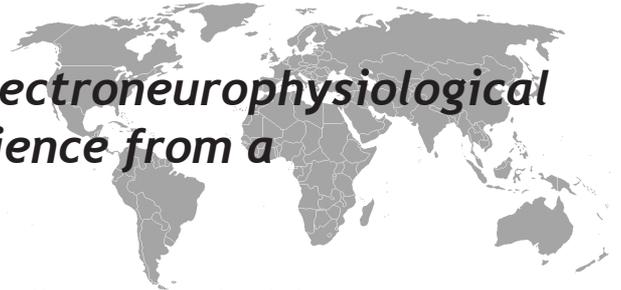


Referral Diagnosis Versus Electroneurophysiological Findings-Three Years Experience from a Tertiary Hospital



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ABSTRACT

An increasing number of requests for electrodiagnostic (EDX) tests is noted. Unnecessary referrals burden electrodiagnostic laboratories, prolonging waiting time for patients needing this examination. There are only a few studies investigating the distribution and concordance of EMG requests. This study is aimed to evaluate the requests of EDX tests and the concordance of referral diagnosis with EDX diagnosis. Electromyography laboratory database of our clinic between January 2008- December 2010 was used in this study. Data on examinees, referral physicians and diagnoses, electrodiagnostic findings were recorded. Entirely 2843 EDX tests had been performed and 142 of them had been excluded from the study because of missing data. Totally 2701 tests were included into the study and 1095 (40.5%) of whom were men. Mean age of patients was 48.3 ± 12.6 years. Most of the EMG requests were done by neurologists (75.3%) and neurosurgeons (13.0%). Very few of EMGs were requested by general practitioners (0.7%). Polyneuropathy (29.2%), carpal tunnel syndrome (27.2%) and radiculopathy (10.2%) were the most common referral diagnoses. EMG results of 37.9% patients were in normal range. The referral diagnosis was concordant with EMG diagnosis in 52.6% of patients. This is the first study that demonstrates the distribution and concordance of EMG requests in Turkey. Most of EMGs were requested by specialists in our study. Polyneuropathy, CTS and radiculopathy were the most frequent diagnoses. Even though around 80% of EMG's were requested from neurology and/or neurosurgery clinics, half of diagnoses were concordant with EDX diagnoses.

Key words: Electrodiagnosis, referral diagnosis, electromyography, concordance, electroneurophysiologic diagnosis

Klinik Öntanılara Karşı Elektronörofizyolojik Bulgular-Üçüncü Basamak Hastanenin Üç Yıllık Deneyimi

ÖZET

Elektrodiagnostik testler artan sayıda istenmektedir. Gerekli olmayan istemler elektrodiagnostik laboratuvarlarında yoğunluğa neden olmakta, hastaların uzun süre beklemesine yol açmaktadır. EMG istemleri ve dağılımlarını araştıran sınırlı sayıda çalışma bulunmaktadır. Bu çalışmada EDX test istemleri ve klinik öntanıların EDX tanıları ile uyumlarının araştırılması amaçlanmıştır. Bu çalışmada Elektromiyografi laboratuvarının Ocak 2008- Aralık 2010 arasındaki veritabanı kullanıldı. Fizik muayene, sevk eden hekimler ve ön tanıları ile elektrodiagnostik bulgular kaydedildi. Toplam 2843 test değerlendirildi, eksik verisi olan 142 hasta çalışma dışı bırakıldı. Çalışmaya 2701 test sonucu dahil edildi. Hastaların 1095'i (%40.5) erkek ve ortalama yaşları 48.3 ± 12.6 yılıdır. EMG istemlerini çoğu nörologlar (%75.3) ve beyin cerrahları (%13.0) tarafından yapılmıştır. Çok az kısmı (%0.7) pratisyenlerce istenmiştir. Polinöropati (%29.2), Karpal tünel sendromu (%27.2) ve radikülopati (%10.2) en sık ön tanılarıdır. Yüzde 37.9 EMG normal sınırlarda bulundu. Hastaların %52.6'sında klinik ön tanı EDX tanısı ile uyumlu bulundu. Bu çalışma EMG istem dağılımlarını ve konkordansını gösteren Türkiye'deki ilk çalışmadır. EMG'lerin çoğun uzman doktorlarca istenmiştir. Polinöropati, KTS ve radikülopati en sık ön tanılarıdır. Yüzde 80 istemin nörolog ve beyin cerrahlarınca yapılmasına rağmen ön tanıların yarısı EDX tanısı ile uyumludur.

Anahtar kelimeler: Elektrotanı, referans tanı, elektromiyografi, uyum, elektrofizyolojik tanı

INTRODUCTION

Even the technologic improvement in imaging, electrodiagnostic (EDX) testing is still a powerful tool in diagnosing and management of peripheral nervous system and muscle problems (1). Generally these studies are accepted as a continuation of the clinical neurological examination (2). Only in a few of the patients with normal neurologic examination, electromyography (EMG) may reveal dysfunction of peripheral nerves or muscles.

Clinical neurophysiologists noted an increasing number of requests for EMG since EDX studies could be requested either by a specialist (neurologist, neurosurgeon, internal medicine, orthopedic surgeon etc.) or by a general practitioner (3-4). Unnecessary referrals burden electrodiagnostic laboratories, prolonging waiting time for patients needing this examination (5). There are only a few studies about the distribution and concordance of EDX test requests (3-6). This study is aimed to evaluate the requests of EDX tests and the concordance of referral diagnosis with EDX diagnosis.

MATERIALS AND METHODS

Ankara Numune Education and Research Hospital is a tertiary referral hospital, located at the capital city of Turkey. Electromyography laboratory database of our clinic between January 2008- December 2010 was used in this study. Demographic characteristics of the patients were recorded. Also we used the data of; clinics where the examination tests had been requested, the referral diagnostic hypotheses, and the results of the EDX tests. EDX tests included; nerve conduction study (NCS), needle EMG, repetitive stimulation tests and evoked potentials (VEP and SEP). As a standard, in all patients with suspected carpal tunnel syndrome (CTS) electrodiagnostic examination included median and ulnar motor and sensory nerve action potentials, and at least peroneal and tibial motor and sural nerve sensory action potentials in suspected polyneuropathies. Patients with suspected radiculopathy, myopathy and motor neuron diseases were evaluated by needle EMG besides these tests. Repetitive stimulation test were used for referral diagnosis of myasthenia.

For statistical analysis we used SPSS 15.0 for Windows (Statistical Package for Social Sciences Inc.Chicago, IL, USA). Statistical analysis of the data was performed using chi-square test with a level of significance of $p < 0.05$.

RESULTS

By three years 2843 EDX tests had been performed and 142 of them had been excluded from the study because of missing data. Totally 2701 tests were included into the study and 1095 (40.5%) of whom were men. Mean age of patients was 48.3 ± 12.6 years. Most of the EMG requests were done by neurologists (75.3%) and neurosurgeons (13.0%). Internal medicine and subspecialty clinics were referred 7.1% of patients. Very few of EMGs were requested by general practitioners (0.7%).

Polyneuropathy and CTS were the most common referral diagnoses far away from the other diagnoses. Distribution of the referral diagnosis was shown in Table 1. Referral diagnoses were different regarding the clinics where EMG was requested ($p < 0.001$). Even though distribution of neurologists were parallel to whole population, most frequent referral diagnosis of neurosurgeons was radiculopathy whereas of internist and subspecialists was polyneuropathy (Table 2). EMG results of 37.9% patients were in normal range. The referral diagnosis was concordant with EMG diagnosis in 52.6% of patients. Rate of concordant diagnosis according to clinics were 51.3% for neurology, 56.8% for neurosurgery, 57.6% for internal medicine and subspecialists ($p = 0.255$).

The concordance rates were higher in peripheral facial paralysis, radiculopathy, and CTS but were lower in myasthenia, motor neuron disease, and ulnar neuropathy (Table 3).

Table 1. Distribution of the referral diagnosis

| Referral Diagnosis | n (%) |
|-------------------------------|------------|
| Polyneuropathy | 789 (29.2) |
| Carpal tunnel syndrome | 736 (27.2) |
| Radiculopathy | 275 (10.2) |
| Ulnar neuropathy | 252 (9.3) |
| Demiyelinated diseases | 182 (6.7) |
| Myopathy | 121 (4.5) |
| Myasthenia | 94 (3.5) |
| Sciatic / peroneal neuropathy | 91 (3.4) |
| Motor neuron disease | 60 (2.2) |
| Brachial plexopathy | 50 (1.9) |
| Peripheral facial paralysis | 26 (1.0) |
| Other diagnoses | 25 (0.9) |

Table 2. Referral diagnosis according to different departments

| Referral Diagnoses | Neurology (n:2031) | Neurosurgery (n:352) | Internal medicine and subspecialties (n:192) |
|-------------------------------|-----------------------|-------------------------|---|
| Polyneuropathy | 29.5 | 5.1 | 69.3 |
| Carpal tunnel syndrome | 27.9 | 30.7 | 13.5 |
| Radiculopathy | 6.6 | 35.0 | 4.7 |
| Ulnar neuropathy | 10.1 | 10.0 | 1.6 |
| Demiyelinated diseases | 8.9 | 0 | 0 |
| Myopathy | 4.7 | 1.1 | 7.8 |
| Myasthenia | 4.1 | 0.6 | 1.0 |
| Sciatic / peroneal neuropathy | 2.4 | 8.5 | 1.5 |
| Motor neuron disease | 2.8 | 0.6 | 0.5 |
| Brachial plexopathy | 1.1 | 6.5 | 0 |
| Peripheral facial paralysis | 1.0 | 0.6 | 0 |

DISCUSSION

This is the first study that demonstrates the distribution and concordance of EMG requests in Turkey and includes 2701 consecutive examinees between 2008-2010. Thus it represents the population referred for routine peripheral nerve electrodiagnosis in a central EMG laboratory in Turkey. Our findings indicate that most of the EDX tests are requested by specialists, majority of them neurologists (75.3%) and neurosurgeons (13.0%). Patients referred for EDX studies by general practitioners and/or family physicians are usually evaluated in our neurology clinic before EMG testing. So very few of EMGs were requested by general practitioners (0.7%) in our laboratory. This approach is recommended by some authors because neurologic examination expertise of general practitioners is generally lower than specialists (4). However it would be a longer wait time for a patient to see a neurologist and then have the electrodiagnostic testing. Post graduate education programmes regarding neurologic examination might be a rational choice to solve this problem.

The most common referral diagnoses were polyneuropathy (29.2%), CTS (27.2%) and radiculopathy (10.2%). In the study of 3900 patients from Italy, 32.5% percent of the referral diagnosis was PNP, 25.1% was CTS and 16.4% was radiculopathy (6). Distribution of these diagnoses may change according to different EMG referral strategies of different countries (3,5). But these studies included smaller number of patients. However our study and study of Cocito et al. include consecutive large number of patients from central hospitals. Therefore polyneuropathy, CTS and radiculopathy could be accepted as the most frequent referral diagnoses and the order of these diagnoses may change according to different clinical perspectives for neurosurgeons (eg. radiculopathy) and internist polyneuropathy etc-.

In all of EDX tests, 37.9% of patients have no pathological EDX results. This data was similar to Italian study (36%) (6). In concordance analysis, 52.6% of referral diagnosis was concordant with EDX diagnosis in our study. In the study of Cocitos et al., 36.5% of requests from GPs's and 41.8 % from specialists's were concordant with EDX diagnoses (6). Podnar et al. had found concordance in 45% of patients (5). Interestingly in the same laboratory this was found as 60% in 1983.7 Even though a neurological referral diagnosis is requested for optimal use of EDX studies, previous studies revealed that referral physicians had not provide a neurological diagnoses in 29-45 % of EDX studies (5,8). All of our patients had a neurologic referral diagnosis before EMG. The mild increase of our concordance rates might be a reflection of our pre-request neurologic examination approach. In subgroup analysis, rates of concordance according to clinics were 51.3% for neurology, 56.8% for neurosurgery and 57.6% for internal medicine and subspecialists (p=0.255).

Table 3. Concordance rates due to referral diagnoses

| Referral Diagnosis | Concordance rate(%) |
|-------------------------------|---------------------|
| Peripheral facial paralysis | 96.2 |
| Radiculopathy | 63.6 |
| Carpal tunnel syndrome | 63.3 |
| Brachial plexopathy | 54.0 |
| Demiyelinated diseases | 52.7 |
| Polyneuropathy | 51.4 |
| Myopathy | 41.7 |
| Sciatic / peroneal neuropathy | 41.7 |
| Ulnar neuropathy | 37.3 |
| Motor neuron disease | 33.3 |
| Miyasthenia | 15.9 |

The concordance of referral diagnoses with EDX findings may differ according to neurologic diagnoses itself. In our study, it was higher for peripheral facial paralysis, radiculopathy, and carpal tunnel syndrome. These diseases have simple examination findings for most of general practitioners. Contrary, these rates were lower for myasthenia, motor neuron disease, and ulnar neuropathy. Neurophysiologists may not perform needle EMG if referral diagnoses do not contain myopathy, motor neuron disease, and radiculopathy. Thus motor neuron disease might be skipped. Lower rates of concordance can be explained by this entity. Cubital tunnel syndrome can be differentiated into a primary form and a secondary form caused by deformation or other processes of the elbow joint. Also differential diagnosis should include such conditions as C8 radiculopathy, pressure palsy; Pancoast tumor (9). So ulnar neuropathy examination is harder than CTS. Since concordance on referral diagnoses as ulnar neuropathy might be lower.

As a conclusion, most of EMGs were requested by specialists in our study. Polyneuropathy, CTS and radiculopathy were the most frequent diagnoses. In half of these tests referral diagnoses were concordant with EDX diagnoses. Prerequisite neurologic examination and fulfilling of neurologic referral diagnoses can increase concordance rates and decrease unneeded usage of EDX tests.

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