Injury Neuropathies of the Sciatic Nerve: Experience of an Electrophysiology Laboratory and Medicolegal Approach in Turkey

Siyatik Sınır Enjeksiyon Nöropatilleri: Bir Elektrofizyoloji Laboratuvarının Tecrübesi ve Türkiye’de Medikolegal Yaklaşım

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ABSTRACT
Objective: The gluteal region is usually the preferred site for intramuscular injections. However, reported complications include pain, abscess formation, hematoma formation and peripheral nerve injury, most frequently sciatic nerve injury. Here, we aimed to analyze the demographical, clinical and electrophysiological features of patients with sciatic nerve injury following gluteal intramuscular injections and to summarize the legal procedure in Turkey.

Methods: We retrospectively investigated the clinical and electrophysiological features of 33 patients who were admitted to our electrophysiology department between January 1995 and June 2006 with symptoms and signs of sciatic nerve injury which appeared after intramuscular injection in the gluteal region and we reviewed the legal procedure.

Results: There were 16 male (48.5%) and 17 female (51.5%) patients. Age range was between 1.5 and 81 years. The interval between nerve injury and admission to our laboratory ranged from 20 days to 25 years. 24 patients were admitted within 6 months after the injury, 32, within 1 year and, only one was admitted after 25 years. The patients who were admitted within the first 6 months after the injury, were commonly admitted for diagnosis and determination of prognosis, whereas the patients in the late periods were referred as a part of medico-legal procedure. All patients expressed burning and shock-like pain radiating to the whole lower extremity. The other symptoms were weakness (50%), numbness (9.1%), and paresthesia (4.5%). Electrophysiologically, both divisions of the sciatic nerve were affected in 9 (27.2%) and axonal involvement of the lateral division predominated in the remaining patients.

Conclusion: Injection neuropathy constitutes the major part of the sciatic nerve injuries. Most frequent symptoms are burning pain and weakness. In any traumatic sciatic neuropathy, the peroneal nerve seems to be involved more frequently resulting from the more lateral and superficial location of the fibers supplying the peroneal nerve. Axonal involvement is generally predominating in injection neuropathies. Patients even in the late period are referred to the electrophysiology laboratory for determination of sequelae and medico-legal procedures. All medical staff should be aware of clinical and electrophysiological findings and medicolegal approach in this condition. (Archives of Neuropsychiatry 2012; 49: 208-211)

Key words: Intramuscular injection, sciatic nerve injury, electromyography, forensic medicine, criminal law, Turkey

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ÖZET


Anahit kelimeler: Kas içi enjeksiyon, siyatik sinir yaralanması, elektromiyografi, adil tip, ceza hukuği, Türkiye

Çıkar çatışması: Yazarlar bu makale ile ilgili olarak herhangi bir çıkar çatışması bildirmemişlerdir.
Introduction

There exist various routes for drug administration in pharmacology. In some occasions, parenteral administration is essential and under such circumstances, intramuscular injections are more widely used. Gluteal region is usually the preferred site for intramuscular injections since the muscle in this region is coarse and dense and has the advantage of better absorption. However, complications like abscess and hematoma formation, pain, and peripheral nerve injury may be encountered. Due to the anatomical location, gluteal injections may injure several nerves such as the sciatic, superior gluteal, inferior gluteal, posterior femoral cutaneous and/or pudendal nerves (1). Nerve injuries caused by gluteal injections are commonly associated with both mechanical effect of syringe and type of drugs administered. Additional predisposing factors are the thickness of the subcutaneous tissue and depth of gluteus musculature, especially in children and elderly patients (2). Permanent residual damage is possible which has been reported to be between 64% and 82% of cases (3,4,5). Eker and colleagues (6) reported 5 cases with intractable sensorial symptoms for more than 6 months. Prognosis is mainly affected by the type and severity of the nerve injury.

Patients even in the late period are referred to the electrophysiology laboratory, generally for determination of sequela and medicolegal reasons. Therefore, all medical staff should be aware of the clinical and electrophysiological findings and medicolegal approach in this condition. Here, we aimed to analyze the demographical, clinical and electrophysiological features of patients with sciatic nerve injury following gluteal intramuscular injections and to summarize the legal procedure in Turkey.

Methods

We retrospectively reviewed the database of the Electrophysiology Laboratory in the Cerrahpasa School of Medicine, Department of Neurology between January 1995 and June 2006. We determined 33 patients who were admitted with symptoms and signs that were ascribed to the sciatic nerve and appeared after an intramuscular injection in the gluteal region. According to the routine practice at our laboratory, all patients underwent a brief history and clinical examination by one of the three neurologists and electrophysiological investigations were done by the same physician.

The following data were obtained from medical records: demographic features, neurological symptoms and signs, time to symptom onset after the injection, mean duration of symptoms, and electrophysiological findings. Sensory (tingling, numbness, pain, burning) and motor symptoms were categorized as present or absent. Findings on neurological examination regarding superficial sensorial system were classified as normal or abnormal. Muscle strength for knee flexion, foot dorsiflexion, and plantar flexion were characterized as normal or abnormal. The motor strength was also graded using the Medical Research Council (MRC) grading score (0-5). All patients underwent a standardized protocol (7,8).

The patients were divided into three groups according to the following clinical and electrophysiological findings: 1) the common peroneal nerve affected alone or affected more than the posterior tibial nerve, 2) the posterior tibial nerve affected alone or affected more than the common peroneal nerve, and 3) the common peroneal and posterior tibial nerves affected equally.

Results

Demographical and clinical features: There were 16 male (48.5%) and 17 female (51.5%) patients. The mean age was 38.6±27.3 years (age range: 1.5-81 years). There were 9 patients under the age 18, ranging from 1.5 to 13 years, and 5 of them were male. The interval between injury and admission to our laboratory ranged from 20 days to 25 years. 24 patients were admitted within 6 months after the injury, 32 within 1 year after the injury, and in only one the injury had occurred 25 years before the admission. The patients in the acute period were directed to our laboratory by their primary physicians to guide the treatment while the patients in the chronic period were directed for medico-legal reasons.

In 20 (60.6%) patients, the left side was involved. All patients expressed burning and shock-like pain radiating to the whole lower extremity. The other symptoms were as follows: weakness in 50%, numbness in 9.1%, and combined in the rest (pain and weakness in 3 patients, pain and numbness in 1 patient). Neurological examination revealed decreased muscle strength in 63.6% of patients and abnormal sensitivity to superficial touch in 9.1%. Dorsiflexion of the foot was mildly affected in 36.4% of patients (MRC grade 3-4) and in 4.5% totally (MRC grade 0-1). Planter flexion was involved in 4.5% (MRC grade 0-1). Combined weakness of plantar flexion and dorsiflexion were observed in 18.2%, all of which were mild. Sensorial signs were hypo/paresthesia in peroneal and/or tibial sensorial distribution.

Pain was the leading symptom (83.4%) in the acute period whereas weakness was predominating (100%) in the chronic period in contrast to the whole group. However, severity of clinical findings did not differ between patients in acute and chronic periods (p=0.614).

Electrophysiological findings: According to the nerve conduction studies and needle EMG, sciatic nerve involvement was total in 9 (27.2%), namely both the tibial and peroneal nerves were not excitable. It was partial in the rest: equal involvement of the tibial and peroneal nerves in 24.2% (8), predominant tibial involvement in 15.2% (5), predominant peroneal involvement in 15.2% (5), only peroneal involvement in 15.2% (5) and only tibial involvement in 3.0% of the patients (1). The peroneal nerve in 15 and the tibial nerve in 14 subjects were not excitable, while the remaining electrophysiological findings were indicating axonal neuropathy. The needle EMG revealed signs of active denervation in acute period.

To make the findings more comprehensible, we categorized them as follows: 1) the common peroneal nerve affected alone or affected more than the posterior tibial in 30.4%, 2) the posterior tibial nerve affected alone or affected more than the common peroneal in 18.2%, and 3) the common peroneal and posterior tibial nerves affected equally 51.2%.
Two out of 9 patients with total axonal injury of the sciatic nerve were above 70 years of age and 5 aged under 13.

**Discussion**

The sciatic nerve is vulnerable to trauma such as fracture; dislocations, hematomas, intramuscular injections and complications of hip replacement surgery (9). In a literature review (9), intramuscular injections have been reported to be the second most common cause of sciatic nerve injury after hip arthroplasty. The incidence of nerve injuries following intramuscular injections has been reported to be 55% (10). However, injection injury may account for up to 50% of sciatic nerve injuries as reported by Kline et al (11). In sciatic neuropathy, volume and type of medication, localization of injection or constrictor from scar/abcess formation are suggested to be responsible (12,13). For example, local diffusion and toxicity of quinine dicrofenac sodium or metamizol may be the causative factor (3,14,15). Children may be more exposed to injury because of the anatomical proximity and, sciatic neuropathy is generally more frequent below 5 years of age (16,17). Because of the retrospective nature of our study, we could not exhibit the exact cause of the injury: medication or localization. However, we may suggest that pediatric and elderly patients with decreased muscle mass are at increased risk for more severe involvement and we agree with the literature that, when injection is given by an authorized medical staff, the offending agent is most commonly an analgesic, especially dicrofenac sodium.

Most frequent symptoms are burning, pain and weakness; other possible complaints are numbness and paresthesias (10). Our results were in concordance with those reported in the literature, however, it was observed that weakness was more frequently encountered. This could be understandable since this study included medical records of patients who were admitted to the department of electrophysiology that patients with weakness could present more frequently.

In any traumatic sciatic neuropathy, the peroneal nerve seems to be involved more commonly probably resulting from the more lateral and superficial location of fibers supplying the peroneal nerve (10,18). Axonal involvement generally predominates in sciatic neuropathies. Yuen et al. reported predominant demyelination in 16% of patients with compressive neuropathies (18). However, determination of conduction block is not possible since the lesion is proximal in injection neuropathies. We evaluated the demyelination by indirect findings such as decreased conduction velocity beyond the decrease in CMAP and we did not observe demyelination similar to that in the study of Pandian et al. (10). Although sural nerve involvement is generally suggested to be a marker for differential diagnosis between sciatic neuropathy and L5-S1 radiculopathy, sural nerve sparing has also been previously reported. In this case, involvement of other muscles innervated by the same radix but by the different nerves, and history compatible with injection neuropathy would be differentiating features (18).

The poor outcome in the form of no recovery or partial recovery was reported to range between 64% and 82% of cases (3,4,5). The electrophysiological finding of total axonal loss of common peroneal, posterior tibial, and sural nerves has been shown to be associated with poor clinical recovery (3). However, there exists discordance between the electrophysiological recovery and the clinical recovery.

Currently, there is no specific treatment for sciatic nerve injuries and the question of the effect or ideal timing of the surgical intervention is still unresolved. Because of the risk of permanent residual damage, they are the subject of medico-legal inquiries. Therefore, as we previously mentioned, the patients in the chronic period are generally referred for medico-legal approaches or to predict disability and, all medical staff should be aware of the legal procedures in Turkey.

Performing an injection is in authorization of medical staff in Turkey similar to other developed countries. If people other than authorized medical staff perform an injection causing injury, they are directly accused and sued without any need for preliminary authorization. They are generally anticipated to be sentenced.

If the subject is an authorized physician, nurse or other medical staff, there exist two alternatives in criminal proceedings. If the subject is a medical staff working in an official hospital (state hospital, university hospital or village clinic), authority in executive position prosecutes preliminary inquiry. If medical staff is concluded as faulty at the end of this preliminary inquiry, senior executive officers of the city which are organized in all cities of Turkey authorize judgment of the subject. Furthermore, additional penalties like warning, censure, prevention of advance in degrees, wage deflation, discharge from public employment can be applied. Beside all these penalties, medical staff can refer to administrative court to cancel. Council of State is the uppermost court which is established for evaluation of judgments of administrative courts and is located in Ankara.

When subject is a medical staff working independently or in the private sector instead of working in an official hospital, there is no requirement for preliminary inquiry or permission. In this case, medical staff is directly subjected to be judged according to the criminal law. The common point in the judgment of either medical staff working in public hospital or subject working privately, necessity of criminal and civic sanction is generally determined and parallels by report of experts nominated by court. Since injection is a technical and medical issue, legal problems regarding this issue are not possible to be solved by only judicial professionals. Therefore, the court responsible for the judgment determines an expert to declare opinion. In criminal proceedings, alternative penalties are prison sentence, working in public duty, dismissing from profession or pecuniary fine.*

The Council of Forensic Medicine of the Ministry of Justice which is located in Istanbul is the major organ for declaration of expertise opinion. Regarding claims about medical errors is the 3rd Specialized board of forensic medicine. This board consists of 3 specialists of forensic medicine (1 chief and 2 members) and 7 additional specialist one from each of the following departments: orthopedics and traumatology, general surgery, neurology, internal medicine, pediatrics, pulmonary diseases, and infectious diseases. Besides, courts may ask for the opinion of the relevant departments of university hospitals which are under the control of the Turkish Council of Higher Education.*
Besides the criminal proceedings, victims may claim for the restitution of their damage. In this case, victims must refer to civil courts. Victims may demand for pecuniary and/or moral compensation. Pecuniary compensation includes all investigation and treatment costs due to damage (tests, hospital payments, medical consumables, medicine, etc.), loss of income for the rest of life resulting from the damage. Amount of compensation for moral damage is generally decided upon a generally accepted rule which is ‘this amount should not enrich the victim’. However, this is a legal controversy and used to be discussed. In the year 2011, current arrangements are in favor to enrich the victim.

Decisions of civil courts are also based on expert opinion. The Council of Forensic Medicine is again the major organ for declaration of expertise opinion. Besides, civil courts may also ask for the opinion of relevant departments of university hospitals which are inferior to the Turkish Council of Higher Education. Although only the courts are authorized for judgment, the decisions of these experts are very influential.

The parties tried to have the right to appeal the verdicts of both penal and civil trials in the higher court in Ankara. The higher court can either reaffirm the sentence of the lower regional court, or return the file to the court for revision, having objected to one or more aspects of it. In case of objection, the court will have to review the file according to the instructions of the higher court.

Another organ in which claims involving medical error are evaluated is the Council of Health which is a subdivision of the Ministry of Health. This council consists of 11 specialists from various departments who are appointed for 1 year as well as 4 bureaucrats of the Ministry of Health. Although decisions of this council do not have any direct restrictive effect, it may have impact on the decision of the court. However, since this council gave reports in a longer period and delayed legal proceedings, this rule was sued and subverted at the Council of State.

In case the medical application was administered by a physician, the Turkish Medical Association might also initiate disciplinary action against the doctor, irrespective of the doctor’s membership in that association, and generally decides according to the expert opinion. The possible disciplinary censure applied by the doctors’ association include, warning, pecuniary fine, temporary suspension of certificate (15 days), and long-term suspension of certificate to practice medical profession (6 months). If the offense requiring 6 months penalty is repeated 3 times, indefinite prohibition of working in the association’s area is possible. The health-care worker has the right to appeal to administrative courts against these disciplinary measures. The sentences of administrative courts are also subject to be appealed at a higher court.

References