

Evaluation of Urinary Bladder Function in Patients with Lumbar Intervertebral Disk Protrusion

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ABSTRACT

BACKGROUND: Lower urinary tract symptoms (LUTS) have been described in patients with bladder dysfunction due to prolapsed lumbar disks. Progressive compression caused by lumbar disk herniation leads to loss of bladder sensation and voiding difficulty due to an acontractile detrusor.

OBJECTIVE: Our objective in this study was to determine the cystometric findings in patients with lumbar intervertebral disk protrusion (LDP).

METHODS: 80 patients with lumbar disk protrusion were included in this study. Their mean age was 39.9 years (26-64), 58 patients (72.5%) were males, and 22 (27.5%) were females. They were divided into two groups according to their urodynamic results: patients in Group I had normal detrusor function (52 patients), and patients in Group II had abnormal detrusor activity (28 patients). Thorough histories and clinical examinations, including general examinations, urological examinations, and neurological examinations, were done for each patient. Uroflowmetry and cystometry were done for the evaluation.

RESULTS: 18 out of 28 patients in Group II had acontractile detrusor, 7 patients had detrusor underactivity, and 3 patients had neurogenic detrusor overactivity. 35 patients (43.75%, 12 from Group I, 23 from Group II) presented with urological symptoms, and all had more than one symptom. Of the 28 patients in Group II, 23 reported LUTS suggestive of bladder outlet obstruction, and only 5 patients in Group II showed no urological symptoms ($P<0.05$). There was a statistically significant difference between the two groups regarding multiple LDP affections ($P<0.05$). There was a high percentage of non-contained LDP in Group II with a statistically significant difference ($P<0.05$).

CONCLUSIONS: Acontractile detrusor represents the most common cystometric finding in patients with LDP. Neurogenic detrusor overactivity may occur in the initial stage of the disease. Patients with multiple, diffuse, and non-contained LDP are more liable to have abnormal detrusor activity.

KEYWORDS: Lumbar intervertebral disk protrusion, urodynamics, acontractile detrusor

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INTRODUCTION

Intervertebral herniation of the nucleus pulposus almost always occurs in a backward direction because the annulus fibrosus is thinner posteriorly [1]. The L4-5 and L5-S1 disks account for approximately 90% of adult lumbar disk herniation, with each level affected equally. The L3-4 disk accounts for the majority of the remaining herniations, while the upper lumbar disks are more rarely involved. Herniation at two different levels is also common [2]. Jones and Moore [3] found that early storage bladder symptoms have been described in patients with bladder dysfunction due to prolapsed lumbar disks. The patients presented with an uninhibited type of neuropathic bladder dysfunction and without loss of bladder sensation. This represents the first stage in a progressive bladder function disorder due to increasing involvement of the cauda equina. Irritation of the cauda equina may initially or with less severe degrees of compression produce hyperexcitability of the sensory and motor fibers resulting in irritative symptoms and an uninhibited bladder. More severe or progressive compression leads to loss of bladder sensation, atonicity, and difficulty in voiding. Bartolin *et al.* [4] found that the only form of bladder dysfunction in patients with prolapsed lumbar disks is detrusor areflexia. Our objective in this study was to determine the cystometric findings in patients having lumbar intervertebral disk protrusion (LDP).

METHODS

80 patients diagnosed with lumbodorsal root syndrome due to LDP were included in this study. The mean age was 39.9 years (26-64), 58 patients (72.5%) were males, and 22 (27.5%) were females. They were divided into two groups according to the cystometric results: patients in Group I had normal detrusor function (52 patients, 65%), and patients in Group II had abnormal detrusor activity (28 patients, 35%). Exclusion criteria included urinary tract infection, outlet obstruction, diabetic patients, and patients with vesicoureteral reflux. Patients were subjected to a thorough history screening that included personal data, lower urinary tract symptoms (LUTS), neurological complaints, and history of pain. Clinical examinations included general, urological, neurological, and motor and sensory assessments. Urine analyses and cultures were done to exclude urinary tract infection. Blood urea and serum creatinine were performed to assess the upper urinary tract function. Blood sugar level was taken to exclude patients with Diabetes Mellitus. Radiologically, plain lumbosacral spine x-rays and both CT and MRI lumbosacral spine scans were done to assess the site, level, and type of LDP. An LDP can be

Table 1. Urological symptoms in the two studied groups

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Urological symptoms	Group I (n = 52)		Group II (n = 28)	
	n	%	n	%
1 - Patients without urological symptoms	40	50	5	6.25
2 - Patients with urological symptoms*	12	15	23	28.75
a) Straining	3	3.75	23	28.75
b) Urgency	1	1.25	21	26.25
c) Frequency	12	15	22	27.5
d) Urge incontinence	0	0	6	7.5
e) Sense of incomplete urination	3	3.75	10	12.5
Erectile dysfunction	0	0	3	3.75

* Most of the lumbar disk protrusion patients presented with more than one urinary symptom

a contained herniation, meaning that there is protrusion of a nucleus pulposus in which the anulus fibrosus remains intact. In a noncontained disk, there is a herniation of the nucleus pulposus with a rupture of the anulus fibrosus. An extruded disk means a herniation of the nucleus pulposus through the anulus fibrosus, with the nuclear material remaining attached to the intervertebral disk. In a sequestered disk herniation, there is a free fragment of the nucleus pulposus in the spinal canal outside of the anulus fibrosus and no longer attached to the intervertebral disk.

Prior to urodynamic investigation, medication that could potentially affect lower urinary tract function was discontinued whenever possible for at least 48 hours. All urodynamic tests were done under the same circumstances using the URIDINE 5500 Dantec-Denmark apparatus. The tests included uroflowmetry, cystometry, and pressure flow studies. Detrusor underactivity was defined by weak detrusor contractions (less than 30 cmH₂O) and a catheterized urine flow of less than 12 ml per second. Patients who had an absence of a detrusor contraction in conjunction with the inability to generate an uncatheterized urine flow were considered to have acontractile detrusor.

RESULTS

18 patients had acontractile detrusor, 7 patients had detrusor underactivity, and 3 patients had neurogenic detrusor overactivity. 47 patients (58.8%) presented with low back pain and unilateral sciatica (33 in Group I, 14 in Group II). 22 patients (27.5%) presented with low back pain and bilateral sciatica (12 in Group I, 10 in Group II).

35 patients (43.75%, 12 in Group I, 23 in Group II) presented with urological symptoms, and all of them had more than one symptom. There was a relationship between urological symptoms and cystometric findings. Of the 52 patients in Group I, only 12 reported voiding symptoms, the majority of which being daytime frequency. Of the 28 patients in Group II, 23 reported LUTS (mainly straining) suggestive of bladder outlet obstruction, and only 5 showed no urological symptoms ($P < 0.05$). Out of the 58 male patients, 3 (5.2%) reported erectile dysfunction, all of whom were in Group II. None of male patients of Group I had erectile dysfunction (Table 1).

Table 2. CT/MRI findings in relation to urodynamic studies

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CT/MRI finding	Group I (n = 52)		Group II (n = 28)	
	n	%	n	%
1 - Level of LDP:				
a. L2-L3	0	0	2	7.1
b. L3-L4	5	9.6	10	35.7
c. L4-L5	28	53.8	19	67.9
d. L5-S1	29	55.8	18	64.3
2 - Type of LDP:				
a. Contained	40	76.9	13	46.4
b. Non-contained	3	5.8	13	46.4
c. Extruded	11	21.2	8	28.6
d. Sequestered	0	0	1	3.6
3 - Site of LDP:				
a. Central	15	28.8	8	28.6
b. Paracentral	29	55.8	12	42.9
c. Diffuse	15	28.8	19	67.9
Multiple level	13	16.25	23	28.75
Singe level	39	48.75	5	6.25

On clinical examination, 55 patients (68.7%) had abnormal motor, sensory, or reflex signs alone or in combination. 39 patients (48.8%) had reflex alterations with or without motor or sensory deficits. 37 patients (46.3%) exhibited motor weakness alone or in combination with sensory or reflex changes. 24 patients (30%) had sensory deficits with or without motor or reflex abnormality in one or more dermatomes. There were 25 patients (31.3%) with no detectable sensory, motor, or reflex abnormalities.

Sensory changes in the saddle area (either hypoesthesia or paraesthesia) were manifested in 19 patients (23.8%), all in Group II ($P < 0.05$). 67 patients (95%) had normal blood urea and creatinine, whereas four patients (5%) had renal insufficiency. According to the CT and MRI findings, 28 patients in Group I had intervertebral disk protrusion at level L4-5, 29 patients at L5-S1, and 5 at L3-4. On the other hand, 39 patients had single level affection and 13 patients had multiple affection. In Group II, 19 patients had intervertebral disk protrusion at level L4-5, 18 patients at L5-S1, 10 patients at L3-4, and only 2 at L2-3. 5 patients had single level affection, and 23 patients had multiple level affection. There was a statistically significant difference between the two groups regarding multiple level affection ($P < 0.05$).

According to the site of disk protrusion, 29 patients in Group I had paracentral disk herniation, 15 patients had diffuse disk herniation, and 15 patients had central disk herniation. In Group II, 12 patients had paracentral disk herniation, 19 patients had diffuse disk herniation, and 8 patients had central disk herniation. There was a statistical significant difference regarding diffuse disk protrusion only ($P < 0.05$).

According to the type of disk protrusion, 40 patients in Group I had contained-type disk herniation, 3 patients had non-contained, 11 patients had extruded disk herniation, and none of the patients had sequestered disk herniation. In Group II, 13 patients had contained type, 13 patients had non-contained, 8 patients had extruded type, and 1 patient had sequestered disk herniation. There was a high percentage of non-contained type with Group II patients and a statistically significant difference ($P < 0.05$) (Table 2).

In Group I, the Post Voiding Residual (PVR) urine was below 100 ml (ranging from 0 to 100 ml) in 46 patients. 6 patients had PVR more than 100 ml (up to 120 ml), and 5 of those patients had urological symptoms without any bladder dysfunction. In Group II, 19 patients had a PVR ranging from 100 to 450 ml

with a mean of 195.8 ± 57.7 ml. 9 patients had a PVR from 0 to 100 ml with a mean of 56.6 ± 14.9 ml. All of the 19 patients with high PVR had urological symptoms, and only 4 out of the 9 patients with PVRs below 100 ml had urological symptoms ($P < 0.05$).

51 out of 80 patients had $Q_{max} > 12$ ml/sec, while the remaining 29 patients had $Q_{max} < 12$ ml/sec. Q_{max} ranged from 9 to 26 ml/sec with a mean of 19.1 ± 7.94 ml/sec in Group I, and from 3 to 25 ml/sec with a mean of 12.34 ± 4.52 ml/sec in Group II ($P < 0.05$). All patients with urological symptoms in Group I had Q_{max} below 12 ml/sec.

DISCUSSION

Acontractile detrusor was noted in 18 out of 80 patients with lumbar intervertebral disk protrusion. 7 patients had detrusor underactivity, and 3 patients had neurogenic detrusor overactivity. These results are in agreement with other studies and denote that acontractile detrusor represents a major urodynamic finding in patients with lumbar disk protrusion [5-8]. In agreement with Jones and Moore [3], who describe four patients with protruded lumbar disks associated with irritative voiding disturbances, we found that some patients may present with neurogenic detrusor overactivity. Sandri *et al.* [9] reported on a woman with neurogenic detrusor overactivity preoperatively. It is possible that detrusor overactivity represents an initial stage in the development of bladder dysfunction. Moderate stretching of the spinal nerve increases its reflex excitability [10]. Yamanishi *et al.* [11] reported that detrusor overactivity occurred in 10% of patients who had LDP.

35 patients (43.75%) presented with urological symptoms (12 in Group I, 23 in Group II). Our data supports the results of Bartolin *et al.* [4] denoting that the most common urological symptom in patients with LDP was LUTS suggestive of bladder outlet obstruction, most notably straining, erectile dysfunction, sensory changes in the saddle area, multiple lumbar intervertebral disk protrusion affection, diffuse disk protrusion, and noncontained type protrusion. All of these issues had a statistically significance difference between the two groups.

All patients in Group I had PVRs less than 120 ml. 19 patients in Group II had residual urine ranging from 100 to 450 ml with a mean of 195.8 ± 57.7 ml, and 9 had residual urine ranged from 0 to 100 ml with a mean of 56.6 ± 14.9 ml. All 19 patients with high PVR had urological symptoms, and only 4 out of the 9 patients with residual urine below 100 ml had urological symptoms ($P < 0.05$).

CONCLUSION

Acontractile detrusor represents the most common cystometric findings in patients with LDP. Neurogenic detrusor overactivity may occur in some patients. Patients presenting with LUTS suggestive of bladder outlet obstruction (mainly straining, erectile dysfunction, sensory loss in the saddle area, and high PVR) are more likely to have abnormal detrusor activity. Also patients with multiple, diffuse, and non-contained lumbar disk protrusion are more liable to have abnormal detrusor activity.

REFERENCES

- [1] Gregory AB, Vincent CT. Disc disease of the spinal column. In Principles of Neurosurgery, 2nd edition. Edited by R.G. Grossman. Lippincott, Philadelphia, 1999, chapter 29:577-593.
- [2] Greenberg MS. Spine and spinal cord. In Handbook of Neurosurgery, 6th edition. Lippincott, Philadelphia, 2001, chapter 11: 285-349.
- [3] Jones DL, Moore T. The types of Neuropathic Bladder Dysfunction associated with Prolapsed Lumbar intervertebral Discs. Br J Urol. 1973 Feb;45(1):39-43.
- [4] Bartolin Z, Gilja I, Bedalov G, Savic I. Bladder function in patients with lumbar intervertebral disk protrusion. J Urol. 1998 Mar;159(3):969-71.
- [5] Rosomoff HL, Johnston JD, Gallo AE, Ludmer M, Givens FT, Carney FT, Kuehn CA. Cystometry in the evaluation of nerve root compression in the lumbar spine. Surg Gynecol Obstet. 1963 Sep;117:263-70.
- [6] Kontturi M, Harviainen S, Larmi TK. Atonic bladder in lumbar disk herniation. Acta Chir Scand Suppl. 1966;357:232-5.
- [7] Rosomoff HL, Johnston JD, Gallo AE, Ludmer M, Givens FT, Carney FT, Kuehn CA. Cystometry as an adjunct in the evaluation of lumbar disc syndromes. J Neurosurg. 1970 Jul;33(1):67-74.
- [8] Andersen JT, Bradley WE. Neurogenic bladder dysfunction in protruded lumbar disk and after laminectomy. Urology. 1976 Jul;8(1):94-6.
- [9] Sandri SD, Fanciullacci F, Politi P, Zanollo A. Urinary disorders in intervertebral disc prolapse. Neurourol Urodyn. 1987 Oct;6(1):11-9.
- [10] Sunderland S, Bradley KC. Stress-strain phenomena in human peripheral nerve trunks. Brain. 1961;84(1):102-19.
- [11] Yamanishi T, Yasuda K, Sakakibara R, Murayama N, Hattori T, Ito H. Detrusor overactivity and penile erection in patients with lower lumbar spine lesions. Eur Urol. 1998 Oct;34(4):360-4.

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