

CASE REPORT

Pontine stroke and bladder dysfunction

Rakesh Shukla,¹ Prithvi Giri,¹ Aveg Bhandari,¹ S N Shankhwar²¹Department of Neurology, King George's Medical University, Lucknow, Uttar Pradesh, India²Department of Urology, King George's Medical University, Lucknow, Uttar Pradesh, India**Correspondence to**
Professor Rakesh Shukla,
rakeshshukla_rakesh@rediffmail.com

Accepted 8 May 2014

SUMMARY

We report the case of a 54-year-old hypertensive woman who presented with sudden onset left hemiparesis with facial asymmetry and inability to pass urine. Her bladder was distended and she had to be catheterised. MRI of her brain showed a large infarct in the right pontine region. Antiplatelet therapy was instituted and the patient showed good recovery and was able to walk with support after a fortnight at the time of discharge. She was discharged with a catheter in situ. After 6 months, she could walk with the support of a stick, but had increased frequency and urgency of micturition along with nocturia. Urodynamic study revealed detrusor hyper-reflexia, possibly due to involvement of the pontine micturition centre.

BACKGROUND

Urinary retention occurs in about half of the hospitalised cases of stroke which improves quickly within 72 h, however in 15–20% of patients it may persist even 6 months post-stroke.¹ Bladder involvement in stroke is often overlooked as neurogenic bladder symptoms are difficult to recognise during the acute cerebral shock phase. They receive scant attention despite their prognostic importance and social significance to the patient and his caregivers. Our patient was a case of pontine infarct with pure motor hemiparesis (PMH) and detrusor sphincter dyssynergia due to pontine micturition centre (PMC) involvement.

CASE PRESENTATION

A 54-year-old right-handed graduate woman was admitted with sudden onset vertiginous sensation and left-sided weakness of 7 h duration. She was fully conscious, and had no history suggestive of language dysfunction, diplopia, dysarthria and sensory involvement; however she was unable to pass urine and had to be catheterised. Family and personal history was unremarkable. Her bladder and bowel function was normal prior to the stroke. Examination revealed left hemiplegia (power 0/5 in the left upper and lower limbs on Medical Research Council scale). Deep tendon reflexes were brisk and abdominal reflexes were absent on the left side; left plantar response was extensor, while superficial and deep tendon reflexes were normal on the right side. The patient was given aspirin and antihypertensive medication along with physiotherapy. There was improvement in motor power to grade 4 minus/5 over the next 15 days so that she could walk with support, but her urinary retention persisted and she was discharged with a catheter in situ. After 6 months she was re-evaluated, and after catheter removal she noticed increased urgency and

frequency of micturition; urodynamic study revealed detrusor hyperreflexia.

INVESTIGATIONS

MRI of the brain (T2-weighted and diffusion-weighted imaging) revealed a large infarct in the right paramedian pontine region (figure 1A, B); MR angiography was normal.

Her complete blood counts, blood sugar, blood urea, serum creatinine, serum electrolytes, lipid and thyroid profile and urine examination, 12-lead

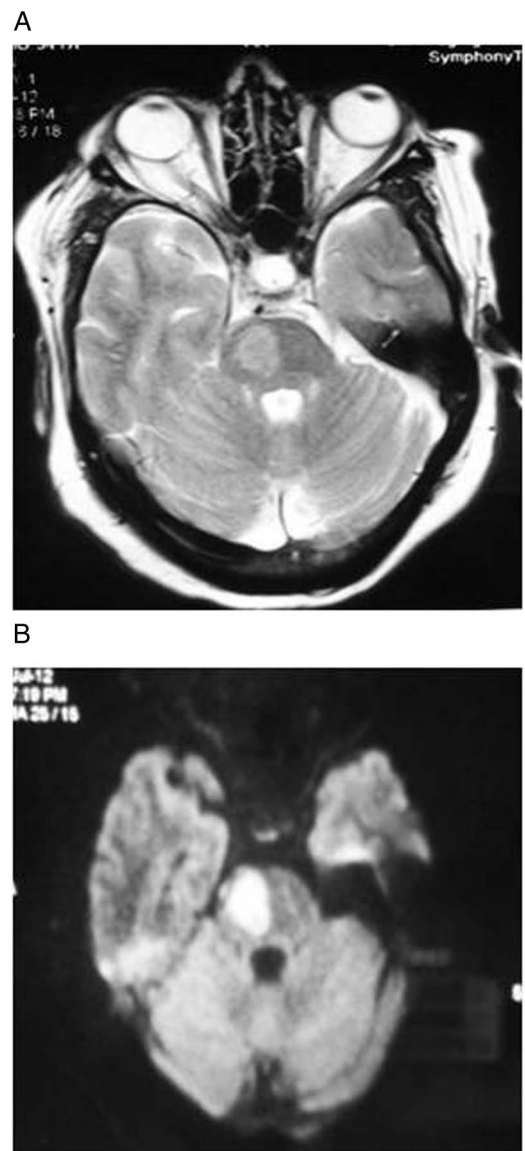


Figure 1 (A) T2-weighted image showing hyperintense lesion in right paramedian pons. (B) Diffusion-weighted MRI showing a restricted area in the right paramedian pons.



CrossMark

To cite: Shukla R, Giri P, Bhandari A, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200787

electrocardiogram, X-ray chest posteroanterior view were normal. Echocardiography revealed concentric left ventricular hypertrophy. Abdominal ultrasonography did not reveal any abnormality while the urodynamic study showed detrusor hyper-reflexia (filling phase showed normal compliance and sensation; capacity could not be assessed due to detrusor instability and associated leak; instability occurred at 30 mL of bladder capacity, voiding phase-normal pressure and flow of voiding).

TREATMENT

The patient was managed with antiplatelet agents (aspirin) and antihypertensive medication along with physiotherapy.

OUTCOME AND FOLLOW-UP

Despite the large pontine infarct the patient had good motor recovery within a fortnight and was able to walk with support, but bladder dysfunction did not recover. After 6 months she could walk with the help of a stick but urinary symptoms (increased frequency and urgency of micturition along with nocturia) persisted.

DISCUSSION

Our patient presented with left-side hemiplegia with hypertension without any cortical signs; this diagnosis is consistent with pure motor hemiplegia (PMH). PMH is the commonest type of lacunar syndrome, occurring in 55–60% of patients with a lacunar stroke; it can be due to a lesion in the internal capsule or in the basis pontis.^{2–3} However, clinical differentiation between a capsular or pontine localisation is difficult; a history of dysarthria, gait disturbance or vertigo supports a pontine lesion.⁴ Our patient presented with vertiginous sensation prior to the occurrence of hemiparesis and also had acute urinary retention without any previous history of bladder symptoms which suggested a pontine lesion. MRI of the brain confirmed the diagnosis of a pontine stroke.

The pons is a discrete structure containing delicate vital centres, reticular activating system, cranial nerve nuclei, various ascending and descending tracts and the PMC. The occurrence of a crossed hemiparesis (ipsilateral cranial nerve involvement with contralateral hemiparesis) favours a brainstem lesion.⁵ Bilateral pontine lesions can cause quadriplegia, locked-in syndrome and coma. Our patient on the other hand presented with only hemiparesis with an ipsilateral upper motor neuron seventh nerve palsy; there were no crossed cranial nerve palsies, and sensory or cerebellar involvement. PMH is an uncommon manifestation of a pontine stroke. In addition to PMH, our patient also had acute urinary retention which required insertion of an indwelling catheter. Although there was some improvement in the motor weakness during the hospital stay, bladder dysfunction persisted in the form of detrusor sphincter dyssynergia.

Micturition disturbances can occur when the pons is affected in a brainstem stroke. It is a more powerful predictor of survival than the level of consciousness.^{6–7} However, it is often overlooked in the setting of an acute stroke in the intensive care unit and does not get the importance it deserves. Most of the information regarding supraspinal control of micturition is based on experimental data in cats.⁸ It is only in the past 10–15 years, with the use of functional imaging studies, such as functional MRI and position emission tomography (PET) in healthy human volunteers, that the role of pontine micturition and continence centres has been clarified.⁹ These studies have shown that the central control of micturition and urinary continence in cats and humans is organised in a similar fashion.⁸ Lesioning

and electrical or chemical stimulation in animals has shown that the PMC is located adjacent to, or includes the locus coeruleus and lateral dorsal tegmental nucleus. A pontine storage centre also exists just close to the PMC which activates the external urethral sphincter motor neurons during continence. It directly excites bladder motor neurons in the sacral cord during micturition; at the same time, it inhibits indirectly via GABAergic and glycinergic interneurons in the medial sacral cord, the external urethral sphincter motor neurons.^{6–8–9}

PET scan studies in human volunteers have shown increased blood flow in the right dorsomedial pontine areas during voiding, while there is increased blood flow in the right ventral pontine areas during continence and withholding of urine.^{6–9} The author suggested that there are specific nuclei controlling micturition, predominantly in the right pons.¹⁰ The MRI findings of the right paramedian pontine infarct in our patient who also had left hemiparesis and acute urinary retention support the above mentioned hypothesis. In addition to stroke, micturition disturbances have also been reported with other lesions of the pons, such as tumours and herpetic brainstem encephalitis.¹¹

Proper management of bladder symptoms is extremely important in a patient with stroke because urinary incontinence is the single best predictor of mortality and disability at 3 months. Indwelling catheters are often used during the acute stage; however, continued indwelling catheterisation is not recommended beyond 48 h. The nursing staff can perform intermittent catheterisation in the hospital and the patient or his family members should be trained to perform it after discharge.¹² Our patient was discharged with an indwelling catheter as the patient could not perform self-intermittent catheterisation due to motor weakness and the caregivers were not willing to perform it at home after discharge. Several attempts were made to decatheterise but the patient could not void and so needed an indwelling catheter beyond 3 months. A silver alloy-coated catheter was used to reduce complication.

Urodynamic studies in 39 patients evaluated 3 months post-stroke have shown that micturition disturbances are seen in nearly 50% of patients with acute brainstem stroke; irritative as well as obstructive urinary symptoms are seen in 49% the next common symptom being voiding difficulty and nocturnal urinary frequency in 28% followed by urinary retention in 21% of patients.¹³ Urodynamic studies of¹¹ symptomatic patients revealed detrusor hyper-reflexia in 73%, low-compliance bladder in 9%, atonic cystometrograms in 27%, detrusor sphincter dyssynergia in 45% and uninhibited sphincter relaxation in 27% of patients. Three asymptomatic patients had normal urodynamic findings. Some authors have also reported micturition disturbance in the right medullary and left pontine lesions.^{14–16} Thus, urinary abnormalities are common in patients with brainstem stroke, but are often under-recognised and overlooked by the clinician.

Learning points

- ▶ Bladder dysfunction in stroke is a key prognostic determinant.
- ▶ Human stroke is a good model to understand micturition.
- ▶ Pure pyramidal tract involvement in a large pontine lesion is rare.
- ▶ Unexplained clinic-radiological findings need further clarification.
- ▶ It may not always be feasible to follow practice guidelines.

Contributors RS and PG were involved in the conception and design of the case report. AB and SNS drafted and revised the article.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Nakayama H, Jorgensen HS, Pedersen PM, *et al.* Prevalence and risk factors of incontinence after stroke: the Copenhagen Stroke Study. *Stroke* 1997;28:58–62.
- 2 Ling L, Zhu L, Zeng J, *et al.* Pontine infarction with pure motor hemiparesis or hemiplegia: a prospective study. *BMC Neurol* 2009;9:25.
- 3 Milagres AC, Alóe F, Limongi JC. Pontine tegmentum hematoma. Report of a case with pure hemiplegia. *Arq Neuropsiquiatr* 1998;56:129–32.
- 4 Nighoghossian N, Rylvlin P, Trouillas P, *et al.* Pontine versus capsular pure motor hemiparesis. *Neurology* 1993;43:2197–201.
- 5 Silverman IE, Liu GT, Volpe NJ, *et al.* The crossed paralyses. The original brain-stem syndromes of Millard-Gubler, Foville, Weber, and Raymond-Cestan. *Arch Neurol* 1995;52:635–8.
- 6 Blok BF, Willemsen AT, Holstege G. A PET study on brain control of micturition in humans. *Brain* 1997;120:111–21.
- 7 Wade DT, Hewer RL. Outlook after an acute stroke: urinary incontinence and loss of consciousness compared in 532 patients. *Q J Med* 1985;56:601–8.
- 8 Blok BF, Holstege G. The central nervous system control of micturition in cats and humans. *Behav Brain Res* 1998;92:119–25.
- 9 Stone E, Coote JH, Allard J, *et al.* GABAergic control of micturition within the periaqueductal grey matter of the male rat. *J Physiol* 2011; 589:2065–78.
- 10 Fowler CJ. Neurological disorders of micturition and their treatment. *Brain* 1999;122:1213–31.
- 11 Sakakibara R, Hattori T, Fukutake T, *et al.* Micturitional disturbance in herpetic brainstem encephalitis; contribution of the pontine micturition centre. *J Neurol Neurosurg Psychiatry* 1998;64:269–72.
- 12 Duraski SA, Denby FA, Clemens IQ. Bladder and bowel management after stroke. In: Stein J, Macko RV, Winstein CJ, Zorowitz RD, eds. *Stroke recovery & rehabilitation. First Indian Pharmaceutical Edition*, New Delhi: Jaypee Brothers Medical Publishers (P) Ltd, 2009. 495–511.
- 13 Sakakibara R, Hattori T, Yasuda K, *et al.* Micturitional disturbance and the pontine tegmental lesion: urodynamic and MRI analyses of vascular cases. *J Neurol Sci* 1996;141:105–10.
- 14 Lee KB, Jang IM, Roh H, *et al.* Transient urinary retention in acute right lateral medullary infarction. *Neurologist* 2008;14:312–15.
- 15 Yaguchi H, Soma H, Miyazaki Y, *et al.* A case of acute urinary retention caused by periaqueductal grey lesion. *J Neurol Neurosurg Psychiatry* 2004; 75:1202–3.
- 16 Wu MN, Guo YC, Lai CL, *et al.* Poststroke detrusor hyporeflexia in a patient with left medial pontine infarction. *Neurologist* 2012;18:73–5.

Copyright 2014 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow