversitesi, Haydarpaşa Numune Eğitim Araştırma Hastanesi Beyin ve Sinir Cerrahisi Kliniği'ne 2021-2022 yıllarında başvuran, aynı cerrah tarafından TFEE işlemi uygulanan 134 olgu retrospektif olarak değerlendirildi. Olgular yaş, cinsiyet, işlem öncesi ve 5-7 gün sonrası Sözel Ağrı skalası (SAS) değerleri, primer patoloji, işlemin tekrarlanma sayısı, işlem öncesi omurga cerrahisi öyküsü ve işlem sonrası cerrahi ihtiyacı olup olmaması açısından tarandı.

Bulgular: Tüm olguların girişim öncesi değerlendirilen SAS ortalaması 9,04 (10-6) idi. İşlem sonrası 5-7. günlerde yapılan kontrolde SAS değeri ortalaması 3,48 (8-1) olarak değerlendirildi. Olguların 11 tanesine (%8,2) ağrı kontrolü sağlanamaması nedeniyle cerrahi girişim uygulandı. Bu olguların 2'si spinal stenozlu olgu, 9 tanesi disk hernisi olgusu idi.

Sonuç: TFEE uygun hastalarda ağrı kontrolünde başarılı bir yöntemdir. Nöroşirürji klinik pratiğinde lomber radiküler ağrı kontrolünde farklı patolojilerde hasta grubunda kullanımı akılda tutulmalıdır.

Anahtar Kelimeler: Transforaminal enjeksiyon, ağrı, disk hernisi, omurga

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INTRODUCTION

Pain is a complaint that significantly impairs the quality of life of individuals. It has been argued that healthy people experience 80-85% back pain throughout their lives. While 80-90% of acute back pain regresses in 6-8 weeks without treatment or regardless of the treatment method, 20-50% recur within a year, and 5% become chronic and persist for longer than six months (1). Intervertebral disk disorder is the most common cause of lumbago and sciatica, and surgical treatment is necessary in only 10-15% of patients (2). In most patients, complaints are eliminated using conservative methods. Conservative treatment methods include medical treatments, physical therapy, resting, weight loss, exercise, changing lifestyle, and epidural steroid injections (ESIs). ESI is a nonsurgical and minimally invasive treatment method commonly used for the treatment of lumbar disk herniations presenting with radicular symptoms. The first study on the epidural administration of steroids was published by Robecchi and Capra (3).

It has been argued that ESIs are effective in the treatment of local inflammatory changes and mechanical compression due to discopathy, which may cause root irritation (4). The cause of radicular pain was thought to be root compression; however, the inability to achieve pain control by removal of the pressure through surgery in some patients and the reduction of pain by ESIs suggested that there were causes of pain other than mechanical pressure on the nerve (5,6). An ESI can be performed interlaminar and/or transforaminal or from the sacral hiatus. In comparative studies on which approach is more effective, no significant superiority was found between the caudal, interlaminar, and transforaminal approaches (7). Today, the transforaminal approach has become more popular to ensure the transfer of a higher concentration of steroids to the target tissue. Studies have shown that selective transforaminal ESIs and local anesthetic injections are effective and safe treatment methods for managing radicular pain in lumbar radiculopathy (8).

Our study aimed to evaluate the effect of transforaminal ESI on pain management before and after surgery in patients with radicular pain, albeit secondary to various pathologies.

METHODS

In this study, 134 patients who presented to the Neurosurgery Clinic of Haydarpaşa Numune Training and Research Hospital, University of Health Sciences Türkiye between 2021 and 2022 and underwent TFEI procedures by the same surgeon were retrospectively evaluated after the approval of University of Health Sciences Türkiye, Haydarpaşa Numune Training and Research Hospital at the TUEK meeting dated 29.11.2022 (no: E-62977267-771).

The study included patients who presented to the outpatient clinic with radicular pain secondary to various pathologies, had disk herniation and signs of spinal stenosis on magnetic resonance imaging, had no motor defects or progressive neurological loss, and had been administered ESI. Patients with extruded or sequestered disk herniation and motor deficit underwent the appropriate surgical procedure performed by the same surgeon. Patients were retrospectively examined in terms of age, gender, Verbal Pain scale (VPS) values before and 5-7 days after the procedure, primary pathology, number of repetitions of the procedure, history of spinal surgery before the procedure, and whether surgery was necessary after the procedure. The data in the study were evaluated by taking the arithmetic averages of the results obtained in the study.

The distance or distances to be intervened for the cases were decided by correlating the dermatomal spread of the pain mentioned at the time of admission to the outpatient clinic with the regions determined to have pressure during imaging.

All patients were orally informed about the procedure during admission to the outpatient clinic, their questions were answered, if any, and written consent was obtained before the procedure. Following the interventional procedures, all patients were invited for follow-up on the 5^{th}-7^{th} days to determine additional treatments, if necessary, and to evaluate the results of the procedure.

The patients were informed that they should have a light meal and take their regular medications on the day of the procedure. Unless there were any contraindications, medical treatments of patients using antiaggregant-anticoagulant were discontinued before the appropriate time according to the active substance. No sedation was administered to the patients during the procedure, and all procedures were performed under local anesthesia. The procedure was performed via the transforaminal route in all patients.

The TFEI procedure was performed in the operating room using C-arm fluoroscopy. The patient was placed in the prone position on the C-arm fluoroscopy table. The distance to perform the procedure was determined by obtaining images in the anteroposterior and lateral planes. Following this, the area was sterilized with a 10% povidone-iodine solution, and the patient was covered sterile.

After local infiltration anesthesia was administered with 5 mL of 2% subcutaneous lidocaine from the injection point at the specified distance, the intervertebral foramen was

reached with an 18 G 90 mm Quincke-type spinal needle accompanied by fluoroscopy. 1 mL of contrast agent was used for level verification. The contrasted area was observed to be the target area by fluoroscopy, and 20 mg (4 mL) and 40 mg methylprednisolone acetate were mixed with 0.5% bupivacaine for each level and injected to reach 5 mL in total. The mixture was prepared in the same amount and administered separately at each level. After the procedure, the patients were followed up in the clinic for 1 hour. Patients were recommended bed rest on the day of the procedure. They were advised to return to their daily routine the next day. Medications other than anticoagulant-antiaggregant treatments were continued, including the day of the procedure. They were recommended to restart anticoagulant and/or antiagregant treatments the next day. They were invited for follow-up on the 5th-7th day after the procedure.

The VPS values used in the study were obtained immediately before the procedure and during the evaluation of the outpatient clinic on the 5th-7th day of the patient.

RESULTS

The study was conducted with 134 patients (61 male, 73 female). The mean age of the patients was 53.96 (19-88). TFEI was performed from multiple distances in 25 patients. The procedure was performed from a single distance in other patients. In three patients, the procedure was performed for pain management following a failed back surgery (FBS). Spinal stenosis was in 10 patients. In other patients, a procedure was performed because of discogenic radicular pain. The procedure was repeated three times in 1 patient and twice in 9 patients with an interval of three months at the minimum. All patients who underwent repeated procedures had discogenic radicular pain. Facet joint block was also performed for accompanying back pain in all patients (n=13) who underwent surgery due to spinal stenosis and FBS.

The procedure was performed at the L2-3 distance in 1 patient, L3-4 distance in 43 patients, L4-5 distance in 98 patients, and L5-S1 distance in 14 patients. The procedure was performed at multiple distances in the same session, including two in 23 patients and three in 1 patient. The patient, who underwent the procedure at three distances in the same session, was diagnosed with spinal stenosis and could not undergo surgery because of accompanying diseases.

The VPS was used as the pain score in all patients. The most severe pain felt throughout life was scored as 10 and the mildest pain as 1. The mean VPS score of all patients was 9.04 (10-6) prior to the procedure. The mean VPS value was 3.48 (8-1) in the follow-up on the 5th-7th days following the procedure.

A surgical procedure was performed on 11 (8.2%) patients because of the inability to achieve pain control. Two of these patients had spinal stenosis and nine had disk herniation. In patients who did not benefit from the procedure and underwent surgery, the mean VPS value was 8.7 before the procedures. On the 5th-7th days following the procedure, it was observed to have regressed to 4.5. It was found that the pain recurred more than seven days later in patients who underwent surgery. The medical history of 15 patients who underwent TFEI included a surgical procedure in the lumbar region before the procedures. The surgery was performed at a different distance from where TFEI was administered, except for three patients with a history of FBS.

No significant major complications that caused labor loss were observed in any of the patients. A complaint of weakness in the lower extremity was detected in only 8 cases (5.9%) on the side of the unilateral procedure, which completely recovered between 6 and 8 hours. Six of the eight patients who developed paresis underwent the procedure at multiple distances. All patients were followed up in our clinic and discharged on the same day without any deficits. Vasovagal syncope developed in 2 patients (1.49%) and fully recovered upon intravenous fluid replacement. Temporary flushing, which improved spontaneously, was observed in 1 patient (0.74%). All these complications completely resolved without any sequelae. The frequency of minor complications was calculated to be 8.2% for all patients who underwent the procedure.

DISCUSSION

ESI has been used for many years as an effective method in the management of radicular pain in patients with radicular pain secondary to disk herniation, spinal stenosis, or spondylolisthesis and after FBS. ESIs can be performed through the caudal, interlaminar, and transforaminal routes. Caudal epidural injection was first published by Viner (9) in the 1920s. Procaine and saline injections were made through the caudal route during the procedure (9). In the 1960s, Brown (10) also published successful results with steroid injection into the epidural distance. In the clinical practice of neurosurgery, TFEIs are frequently used in patients with a wide spectrum of radicular pain.

It is believed that the mechanism of radicular pain causes root edema after increased vascular permeability due to inflammation secondary to pressure. Steroids applied in TFEI directly and/or indirectly suppress the synthesis and

accumulation of inflammatory agents such as arachidonic acid, phospholipases, and prostaglandins. Thus, acute inflammation is also limited (11). In many studies, it has been mentioned that the treatment of radicular pain with TFEI in the early period provides more effective pain control compared with the chronic process (12). In our clinical practice, we perform TFEI injections on the same day or within one week following the admission of the patients in the acute painful period, if possible. Following the procedure, we observed that the quality of life of the patient improved, and the patient returned to daily life more quickly. This facilitates the rapid return of the person to their roles in life, except for the loss of the workforce.

Many studies have mentioned the necessity of using contrast agents and fluoroscopy in ESIs (13). In our clinical practice, we provide effective access to the target tissue using C-arm fluoroscopy and contrast agents in all TFEI injection procedures.

In our study, we used the VPS as the pain score in all patients in the retrospective evaluation of patients who underwent TFEI. In our clinical practice, we check the VPS values during patient follow-up. The most severe pain felt in the life of the patients was scored as 10 points, and the mildest pain as 1 point. The mean VPS score of all patients was 9.04 (10-6) before the procedure. In the follow-ups performed on the 5th-7th days after the procedure, the mean VPS value was found to be 3.48 (8-1). There was a prominent decrease in pain levels compared with those before the procedure. There was a significant decrease in the VPS values of all patients. Unlike other studies, significant regression was observed in the VPS values of patients with spinal stenosis. This difference was thought to be associated with the small number of patients with spinal stenosis in our sample. The highest benefit was determined in the patient group with disk herniation, which is consistent with the literature. Unlike our study, Taşdemir and Aydın (14) found that pain management was less successful in patients with spinal stenosis than in patients with FBS and disk herniation. Other studies have determined higher success rates in patients with disk herniation and limited success rates in patients with FBS and spinal stenosis (15,16).

In our study, 11 patients required surgical intervention because of the recurrence or exacerbation of pain in their follow-ups after the TFEI procedure. Nine of these patients had disk herniation and two had spinal stenosis. Four patients with disk hernia that required surgery were patients with surgical indications for whom pain control was intended during the preparation period until surgery. All patients underwent surgery by the same surgeon who performed the TFEI procedure.

In the literature, minor complications (transient root total block, contrast-associated side effects, vasovagal syncope, flushing, etc.) have been frequently reported concerning TFEI injections. Major complications such as exitus, discitis, or cardiac arrest have been reported in sporadic patients. In their study on 375 patients, Taşdemir and Aydın (14) reported pain at the injection site in 7 patients, increased complaints before the procedure in 4 patients, weight gain in 2 patients, and no major complications in any patient. Botwin et al. (17) reported the percentage of minor complications as 9.6%. Çetin et al. (18) reported that no major complications were encountered, and the percentage of minor complications was 11.1%. In our study, no significant major complications causing loss of labor force were observed in any of the patients, and the frequency of minor complications was calculated as 8.2% for all patients treated, in compliance with the literature.

We believe that TFEI is an efficient, easy, and inexpensive method for the management of radicular pain, which constitutes a significant part of neurosurgical clinical practice. We observed that effective treatment with appropriate indications increased the quality of life of the patient, facilitating the return to work and improving comfort in daily life activities. From our point of view, the fact that this study was a single surgeon experience is noteworthy in terms of closely monitoring the success of the procedure, complications, and progress in cases in need of surgery; however, we believe that it can be supported with a further retrospective study with long-term follow-up and a control group.

CONCLUSION

We believe that TFEI, which is used in the practice of spinal surgery for the management of radicular pain in patients with acute pain, patients who cannot undergo surgery due to comorbid pathologies, and patients with pain and preparing for surgery, is an efficient treatment method that should be considered by neurosurgeons.

ETHICS

Ethics Committee Approval: Approval of University of Health Sciences Türkiye, Haydarpaşa Numune Training and Research Hospital was received at the TUEK meeting dated 29.11.2022 (no: E-62977267-771).

Informed Consent: All patients were orally informed about the procedure during admission to the outpatient clinic, their questions were answered, if any, and written consent was obtained before the procedure.

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