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# Hemi-Cauda Equina Syndrome from Herniated Lumbar Disc: a Neurosurgical Emergency?

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**ABSTRACT: Background:** We report experience with patients presenting with a specific combination of symptoms: unilateral sciatica, unilateral sensibility loss in the dermatomes S1 to S5 (hemi-saddle) and subjective micturation problems secondary to ruptured lumbar disc. Because of its similarities with a cauda equina syndrome, this combination of symptoms was thought to be a unilateral cauda equina syndrome and it was called hemi-cauda equina syndrome. Consequently, it was treated as an emergency. **Methods:** Ten patients were evaluated. They compromised 2.3% of all patients undergoing lumbar discectomy. **Results:** Outcome is good with only 10% persisting minor neurologic deficit (sensibility loss in dermatomes S3 to S5). With the exception of urinary retention or incontinence, duration of symptoms and signs does not seem to influence outcome. Comparing signs, symptoms and radiographic findings with those of a cauda equina syndrome which were recently and thoroughly studied, they were found to be more severe in cases of cauda equina syndrome. Especially, the good outcome, (apparently unrelated to the duration of symptoms in cases of hemi-cauda equina syndrome) contrasted with the treatment results of cauda equina syndrome. **Conclusions:** We defined the hemi-cauda equina syndrome from ruptured disc as a combination of unilateral leg pain, unilateral sensibility loss in dermatomes S1 to S5 and sphincter paralysis (proven urinary retention or incontinence). Motor deficit is not necessarily present. Emergency surgery is warranted. Patients presenting with micturation complaints other than urinary retention or incontinence do not suffer from a hemi-cauda equina syndrome.

**RÉSUMÉ: Hémi - syndrome de la queue de cheval dû à une hernie discale lombaire: une urgence chirurgicale?**

**Introduction:** Nous rapportons notre expérience auprès de patients qui consultent pour une combinaison spécifique de symptômes: une sciatique unilatérale, une perte de sensibilité unilatérale dans les dermatomes S1 à S5 (hémi - selle) et des problèmes subjectifs de la miction secondaires à la rupture d'un disque lombaire. A cause de ses ressemblances avec le syndrome de la queue de cheval, on pensait que cette combinaison de symptômes était un syndrome unilatéral de la queue de cheval, on l'appelait l'hémi - syndrome de la queue de cheval et on le traitait comme une urgence. **Méthodes:** Dix patients ont été évalués. Ils constituaient 2.3% de tous les patients qui subissaient une cure chirurgicale de hernie discale lombaire. **Résultats:** Les résultats sont bons et seulement 10% des patients ont un déficit neurologique mineur persistant (perte de sensibilité dans les dermatomes S3 à S5). A l'exception de la rétention urinaire ou de l'incontinence, la durée des symptômes et des signes ne semble par influencer l'issue. En comparant les signes, les symptômes et les constatations radiologiques avec ceux du syndrome de la queue de cheval que nous avons étudiés à fond dernièrement, nous avons constaté qu'ils étaient plus sévères dans les cas de syndrome de la queue de cheval. De façon plus spécifique, les bons résultats, apparemment non reliés à la durée des symptômes dans les cas d'hémi - syndrome de la queue de cheval, contrastaient avec les résultats du traitement du syndrome de la queue de cheval. **Conclusions:** Nous définissons l'hémi - syndrome de la queue de cheval du à la rupture d'un disque comme étant une combinaison d'une douleur unilatérale à la jambe, une perte unilatérale de sensibilité dans les dermatomes S1 à S5 et une paralysie du sphincter (rétention urinaire prouvée ou incontinence). Il n'y a pas nécessairement de déficit moteur. La chirurgie d'urgence est justifiée. Les patients qui se plaignent de troubles de la miction autres que la rétention urinaire ou l'incontinence ne sont pas atteints de l'hémi - syndrome de la queue de cheval.

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In neurosurgical practice, symptomatic intervertebral lumbar disc herniations are frequently encountered.<sup>1,2</sup> Indication for surgery is failure of conservative management, whereas progressive neurologic deficit and cauda equina syndrome even warrant surgery within 24 to 48 hours of onset.<sup>3-7</sup>

Frequently, patients with a herniated intervertebral lumbar discs presented to us with unilateral radicular pain, unilateral perianal

sensibility loss and subjective urinary voiding problems. Motor deficit was not always present. Since sphincter disturbances and

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the typical sensibility loss in the "saddle" distribution are the most striking features of cauda equina syndrome, we interpreted the combination of unilateral perianal sensibility loss and subjective voiding problems as a minor variant of the cauda equina syndrome and called it for internal usage hemi-cauda equina syndrome. To our knowledge this specific combination of signs and symptoms has never been described before. In analogy with a cauda equina syndrome, we treated it as a neurosurgical emergency, although we always doubted whether such an aggressive attitude was necessary.

To evaluate our policy, we analyzed our recent experience with patients treated for hemi-cauda equina syndrome secondary to herniated lumbar intervertebral disc.

## METHODS

Between February 1, 1994 and February 1, 1995, 426 patients underwent lumbar discectomy for herniated intervertebral discs. Ten patients (2.3%) presented with a hemi-cauda equina syndrome. There were six women and four men, ranging in age from 22 to 44 years (mean 37 years) (Table 1). One patient had a history of previous lumbar laminectomy (Patient 7). Plain radiographs of the lumbar spine were taken in all patients, in eight patients myelography was performed, in seven, computed tomography and in only one case, magnetic resonance imaging. Except for one patient who refused operation (Patient 7), all patients underwent surgery (either microdiscectomy (5) or laminectomy (4)) within 24 hours of first being seen by a neurosurgeon.

## RESULTS

## Clinical Findings (Table 1)

All patients had radicular pain in one leg with a duration ranging from 0 - 237 days. The sensory deficit and micturation disturbances developed simultaneously in all cases. In only two cases, these symptoms were present for less than 24 hours (range 0 - 90 days). Micturation complaints were: increased frequency (8), changed feeling during micturation (1), urgency complaints (6), feeling of incomplete voiding or residual (1), urinary incontinence (1), impossibility to micturate (1). None of the patients complained of difficulties with defecation.

At examination, motor deficit was found in seven patients. In all cases sensory deficit (hypoesthesia and/or hypalgesia) could be elicited. The dermatomes S1 to S5 were always unilaterally involved. In five cases the dermatome L5 was also affected. In four patients (2,3,6,10) anal reflexes were diminished unilaterally. Urinary retention was found only once (Patient 10).

## Radiographic Findings

Plain radiographs of the lumbar spine disclosed narrowing of disc space L4 - L5 in three cases and of L5 - S1 in two. Myelography in one patient disclosed severe compression of the thecal sac due to massive herniation at level L5 - S1 (Patient 6). In the remaining cases compression of one root due to an extradural process could be seen and in four of them also impression on a lower (sacral) root. Computed tomography in one patient (Patient 6) showed a huge herniated disc, compromising more than 50% of the canal diameter. In the other cases small herniations were found, including the patients with urinary incontinence or retention (Patients 5 and 10). The only magnetic resonance imaging study also disclosed

**Table 1.** Clinical characteristics of 10 patients with a hemicaudas syndrome secondary to herniated lumbar disc. Duration in days.

Patient No.	Sex	Age (Yrs)	Duration Radicular Pain	Sensory Deficit (Duration)	Micturation Disturbances (Duration) <sup>Δ</sup>
1	F	35	31	Y (5)	Y (5); FREQ, SENS
2	M	36	28	Y (0)	Y (0); FREQ, RESIDU
3	M	39	120	Y (11)	Y (11); FREQ, URGE
4	F	22	237	Y (90)	Y (90); FREQ, URGE
5	F	41	72	Y (2)	Y (2); URGE, INCONT
6	F	41	35	Y (4)	Y (4); FREQ
7	F	44	35	Y (27)	Y (27); FREQ, URGE
8	F	43	21	Y (21)	Y (21); FREQ, URGE
9	M	33	24	Y (14)	Y (14); FREQ, URGE
10	M	37	0	Y (0)	Y (0); RETENTION

<sup>Δ</sup>FREQ: increased frequency; SENS: changed feeling during micturation; INCONT: incontinence; URGE: urge complaints; RESIDU: feeling of incomplete micturation.

Patient No.	Motor Deficit	Sensory Deficit	Urinary Retention (ml)	Herniation Level (Side)	Outcome
1	L5	L5 - S5	0	L4-L5 (R)	Normal
2	S1	S1 - S5	0	L5-S1 (L)	Normal
3	-	S1 - S5	0	L5-S1 (L)	Normal
4	-	L5 - S5	0	L4-L5 (L)	Low Back Pain
5	S1	L5 - S5	0	L4-L5 (R)	Normal
6	S1	S1 - S5	0	L5-S1 (L)	Sensory Loss S3-S5
7	S1	S1 - S5	0	L5-S1 (R)	Spontaneous Complete Recovery
8	S1	S1 - S5	0	L5-S1 (R)	Normal
9	-	L5 - S5	0	L4-L5 (R)	Low Back Pain
10	*	L5 - S5	1000	L4-L5 (R)	Normal

\* Examination of strength was unreliable due to severe pain.

a small herniation not compromising the dural sac. Disc herniation occurred in five patients (50%) at L4 - L5, and in the other five at L5 - S1. None of the patients had concomitant spinal stenosis or tethered spinal cord. In all cases the side of abnormal radiological findings corresponded with the side of neurologic deficit.

**OPERATIVE RESULTS**

At surgery, free sequestered herniated discs were found in four patients (Patients 2, 3, 6, and 8). In the other cases, small disc fragments were found beneath the intact posterior longitudinal ligament.

There was no perioperative morbidity or mortality. In one patient (Patient 6) sensory loss in dermatomes S3 to S5 persisted (follow up seven months). The other patients completely recovered within eight days of operation. Their micturation complaints resolved within 24 hours after surgery, except for one patient (Patient 10). He suffered for six days postoperatively from urinary retention, which gradually improved. Finally, he did not have any retention and was able to void normally.

One patient refused surgery (Patient 7). She was managed conservatively and completely recovered within five weeks.

**DISCUSSION**

At first instance, symptomatic herniated lumbar intervertebral discs are treated conservatively. Failure of conservative management is an indication for surgery. However, progressive neurologic deficit and, especially, cauda equina syndrome are neurosurgical emergencies. Proper diagnosis is needed and every effort should be made to operate within 24 to 48 hours of onset.<sup>3-7</sup>

The symptoms and signs of a complete cauda equina syndrome due to ruptured intervertebral disc are characteristic: bilateral sciatica, bilateral paresis, sensibility loss in the "saddle" distribution and urine or stool incontinence or both.<sup>7-9</sup> In practice, the complete cauda equina syndrome may not be present, which poses for the physician diagnostic and therapeutic difficulties.

Frequently, we were confronted with patients presenting with unilateral leg pain, unilateral loss of sensibility in dermatomes S1 to S5 and subjective urinary voiding problems. The combination of sensibility loss in the "hemi-saddle" distribution and subjective urinary voiding problems was thought to be a unilateral, less complete cauda equina syndrome and was called hemi-cauda equina syndrome. As a consequence, patients presenting with hemi-cauda equina syndrome from ruptured lumbar disc were always treated as emergencies, irrespective of the duration and severity of symptoms and signs. However, we doubted whether such an aggressive attitude was always necessary. To our knowledge, the above mentioned specific combination of signs and symptoms has never been studied before. Therefore, we reviewed our recent experience.

The question arises whether a hemi-cauda equina syndrome (as we defined it formerly) really is a variant of a cauda equina syndrome necessitating emergency neurosurgery. For comparison, we listed in Table 2 some features of the cauda equina syndrome as recently reported in a detailed and thorough study by Shapiro<sup>7</sup> and of the hemi-cauda equina syndrome.

Like the cauda equina syndrome, hemi-cauda equina syndrome compromises approximately 2% of all lumbar discectomies. In our series females outnumber males, and most patients are affected in their fourth decade.

Generally, signs and symptoms are more severe in cauda equina syndrome: all patients reported by Shapiro<sup>7</sup> had motor deficit and nearly all suffered from major sphincter disturbances (incontinence from urine or stool or both, or urinary retention). None of our patients complained of incontinence from stool. Motor deficit was present in 70% of the patients with a hemi-cauda equina syndrome, whereas only 20% of the patients suffered from major sphincter disturbances.

Radiographic findings are also less impressive in patients with a hemi-cauda equina syndrome. In only one case (10%) was a massive herniation found. In the remaining cases, herniations were found without specific features. The absence of concomitant spinal diseases in patients with hemi-cauda equina syndrome is remarkable.

The long duration between onset of signs and symptoms of the hemi-cauda equina syndrome and referral to our department is striking. Only three patients were referred within 48 hours after onset of the hemi-cauda equina syndrome, and these were the only ones operated on within 48 hours.

Although most patients did not undergo surgery within 48 hours of onset, the outcome of the hemi-cauda equina syndrome

**Table 2.** Features of cauda equina syndrome (CES) from ruptured disc (from Shapiro (8)) and "hemi-cauda equina syndrome" (hemi-CES).

	CES	hemi-CES
number of cases	14	10
% of discectomies	1 - 2	2.3
male/female ratio	9/5	4/6
mean age (years)	43	37
symptoms and signs		
side	bilateral	unilateral
sciatica	100%	100%
motor deficit	100%	70%
sensibility loss	not mentioned	100%
altered miction	93%	100%
incontinence	93%	10%
urine retention	not mentioned	10%
radiographic findings		
large herniation	64%	10%
level L3 - L4	14.2%	0%
L4 - L5	61.8%	50%
L5 - S1	14.2%	50%
concomitant diseases		
stenosis	35.7%	0%
tethered cord	14.2%	0%
surgery within 48 hours		
after onset	50%	30% <sup>0</sup>
outcome		
normal	64.3%	90%
neurologic deficit	35.7%	10%
urinary incontinence	28.4%	0%

<sup>0</sup>One patient refused surgery. She was managed conservatively and completely recovered.

is good. Only one patient did not recover completely, and is still suffering from a sensibility loss in dermatomes S3 to S5. However, sphincter disturbances completely resolved in all patients. Even the patient refusing surgery and managed conservatively completely recovered. In contrast to the cauda equina syndrome, time seems to be a less important factor for recovery in cases of a hemi-cauda equina syndrome. An exception is patients with urinary retention and/or urinary or stool incontinence, or both. Two patients with major sphincter disturbances (urinary retention or incontinence) underwent surgery within 48 hours of onset!

It is intriguing to speculate why these smaller disc protrusions do produce the above described combination of symptoms. Except for the huge herniation, we can not imagine more than two nerve roots are compromised. Hypothetically, reactive intrathecal inflammatory changes may contribute to the involvement of more nerve roots.

Because the outcome is good and apparently unrelated to the duration of symptoms, we believe that patients presenting with unilateral sensibility loss in the "saddle" distribution and only subjective micturition disturbances should not be diagnosed as suffering from a hemi-cauda equina syndrome necessitating emergency surgery. In our opinion, sphincter disturbances such as incontinence or proven urinary retention are indications for emergency surgery (within 24 hours of presentation). We propose to define a hemi-cauda equina syndrome from herniated lumbar disc as the combination of unilateral leg pain, unilateral sensibility loss in dermatomes S1 to S5, urinary incontinence or

proven urinary retention. Patients presenting with these symptoms from a ruptured lumbar intervertebral disc should undergo surgery within 24 hours.

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