Introduction

Autonomic dysreflexia, first described by Guttman and Whitteridge in 1947 [1], is a well-known syndrome seen in individuals with spinal cord injury above the T4/5 neurological level. The most serious complication is hypertensive intracerebral hemorrhage. Sufficient knowledge and proper medical management are of utmost importance for preventing this syndrome. Although a small number of reports have described hypertensive intracerebral hemorrhage due to autonomic dysreflexia [2–4], the importance of prevention is not always sufficiently recognized by medical staff engaging in the rehabilitation of spinal patients. This report describes the case of a young man with cervical cord injury in whom autonomic dysreflexia developed into intracerebral hemorrhage during inpatient rehabilitation.

Case report

A 36 year old male worker with no particular past history was involved in a labor accident on September 1, 2004. A 100 kg signboard struck him in the occipital
region and caused hyperflexion of the neck, resulting in immediate quadriplegia without loss of consciousness. In an emergency hospital, dislocation fracture of the 6th cervical vertebra was diagnosed and he underwent anterior-posterior cervical fusion on September 8, 2004. Postoperative magnetic resonance imaging of the cervical spine showed abnormal signals inside the spinal cord from the C3 to C7 level, suggesting spinal cord malacia [Fig. 1].

The patient remained quadriplegic 3 months postoperatively without any neurological recovery, and was admitted to a rehabilitation hospital on November 24, 2004. On admission, his neurological level was motor C6 complete and sensory C7 complete bilaterally. The upper extremity showed almost normal muscle tonus, with normal muscle strength in the deltoid and biceps brachii, good strength in the wrist extensors, poor strength in the triceps, and no strength in the wrist flexors and all finger muscles. Lower extremity muscles were all very spastic without any voluntary movements. An indwelling urethral catheter had been placed since emergency hospital admission and a pressure ulcer was present in the sacral area. The patient was dependent on nursing staff for all activities of daily living except feeding.

At the beginning of wheelchair training, the patient quickly overcame orthostatic hypotension, and his blood pressure stabilized to remain at about 90/50 mmHg. The pressure ulcer took 3 months to heal with conservative treatment. Spasticity in the trunk and lower extremity muscles gradually increased and oral administration of dantrolene sodium (Dantrium) was required to relieve accentuated muscle tonus.

Long-term use of the indwelling urethral catheter diminished bladder expansiveness, which showed a decrease in capacity to 200 ml. The patient frequently reported headache whenever his bladder was full, which was interpreted as a symptom of autonomic dysreflexia. For better urinary management, a suprapubic cystostomy was performed in March 2005, but this treatment did not immediately cure the frequent headaches. To make urine flow as smoothly as possible and avoid irritation of the bladder wall by the catheter tip, a cystostomy catheter had to be inserted into the bladder to the optimum depth, and occasionally the cystostomy catheter needed to be exchanged for a urethral catheter in the event of sustained headache. In July, the patient finally attained stable urine flow by cystostomy after several attempts and achieved relief from frequent headaches. After 8 months of hospitalization, he became an independent manual wheelchair user, and discharge in early September with home-visit nursing care was scheduled.

On the afternoon of Saturday, August 14, after rambling about by wheelchair, he developed headache with a cold sweat. At this time, his blood pressure reached 211/128 mmHg with a regular heart rate of 67 beats/min. The cystostomy catheter was inspected, but no obvious occlusion was apparent. An on-duty doctor could not make a clear diagnosis about these symptoms. To obtain quick relief from the headache, a loxoprofen sodium tablet (Loxonin) was administered, but had no effect in relieving the headache and hypertension. About an hour later, the patient began salivating from the right corner of the mouth, became inarticulate, and unable to move the right upper extremity at all, and finally entered a semi-comatose state. Computed tomography (CT) of the head revealed left putaminal hemorrhage perforating to the 4th ventricle [Fig. 2]. An intravenous drip of nicardipine hydrochloride (Perdipine) was started at 40 μg/min, and the patient was transferred to an emergency.
hospital, where he underwent evacuation of hematoma by craniotomy. The following day, his consciousness became clear and physiotherapy was started while he remained confined to bed. He returned to the former rehabilitation hospital on October 11, 2005.

The right upper extremity showed partial motor recovery over the course of 3 months after stroke onset. Using synergic movements, he could flex, abduct, and adduct the shoulder, and flex the elbow, but could not extend the elbow or move the wrist at all. He also showed right facial paralysis, amnestic aphasia, and slight memory disturbance. He was absolutely dependent on the nursing staff for activities of daily living, including feeding. A CT of the head after stroke showed a low-density area from the left putamen to the corona radiate [Fig. 3].

The author expected the right upper extremity to regain some degree of function, but the muscles of shoulder adduction and elbow flexion showed gradual increases in tonus. Passive flexion/abduction of the shoulder or passive extension of the elbow consequently induced severe pain, progressively limiting the ranges of joint motion. Motor points of the biceps brachii muscle were repeatedly blocked with 5% phenol to reduce spasticity, but results proved only briefly effective. The patient was unable to accept muscle stretching either by a physiotherapist or by arm splinting, due to intolerable pain. The right upper extremity showed progressive loss of functional movements and finally formed a frozen shoulder with elbow flexion contracture.

Stroke sequelae in addition to cervical cord injury made rehabilitation very difficult and contributed to the development of a depressive state. For a change of pace, he tried staying at home one night during the 2006 New Year holiday, which was very effective for improving both his mental and physical status. About 4 months after stroke, the patient was partly able to feed himself using the left upper extremity, but was still unable to control a manual wheelchair unaided. After arranging for home visit nursing care, the patient was discharged home on March 5, 2006.

Discussion

Symptoms of autonomic dysreflexia vary widely from some feelings of slight involuntary muscle contractions (crispation) to severe hypertension accompanied by headache. These symptoms are often a casual sign of bladder filling, but sometimes develop into a serious complication. It has been observed that the higher the injury level, the greater the degree of clinically manifest cardiovascular dysfunction [5, 6]. The completeness of the spinal injury also relates to the severity of autonomic dysreflexia: only 27% of patients with incomplete quadriplegia present with signs.
of autonomic dysreflexia, in comparison with 91% of patients with quadriplegia with complete lesions [5]. While autonomic dysreflexia occurs more often in the chronic stage of spinal cord injury at or above the sixth thoracic segment, there is also clinical evidence of episodes of autonomic dysreflexia in the first days and weeks after injury [7].

Medical management of autonomic dysreflexia is a well-known issue among medical staff specializing in patients with cervical cord injury, but may be less familiar to doctors in other specialties not closely acquainted with characteristic symptoms and proper treatment of autonomic dysreflexia. Nevertheless, any doctor may have to manage autonomic dysreflexia in the course of providing primary care for a patient. Due to the potentially serious complications of autonomic dysreflexia, medical staff, including doctors, require education about autonomic dysreflexia [8].

When patients with cervical cord injury complain of headache with hypertension, autonomic dysreflexia should be the first condition suspected. An exhaustive search for possible triggers must be conducted and those identified must be quickly eliminated, or blood pressure should be immediately controlled with antihypertensives [9].

In this case, distention of the bladder wall due to insufficient urine flow and/or irritation of the bladder wall by the tip of the cystostomy catheter were considered strong candidates as potential triggers. A quick change to a urethral catheter should have been attempted, and if no amelioration had been obtained, an antihypertensive should have been administrated immediately. However, it must be very difficult for an on-duty doctor to decide on changing a catheter from cystostomy to urethral while urine flow is being maintained without apparent occlusion. Moreover, blood pressure should have been repeatedly monitored to allow active decisions on the use of antihypertensives without delay. Information on specific triggers of autonomic dysreflexia and proper medical management should thus be shared by all medical staff, to ensure that adequate emergent medical care is provided. For this purpose, a complete clinical practice guideline should be available on a website [10].

Conclusion

This report presents the case of a young man with cervical cord injury who developed hypertensive intracerebral hemorrhage due to autonomic dysreflexia. Cystostomy catheter dysfunction probably acted as a trigger. This serious complication resulted in severe contracture of the right upper extremity, adding to quadriplegia. Medical staff engaging in the rehabilitation of patients with cervical cord injury should be thorough in identifying triggers of autonomic dysreflexia and providing emergent medical management.

References

頸髄損傷の若年男性に併発した自律神経過反射による高血圧性脳内出血

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要 旨：リハビリテーションのため入院中に自律神経過反射による脳内出血を併発した36歳男性頸髄損傷者の1症例を報告する。本患者は第6頸椎骨折による完全四肢麻痺（第6頸髄節以下で運動麻痺, 第7頸髄節以下で感觉麻痺）であった。尿道カテーテルが3ヶ月間膀胱内に留置されていたため膀胱拡張能は低下していた。膀胱容量は200 mlに減少しており、膀胱充満時にはつねに頭痛を訴えていた。より円滑な尿流を得るために膀胱瘻が造設された。頭痛は一時的に治まったが程なく再発し、血圧の極端な上昇を伴って典型的な自律神経過反射の症状を呈していた。しかし、潜在的な引き金が見つからず除去できなかったことと、血圧管理ができていなかったことで、左被殻出血を併発した。手術療法が行われたにも関わらず、右上肢の筋緊張は進行的に増大し、最終的には肘屈曲拘縮を伴った凍結肩を呈するに至った。この重大な合併症をもたらした誘因は2つあげられる：第1に、膀胱瘻カテーテルのわずかな機能不全や刺激が自律神経過反射をもたらしたこと；第2に、医療スタッフが自律神経過反射に関する十分な経験と知識を持たなかったことである。頸髄損傷者のリハビリテーションに従事する医療スタッフにとって、自律神経過反射の引き金に関する情報を共有することと、正しい医学的管理を確実に行えるように徹底させることは極めて重要である。

キーワード：脊髄損傷, 尿道カテーテル, 膀胱瘻, 自律神経過反射, 脳内出血

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