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THE ROLE OF URODYNAMIC ASSESSMENT IN CAUDA EQUINA SYNDROME ASSOCIATED WITH LUMBAR DEGENERATIVE DISEASE

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Introduction

Cauda equina syndrome (CES) has an incidence of 3.4/million people and a prevalence of 8.9/100.000 population with the highest rates recorded in men in their 5th decade of life. Disc herniation is the most common cause in ages between 40-60 years, spinal fractures in younger ages (less than 40 years) and iatrogenic causes in older adults (more than 60 years of age).

Lower urinary tract (LUT) dysfunction is quite common at presentation of the CES (mean prevalence approximately 89%). Partial perineal anesthesia rates range between 30-50%, and perineal sensory deficits are strongly associated with LUT dysfunction [1].

Urodynamically, LUT dysfunction in CES typically involves underactive or acontractile bladder with sphincter underactivity, which result in incomplete bladder emptying and stress urinary incontinence [2]. Detrusor overactivity (DO) can be found in one out of 3 patients [3]. Prolonged and excessive abdominal straining can denote underactive bladder in such patients, whereas incontinence maybe an early symptom too.

We performed a retrospective study of CES patients who had been operated at the Neurosurgical Department of a public teaching Hospital, and had been also submitted to urodynamic investigation either at the immediate peri-operative period or in the following months after surgery, in order to investigate a possible role of urodynamic assessment in the patients' management.

Methods and Materials

We retrospectively reviewed the charts of CES patients who had been operated between 2012-2021 in our hospital.

Data from the patients' neurological status at presentation and hospital admission, radiological findings (including simple X-ray of the lumbar spine, CT and MRI scans), and available urodynamic findings were analyzed.

Associations were sought between urodynamic findings and the time that had elapsed between presentation of symptoms/diagnosis and the surgical procedure, the clinical signs and symptoms at presentation and the affected levels radiologically. The Mann-Whitney test and the chi-square test were used accordingly.

Table 1.

Neurological signs and symptoms	Number of patients and frequency
Limb pain and paresthesia	27 (100%)
Motor deficits	15 (55.5%)
Bilateral manifestations	13 (48.1%)
Partial saddle anesthesia	11 (41%)

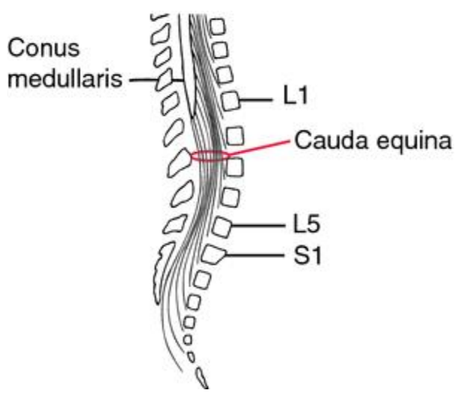

Image 1.
Cauda equina and conus medullaris anatomy

Image 2.
MRI of a male patient with lumbar disc herniation (main affected level L3-L4)

Results

Twenty-seven patients (n=16 women, 59% and n=11 men, 41) had complete data and were included in the final analysis. The mean patient age was 59.59±15.55 years.

Neurosurgical data. Radiologically, 44% (n=12) of the patients had one affected level, 37% (n=10) had two affected levels, 15% (n=4) had three affected levels and 4% (n=1) had four affected levels. The majority of patients (n=17, 63%) were submitted to a combination of microdiscectomy, hemilaminectomy and instrumentation, followed by 8 patients (30%) who had been submitted to microdiscectomy and hemilaminectomy, while the remaining 7% (n=2) had been submitted to microdiscectomy alone.

Urological data. The vast majority of patients (92%, n=25) suffered from LUT dysfunction, urinary retention being the most prevalent symptom (48.1%, n=13) followed by abdominal straining to void (37%, n=10), while urodynamic investigation most commonly demonstrated detrusor underactivity (77%, n=21) followed by detrusor overactivity (33.3%, n=9).

Urological management. Only 3 patients (11%) could freely void without any intervention. Twelve patients (44%) were started on clean intermittent catheterizations (CIC), while another 4 (15%) were on indwelling catheter, 3 patients (11%) were on an alpha-blocker, 4 patients were on antimuscarinics, and one patient on combination of an alpha-blocker with an antimuscarinic and CIC.

Associations. The presence of detrusor underactivity (DU) was related to the number of affected levels ($p<0.05$, $x2(3) =8.196$). Detrusor overactivity was more commonly present in patients with delayed procedures ($p<0.05$, $U=41.0$, $z=-2.08$). By contrast, early procedures were associated with abdominal straining ($p<0.05$, $U=44.0$, $z=-2.09$).

In terms of neurological signs, perianal hypo-aesthesia was the single symptom which precipitated the decision for surgery ($p<0.05$, $U=38$, $z=-2.5$), while paresis and rhizalgia were major indications but did not reach statistical significance. Finally, the number of affected levels was not associated with CES and the type of urological management was not related to the type of neurosurgical procedure.

Discussion

Our study results suggest an association between the time to surgical management of CES and urodynamic outcomes, but also between radiological findings and urodynamic outcomes. The mechanisms by which an early procedure for CES might be associated with detrusor underactivity whereas a late procedure might be more predictive of DO need to be elucidated. However, the sample size was small and follow-up inadequate for robust results.

To establish the role of urodynamics in the neurosurgical and urological management of CES further research is warranted, with prospectively designed studies including preoperative and postoperative urodynamic investigations.

Conclusions

In this patient cohort, we could not find associations between limb sensorimotor dysfunctions and urodynamic findings. Associations were found between the time to surgical management of CES and urodynamic outcomes, as well as between number of affected radiological levels and urodynamic outcomes. Thus, cystometric and radiological evaluation could be proposed in patients with high suspicion of CES.

Underactive bladder is the most common urological dysfunction. Compensatory abdominal straining may ensue and persist in cases of degenerative lumbar disease.

Detrusor overactivity is a rather prevalent condition, accounting for up to 1/3 of patients, with a statistically significant association postoperatively with delayed procedure.

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All urodynamic investigations were performed on a Solar Silver urodynamic system (by MMS, distributor in Greece: Solution Medical Care, Thessaloniki) .

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