

Urodynamic evaluation and rehabilitation outcomes in transverse myelitis

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ABSTRACT

الأهداف: تقييم شذوذية البول لدى المرضى المصابين بالتهاب المستعرض في النخاع الشوكي (TM)، عن طريق دراسة حركات البول وإدراج النتائج الوظيفية لهؤلاء المرضى بعد برنامج إعادة التأهيل.

الطريقة: شملت هذه الدراسة 46 مريضاً مصاباً بالتهاب النخاع الشوكي المستعرض (TM)، والذين طلبوا العلاج الطبيعى بمستشفى إعادة التأهيل الطبي ومركز الأبحاث - أنقرة - تركيا، خلال الفترة ما بين يناير 2000م وحتى يونيو 2005م. تم تسجيل النتائج السكانية للمرضى، كما تم إجراء فحص عصبي كامل لجميع المرضى. بالإضافة لطلب الأعراض البولية والتاريخ الطبي لحركة الأمعاء والحركة الجنسية. أجري فحص لحركات البول لكل مريض. تم إلحاق جميع المرضى ببرنامج إعادة التأهيل الطبي. تم إدراج أنواع المثانة العصبية، المعالجة، والمستويات الوظيفية للمرضى بعد إدراجهم في برنامج إعادة التأهيل الطبي.

النتائج: تم تقييم حالة 22 رجلاً و 24 امرأة. كان متوسط العمر 39.74 ± 15.94 (15-75) عاماً، بلغ متوسط فترة المرض 800.24 ± 885.49 (150-3600) يوماً. يعاني 36 مريضاً من شلل نصفي و10 مرضى يعانون من شلل رباعي. ثلاثون مريضاً تعرضوا لاعتلال مرضي بولي، 32 مريضاً تعرضوا لاعتلال مرضي في الأمعاء، و6 مرضى تعرضوا لاعتلال مرضي جنسي. أظهرت دراسات حركات البول وجود انخفاض الالتزام في المثانة لدى مريضين، عسر الانسجام لدى 22 مريضاً، وفرط الانعكاس لدى 16 مريضاً، فقط 6 مرضى يعانون من اضطراب في المصرة. كما تبين وجود نتائج وظيفية غير مستقلة انتقالية لدى 8 مرضى، متنقلة مع العكازات لدى 16 مريضاً، متنقلة مع طرف بديل صناعي من مستوى الركبة - الكاحل - القدم وعكازات لدى 4 مرضى، انتقالية علاجية لدى مريضين ومستخدمي الكرسي المتحرك لدى 16 مريضاً عند الخروج.

خاتمة: يعتبر برنامج إعادة التأهيل الطبي مهماً لدى المرضى المصابين بالتهاب مستعرض في النخاع الشوكي (TM) لإكمال التحكم بالبول، الحفاظ على الوظيفة الكلوية، الحصول على الاستقلالية الوظيفية، ومنع المضاعفات.

Objectives: To evaluate micturition abnormalities in patients with transverse myelitis (TM) using urodynamic studies, and to record functional outcomes of these patients after the rehabilitation program.

Methods: Forty-six patients with TM who attended the Ankara Physical Medicine and Rehabilitation Education and Research Hospital, Ankara, Turkey between January 2000 and June 2005 were included in the study. Demographic findings of patients were documented. A history and detailed neurological examination was performed on all patients. Urological symptoms and history of bowel and sexual involvement were recorded. Urodynamic investigations were carried out for each patient. All patients were enrolled in the rehabilitation program. Neurologic bladder types and treatments, and functional levels of the patients after the rehabilitation program were recorded.

Results: Twenty-two men and 24 women were evaluated. The mean age was 39.74 ± 15.94 (15-75) years, mean illness duration was 800.24 ± 885.49 (150-3600) days. Thirty-six patients had paraplegia and 10 had tetraplegia. Thirty patients had a history of urinary pathology, 32 had bowel pathology, and 6 had sexual pathology. Urodynamic studies showed hypocompliant bladder in 2 patients, detrusor sphincter dyssynergia in 22, detrusor hyperreflexia in 16, and only sphincter disorder in 6 patients. Functional outcomes on discharge were independent ambulation in 8, ambulation with crutches in 16, ambulation with knee-ankle-foot orthosis and crutches in 4, therapeutic ambulation in 2, wheelchair in 16.

Conclusions: Rehabilitation is important in patients with TM to continue the urinary continence and to preserve renal function, to obtain functional independence and to prevent complications.

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Acute transverse myelitis (TM) is a focal inflammatory disorder of the spinal cord, resulting in motor, sensory, and autonomic nerve dysfunction. Nowadays, the pathogenesis of acute TM is not clear.¹ Among the causes are postinfectious inflammation, multiple sclerosis, autoimmune inflammation, vasculitis, and drugs. Symptoms include bilateral motor, sensory, and sphincter deficits below the level of the lesion. In acute TM, bladder dysfunction is an integral component of the diagnosis and may be one of the most disabling sequelae in spite of near total recovery of other neurological deficits. Bladder and bowel problems may involve increased frequency of the urge to urinate or have bowel movements, incontinence, difficulty voiding, the sensation of incomplete evacuation, and constipation. Over the course of the disease, most people with TM will experience one or several of these symptoms. Inflammation tends to involve the spinal cord diffusely at one or more levels, affecting all spinal cord function. Generally, the more acute the progression is, the worse the prognosis. Recovery from TM usually begins within 2-12 weeks after the onset of symptoms and may continue for up to 2 years. However, if there is no improvement within the first 3-6 months, significant recovery is unlikely. Around one-third of people affected with TM experience good or full recovery from their symptoms; they regain the ability to walk normally and experience minimal urinary or bowel effects and paresthesias. Another one-third shows only fair recovery and is left with significant deficits such as spastic gait, sensory dysfunction, and prominent urinary urgency, or incontinence. The remaining one-third shows no recovery at all, remaining wheelchair-bound, or bedridden with marked dependence on others for basic functions of daily living. Unfortunately, making predictions about individual cases is difficult.² Bladder dysfunction is common, but there is a paucity of prior reports of this condition in the medical literature.³⁻⁵ Our aim in this study was to evaluate micturition abnormalities in patients with TM by urodynamic studies, and to enroll functional outcomes of these patients after the rehabilitation program.

Methods. The study comprised 54 TM patients who were admitted to the hospital inpatient rehabilitation program of Ankara Physical Medicine and Rehabilitation Education and Research Hospital, Ankara, Turkey between January 2000 and June 2005. The Transverse Myelitis Consortium Working Group criteria was used for the diagnosis of TM.⁶ Eight patients were excluded: 4 patients with previous urological complications, 3 previous urological surgery patients, and one patient who had uncontrolled general morbidity. Forty-six patients with TM (22 men and 26 women) between 15-

75 years of age consented to be involved in this study. Demographic findings of the patients were documented. A history and detailed neurological and urological physical examination was performed on all patients. Laboratory findings were enrolled. The CSF and spinal MRI of all the patients were evaluated. Urologic symptoms (urgency, frequency, urge incontinence, stress incontinence, dysuria, mixed incontinence, retention, and hesitancy) and any history of bowel (constipation, stool incontinence) and sexual involvement (erectile or ejaculatory dysfunction) were recorded. All patients enrolled were informed of the study and medical evaluations, and accepted the conditions of the study. All medical evaluations carried out were part of the patients' treatment. Ethical approval to perform the study was obtained from the Ankara Physical Medicine and Rehabilitation Center Education Planning and Coordination Commission. All patients underwent ultrasound imaging of the bladder, ureters, and kidneys. Intravenous pyelograms (IVP) were performed on all patients to evaluate the upper urinary system before the urodynamic study. Urodynamic investigations were carried out for each patient. At the time of urodynamic investigation, patients were free from urinary tract infection and were not receiving any drug that could influence detrusor and sphincter behavior. A total of 10^5 bacteria/ml of "clean catch" urine and the presence of pyuria (>5 white blood cell/ per high power field) on urinalysis were used to diagnose urinary tract infection. Urodynamic assessment was carried out according to the International Continence Society (ICS) standards⁷ at the chronic stage. Urodynamic examination consisted of water cystometry at 37° at a filling rate of 50 ml/min with a 6F double lumen catheter for infusion and recording of intravesical pressure, and a 10F intrarectal balloon catheter for recording of abdominal pressure, with patients in the supine position. Detrusor hyperreflexia, detrusor areflexia, and detrusor sphincter dyssynergia were defined according to ICS standards. The bladder types and treatment of neurologic bladders of patients were recorded. All patients were enrolled in the rehabilitation program by conventional methods and stretching and strengthening exercises, range of motion exercises, and ambulation training was applied. Functional levels after the rehabilitation program were recorded.

Descriptive statistics of all data were carried out using the using Statistical Package for Social Sciences (SPSS) 11.00 version. Descriptive analysis used numeric, and frequency analysis used categoric data.

Results. Twenty-two men and 24 women were evaluated. The mean age was 39.74 ± 15.94 (15-75) years, and mean illness duration was 800.24 ± 885.49

(150-3600) days. Lesion level was cervical in 10 patients, thoracic in 34 patients, and lumbar in 2 patients. There was paraplegia in 36 patients and tetraplegia in 10 patients. Thirty patients had spasticity by Ashworth scale and 16 patients had hypotony. Twenty had sensory loss. Thirty patients had Babinski sign. Urinary infection was determined in 4 patients. The CSF contained monocytes, protein content is slightly increased, and IgG index was elevated in 8 patients. Spinal MRI was performed on admission to the neurology clinics, and in 32 of 46 patients revealed T2 hyperintense signal changes. The MRI of the patients typically showed cord swelling and helped to exclude other treatable causes of spinal cord dysfunction (spinal cord compression). There was urinary pathology in 30 patients. Urinary symptoms including urgency in 10, urge incontinence in 10, frequency in 8, and urinary retention in 2 patients. Sixteen patients had no urinary symptoms. Thirty-two patients had bowel symptoms; 28 had stool incontinence and 4 constipation. Erectile or ejaculatory symptoms were reported by 6 men. Anal tonus loss was found in 28, perianal sensory loss was found in 20, bulbocavernous reflex was absent in 26. Urodynamic studies showed hypocompliant bladder in 2 (4.3%) patients, detrusor sphincter dyssynergia in 22 (47.8%), detrusor hyperreflexia in 16 (34.8%), and only sphincter disorder in 6 (13%) patients. The mean maximum cystometric capacity was 260.76 ± 162.75 (41-597) cc, and the mean detrusor pressure was 34.15 ± 16.93 (9-63) cm H₂O. Functional outcomes were independent ambulation in 8 (17.4%), ambulation with crutches in 16 (34.8%), ambulation with knee-ankle-foot orthosis and crutches in 4 (8.7%), therapeutic ambulation in 2 (4.3%), and wheelchair in 16 (34.8%) patients on discharge.

Discussion. Transverse myelitis is a clinical syndrome of acute flaccid paraparesis with segmental sensory dysfunction, without evidence of cord compression. This disorder may selectively affect different parts of the nervous system.³ It may be caused by parainfectious processes, autoimmune, and vascular diseases. We could not investigate the etiology of myelitis in our patients, as they did not apply to us initially. They were first evaluated in the neurology clinics where no etiologic factors were found. Clinical manifestations of myelitis are due to specific neurologic lesions. In our series, 36 of our patients had paraplegia and 10 had tetraplegia. Thirty patients had spasticity, and 16 patients had hypotony. Twenty had sensory loss, 30 had Babinski sign, 30 had urinary, 32 had bowel, and 6 had sexual pathology.

Bladder dysfunction is common and sometimes may be the presenting symptom in TM.⁸ A normal

micturition pattern will start again in patients with TM when recovery is completed. The dual goals of management of urinary tract dysfunction after TM are preservation of renal function and urinary continence. Empirical treatment of patients with TM and urinary symptomatology without a prior urodynamic examination should not be proposed. Full assessment, which includes video urodynamics, is important to assess bladder and urethral dysfunction and to guide management strategies. These patients may require periodically repeated urodynamic examinations. Long-term follow-up is essential.³ Any lesion within the spinal cord, such as trauma, multiple sclerosis (MS), myelodysplasia and myelitis, which cause disruption of this pathway may result in detrusor-external sphincter dyssynergia. This condition is a serious condition that causes predisposition to urological complications. Careful follow up and treatment is important.³ If the disease process involves the sacral (S2 to S4) cord or roots, a lower motor neuron lesion may occur as well, with pudendal or parasympathetic dysfunction. When the thoracolumbar cord is affected, sympathetic dysfunction may occur.

In a previous study,⁴ detrusor areflexia or hyporeflexia was found in 66%, detrusor sphincter dyssynergia in 20%, and detrusor hyperreflexia in 13.3% of TM patients. Berger et al³ evaluated 8 patients with a history of TM and persistent lower urinary tract symptoms. Urodynamic studies revealed detrusor external sphincter dyssynergia in 6 patients, 2 patients had detrusor hyperreflexia, of whom one also had an incompetent sphincter. Sakakibara et al⁵ evaluated 10 patients with acute TM and all of the 3 patients with urgent incontinence had detrusor hyperreflexia, all the 4 patients with retention had an areflexic cystometrogram as well as sphincter hyperreflexia, and 3 of 5 patients with voiding difficulty had detrusor-sphincter dyssynergia. They found that 9 out of 10 patients had ongoing urinary tract symptoms 40 months after acute TM. In another study of pediatric patients, Ganesan et al⁸ showed that many patients had a combination of detrusor-external sphincter dyssynergia leading to difficulties with voiding and detrusor hyperreflexia resulting in urge incontinence. In our study 4.3% (2 patients) of our patients had hypocompliant bladder, 47.8% (22 patients) had detrusor sphincter dyssynergia, 34.8% (16 patients) had detrusor hyperreflexia, and 13% (6 patients) had only sphincter disturbances. Anticholinergic drugs, for example, oxybutynin or tolterodine, are the first line of treatment for detrusor hyperreflexia. A combination of anticholinergic medication and clean intermittent self-catheterization (CIC) is required to adequately empty their bladder and achieve urinary continence in these patients.⁸ We

proposed oxybutynin and CIC combination therapy in 16, and oxybutynin, prazosin, and CIC in 20 patients. All patients with detrusor hyperreflexia had a detrusor leak point pressure exceeding 40 cm H₂O, which has been shown to be associated with a significantly increased risk of renal damage.⁴ The mean detrusor pressure was found to be 34.15 cm H₂O in our patients. A relationship was previously found between areflexic or hyporeflexic bladder and lower extremity hypotony and areflexia.⁴ In our study, 2 patients with determined areflexic bladder had lower extremity hypotony and areflexia.

Ganesan et al⁸ reported that motor recovery did not seem to be related to recovery of urinary symptoms. However, Leroy-Malherbe et al⁹ followed 21 children and found that early motor recovery did signify a better prognosis for urinary problems. Furthermore, they found that early bladder management had a better prognosis, and they proposed that routine video-urodynamic studies in children presenting with acute TM could help in delineating the problems and guide early management. Although T2 hyperintense signal changes and swelling in the spinal cord at lesion level may be seen, the MRI is usually normal.¹⁰ In acute TM, the hyperintense lesions on MRI are mostly present in the central two-thirds of the spinal cord. In our series, 32 patients had hyperintensity lesions on their spinal MRI. The MRI of the patients typically showed cord swelling and helped to exclude other treatable causes of spinal cord dysfunction (spinal cord compression). On CSF examination, the lymphocyte number may be 50-2000 cells and there may be increased protein level. The CSF contained monocytes, the protein content was slightly increased, and IgG index was elevated in 8 of our patients.

The neurologic rehabilitation program comprised range of motion exercises, balance and coordination exercises, ambulation education, occupational therapy, stretching exercises, and spasticity rehabilitation and was applied to all patients. Sixteen patients were of wheelchair level, 2 had therapeutic ambulation level, 4 had ambulation with knee-ankle-foot orthosis (KAFO) and crutches, 16 had ambulation with crutches,

and 8 had independent ambulation at the end of the rehabilitation program.

In conclusion, bladder dysfunction is common in TM and persists despite motor recovery. Urodynamic studies are helpful in evaluating bladder dysfunction and also its management. Rehabilitation is important in these patients to continue urinary continence, for preservation of renal function, to obtain functional independence, and prevent complications. Low case number is a limitation of our study, and further extensive case studies are needed to examine urodynamic evaluation and rehabilitation outcomes in TM.

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