

URODYNAMIC STUDY: THE MOST POWERFUL TOOL TO DIAGNOSE TETHERED CORD SYNDROME EARLY IN PATIENTS WITH SPINA BIFIDA

Hypothesis / aims of study

The most common cause of neurogenic bladder dysfunction in children is abnormal development of the spinal canal or spina bifida (SB), including myelomeningocele and spinal lipoma. Even though the lesion is appropriately repaired with surgery, mechanical stretching of the spinal cord or tethered cord syndrome (TCS) may occur with growth, causing progressive neurological deficits. These symptoms include gait deterioration, changes in bowel function, and urinary tract deterioration, such as urinary incontinence and impaired voiding function. Incomplete innervation of the urinary bladder and pelvic sphincter can lead to high intravesical pressure, which can cause renal damage and failure. This is why SB patients need close follow-up for urological management over their life time.

It is known that surgical untethering is an option for improving the symptoms of TCS and prevent irreversible upper urinary tract dysfunction.

However, even with the introduction of magnetic resonance imaging, early diagnosis and untethering are still difficult. The aim of this study was to explore whether urodynamic study (UDS) plays an important role in the early detection of TCS and contributes to untethering, preventing the bladder and renal damages of TCS in SB patients.

Study design, materials and methods

A total of 199 SB patients admitted to our department from 2000 to 2013 were retrospectively reviewed. Medical records of the patients, including 577 UDS records, urological, orthopaedic, and intestinal symptoms, and treatment for urological symptoms were investigated. In the cohort, 21 patients were diagnosed with TCS because of deteriorating symptoms and/or: symptomatic TCS (S-TCS), with deterioration of symptoms followed by abnormal UDS findings; and asymptomatic TCS (A-TCS), diagnosed by UDS findings without symptoms. Changes in urological and orthopaedic symptoms and bladder functions evaluated with UDS after untethering surgery were compared between S-TCS and A-TCS. Postoperative UDS was done 6 to 18 months after untethering surgery. Nominal value were evaluated with the chi-square test and numeric values with Student's t test. $P < 0.05$ was considered statistically significant.

Results

TCS was suspected in 30 of 199 patients, but it was ruled out in 9 of 30 patients based on MRI or neurological findings. Of the remaining 21 patients, 17 could be evaluated by UDS both before and after untethering surgery. The A-TCS group and S-TCS group included 7 and 10 patients, respectively, with the average ages before surgery of 7.1 and 10.2 years, respectively.

Six of 7 patients (86%) in the A-TCS group showed improved UDS findings because detrusor overactivity (DO) disappeared, whereas 3 of 10 (30%) in the S-TCS group improved ($P < 0.05$) (Figure 1). On the other hand the average of bladder compliance was 15.5 ml/cmH₂O in the A-TCS group and 19.8 ml/cmH₂O in the S-TCS group, 60% of the A-TCS group and 56% of the S-TCS group showed improved bladder compliance (no significant difference).

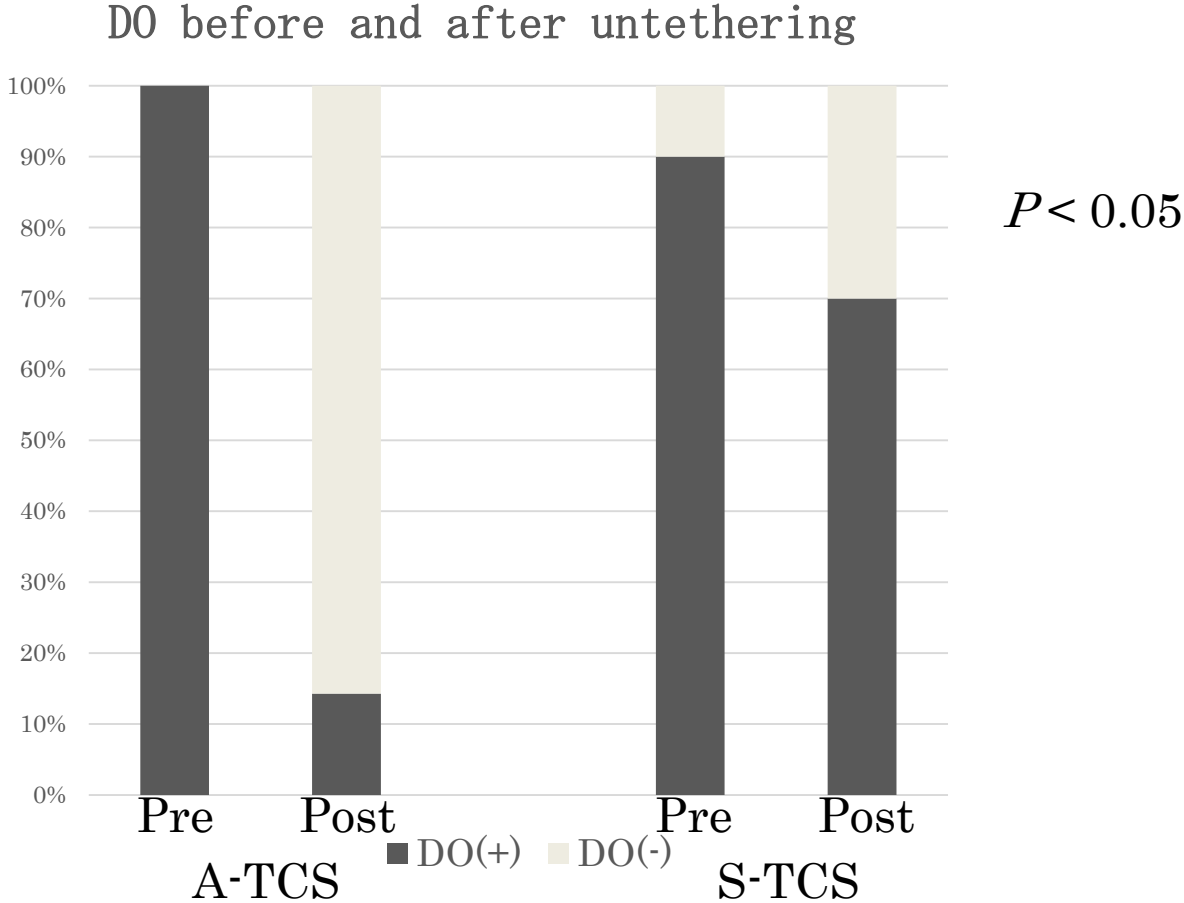
Interpretation of results

In our cohort, 10.6% of SB patients developed TCS over time, as in previous reports. The present results that the A-TCS group recovered from the deterioration of the bladder dysfunction more than the S-TCS group indicates that SB patients even without symptoms except for DO and worsening of bladder stability evaluated on UDS, could have early TCS. Therefore, the A-TCS group had better urological outcome for bladder function after surgical untethering. Regarding bladder compliance, both group had favourable plasticity before surgical untethering, suggesting that both group of patients were diagnosed before the development of the continuous high pressure urination that results in irreversible bladder dysfunction. This is because there was no significant differences in the rate of improvement of bladder compliance after surgery between two groups.

Concluding message

This study suggests that UDS plays an important role in management of urological problems in SB patients. In order for untethering to be performed immediately once the patient manifests evidence of symptomatic lumbosacral cord tethering, UDS is one of the mandatory measures to evaluate bladder dysfunction irrespective of age. Moreover, worsening bladder function on UDS evaluation could be a strong clue of suspected TCS, regardless of symptoms.

Figure 1



Disclosures

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