

ELECTROPHYSIOLOGY OF THE LOWER URINARY TRACT IN PATIENTS WITH DETRUSOR UNDERACTIVITY– A NECESSARY STUDY TO DIFFERENTIATE NEUROPATHY AND NON-NEUROPATHY BEFORE TREATMENT

Hypothesis / aims of study:

Patients with chronic urinary retention usually have low voiding pressure or detrusor underactivity (DU) without significant bladder outlet obstruction in video-urodynamic study (VUDS), defined as non-obstructive voiding dysfunction. DU can be observed in many conditions of neurologic insults or myogenic failure. However, the pathophysiology is unclear and the effective treatment strategy is limited. We try to use lower urinary tract electrophysiologic (EP) study to investigate these patients and provide the knowledge to guide the decision making of management.

Study design, materials and methods:

We retrospectively collected 60 patients, who were diagnosed as non-obstructive voiding dysfunction in VUDS and received lower urinary tract EP studies. EP studies including the examinations of bulbocavernous reflex (BCR) by electric stimulations, electromyography (EMG) of external urethral sphincter (EUS), and nerve conduction velocity (NCV) study of internal pudendal nerve. We analyzed the findings of EP studies in these patients.

Results:

BCR was positive in 41.7% patients (Table 1). In EMG study, denervation, re-innervation changes, and reduced recruitment of EUS were observed in 21.7%, 71.7%, and 86.7% patients respectively. Decreased amplitude of internal pudendal nerve in NCV study was noted in 73.3% patients. Significant sacral neuropathy (eg. saddle anesthesia) examined in neurologic examinations was present in 19 of 60 patients (31.7%). Patients with sacral neuropathy had a lower BCR positive rate ($p=0.001$), a non-significant but higher denervation rate ($p=0.059$) in EMG studies, and a higher rate of decreased amplitude in NCV ($p=0.011$) than those without sacral neuropathy. In VUDS, although the majority of bladder outlet conditions during voiding was closed bladder neck (BN, 71.7%), their distribution was significantly different between the patients with and without sacral neuropathy ($p=0.042$). The majority of internal sphincter deficiency (ISD) was examined in the group of sacral neuropathy.

Within 41 patients without sacral neuropathy, high percentage of neurologic deficits in EP studies were detected including 43.9% BCR negative rate, 14.6% denervation change, 75.6% re-innervation change, and 82.9% reduced recruitment in EMG studies, and 63.4% decreased amplitude in NCV studies. Between the patients with and without detrusor overactivity, the parameters in EP studies were similar.

Interpretation of results:

High percentage of neurologic deficits in EP studies were examined in DU patients, even in those without sacral neuropathy in physical examinations. Re-innervation and reduced recruitment of EUS indicated the status of lower urinary tract experienced an incomplete or inadequate recovery from the potential neurologic insults, which might play a role in the pathophysiology of DU and the further treatment outcome. Decreased amplitude in NCV studies also suggested the presence of internal pudendal neuropathy. Bladder outlet condition during voiding was different between the patients with and without sacral neuropathy, which demonstrated the impact of neuropathy in lower urinary tract.

Concluding message:

High percentage of neurologic deficits in EP studies was noted in the patients with non-obstructive voiding dysfunction. Even within the patients without sacral neuropathy, high percentages of BCR negative rate, re-innervation and incomplete recruitment rates of EUS, and decreased amplitude in NCV studies were detected. Potential neurologic insults explored in EP studies could play an important role in the pathophysiology of DU, and EP studies may provide an aid of treatment strategy of non-obstructive voiding dysfunction (including DU) in the future.

Table 1. Demographic, EMG, NCV, and VUDS data of patients with non-obstructive voiding dysfunction

	Sacral Neuropathy (+)	Sacral Neuropathy (-)	Total	P value
No	19	41	60	
Sex	11M, 8F	17M, 24F	28M, 32F	0.182
Age	48.5 ± 16.9	66.0 ± 14.1	60.4 ± 17.0	<0.001
BCR (+)	10.5 % (2)	56.1% (23)	41.7% (25)	0.001
EMG_DeN	36.8% (7)	14.6% (6)	21.7% (13)	0.059
EMG_Re-inN	63.2% (12)	75.6% (31)	71.7% (43)	0.247
EMG_Reduced recruitment	94.7% (18)	82.9% (34)	86.7% (52)	0.329
NCV_decreased amplitude	94.7% (18)	63.4% (26)	73.3% (44)	0.011
VUDS				
DO	10.5% (2)	19.5% (8)	16.7 (10)	0.477
Closed BN	63.2% (12)	75.6% (31)	71.7% (43)	0.042

Closed EUS	15.8% (3)	22.0% (9)	20.0% (12)
ISD	21.1% (4)	2.4% (1)	8.3% (5)

DeN: Denervation; Re-inN: Re-innervation.

Disclosures

Funding: None **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Research Ethics Committee of Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation **Helsinki:** Yes **Informed Consent:** Yes