

## Chronic Subdural Hematoma Coexisting with Ligamentum Flavum Hematoma in the Lumbar Spine: A Case Report

YOICHI SHIMADA, YUJI KASUKAWA,<sup>1</sup> NAOHISA MIYAKOSHI,<sup>1</sup> MICHIO HONGO,<sup>1</sup>  
SHIGERU ANDO<sup>1</sup> and EIJI ITOI<sup>1</sup>

*Rehabilitation Division, Akita University Hospital, Akita, Japan, and*  
<sup>1</sup>*Department of Orthopedic Surgery, Akita University School of Medicine, Akita, Japan*

SHIMADA, Y., KASUKAWA, Y., MIYAKOSHI, N., HONGO, M., ANDO, S. and ITOI, E. *Chronic Subdural Hematoma Coexisting with Ligamentum Flavum Hematoma in the Lumbar Spine: A Case Report.* Tohoku J. Exp. Med., 2006, **210** (1), 83-89 — We present a case of a chronic spinal subdural hematoma combined with a ligamentum flavum hematoma in the lumbar spine treated surgically. An 83-year-old woman receiving antiplatelet medicine due to an angina suffered from pain in her lower extremity and gait disturbance after a backward fall. Radiological findings including magnetic resonance imaging (MRI) revealed hematoma in the ligamentum flavum at the level of L2 - L3 and a chronic subdural hematoma at the level from L3 to L5. Laminectomy through L2 to L5 was performed and a hematoma existing in the ligamentum flavum and cystic mass was removed. A chronic subdural hematoma was spontaneously evacuated after splitting of the dura mater and an intact arachnoid membrane was observed with no leakage of cerebrospinal fluid. Her clinical symptoms completely disappeared after surgery. To the best of our knowledge, this is the first case of combination of chronic subdural hematoma and ligamentum flavum hematoma in the lumbar spine treated by surgery. Chronic spinal subdural hematoma and hematoma in the ligamentum flavum should be considered as a cause of progressive nerve root compression in patients with anticoagulant therapy, and an appropriate pre-operative diagnosis would be needed to achieve complete decompression of subdural and epidural hematoma. ——— chronic spinal subdural hematoma; hematoma in ligamentum flavum; lumbar spine; anticoagulant therapy; radiculopathy

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A chronic spinal subdural hematoma is a very rare entity to cause spinal cord or nerve root compression and is usually associated with anti-coagulant therapy or trauma (Russell and Benoit 1983; Shimada et al. 1996; Jimbo et al. 2006). It

occurs typically in the lumbar and thoracolumbar levels (Jimbo et al. 2006).

A ligamentum flavum hematoma is also a rare cause of spinal nerve root compression and it also commonly occurs in the lumbar spine

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Correspondence: Yoichi Shimada, M.D., Rehabilitation Division, Akita University Hospital, 1-1-1 Hondo, Akita 010-8543, Japan.

e-mail: yshimada@med.akita-u.ac.jp

(Sweasey et al. 1992; Cruz-Conde et al. 1995; Minamide et al. 1999; Hirakawa et al. 2000; Yuceer et al. 2000). We report the case of a chronic spinal subdural hematoma coexisting with a hematoma in the ligamentum flavum of the lumbar spine after falling in a patient receiving anti-coagulant therapy. To the best of our knowledge, this is the first case of a hematoma in the subdural space and ligamentum flavum described in the English language literature.

### CASE REPORT

An 83-year-old woman had a history of medical treatment for cardiac disease and had been treated with anticoagulant medicine, including two kinds of antiplatelet agents for more than three years. The patient had experienced pain in her right lower extremity for one year and had fallen to the floor and landed on her buttocks in March of 2005. After this episode, the pain in the lower extremity was increased and walking became difficult. She was referred to our institution after a mass lesion in the lumbar spine was found by magnetic resonance imaging (MRI) in May 2005. She had right buttock and thigh lateral pain upon walking and she could walk only several meters. Although the sensation to fine touch was decreased on right L5 dermatome, a manual muscle test on the lower extremities was normal. Physical examination showed a limitation of 70° in the right straight leg-raising test and hypoflexivity of the right patella tendon and bilateral Achilles tendons.

Plain radiography showed severe spondylosis below the L3 level and Grade I anterior spondylolisthesis at the L4-L5 level. Examination by MRI demonstrated that the round mass lesion was continuous with the ligamentum flavum on the right side at the L2-3 level (Figs. 1D, E, and F and 2A, B, and C). The enlarged ligamentum flavum revealed iso-signal intensity on the T1-weighted images and low-signal intensity on the T2-weighted images, indicating a hematoma in the ligamentum flavum (Fig. 1A and B). The central part of the round mass lesion showed low-signal intensity on the T1- and T2-weighted images and its peripheral part showed iso-signal intensity on

the T1-weighted images and hyper-intensity on the T2-weighted images (Fig. 2A and B). The mass lesion was not well enhanced after intravenous administration of Gd-DTPA (Figs. 1C and 2C). Furthermore, MRI revealed the presence of an intradural mass lesion that extended from the level of the L3 vertebral body to the L4-L5 disc space in the dorsal side of the dural sac (Fig. 1D, E, and F). The mass lesion showed iso-signal intensity on T1-weighted images (Figs. 1D and 2D) and slightly hyper-signal intensity on T2-weighted images (Figs. 1E and 2E) without enhancement after Gd-DTPA administration (Figs. 1F and 2F). Myelograms revealed an incomplete block at the levels of L2-L3 and L3-L4 with an anterior-posterior view and the contrast medium was not observed from the level of the L2-L3 disc space to the L5 vertebral body at the dorsal part of the dural sac with a lateral view. Computed tomography (CT) after myelography also demonstrated that the dural sac was severely compressed by the mass from the right facet joint and ligamentum flavum at the level of L2-L3 (Fig. 3A) and by the mass from the dorsal point of the spinal canal at the level of the L3-L4 vertebral body (Fig. 3B).

Laminectomy from L2 to L5 was performed to decompress the nerve roots. At the level of L2-L3, the mass lesion of the right side was expanded to the left side of the spinal canal and was severely adhered to the dural sac. The mass was continuous to the ligamentum flavum and a hematoma was observed in the mass and the ligamentum flavum. After laminectomy and decompression at the L2- L3 level, a dark purple mass was observed under the dura mater at the level of L3-L4. A clotted mass of blood was spontaneously evacuated from the subdural space when the dura mater was split and a thin membrane indicating chronic subdural hematoma membrane was observed. Once the hematoma had been removed, the arachnoid membrane was found to be intact and there was no leakage of cerebrospinal fluid. No evidence of any vascular malformation, tumor, or other pathologic abnormality was found. Histological examination of the ligamentum flavum surrounding the hematoma revealed granulation tissue and degenerative fibrous tissue with

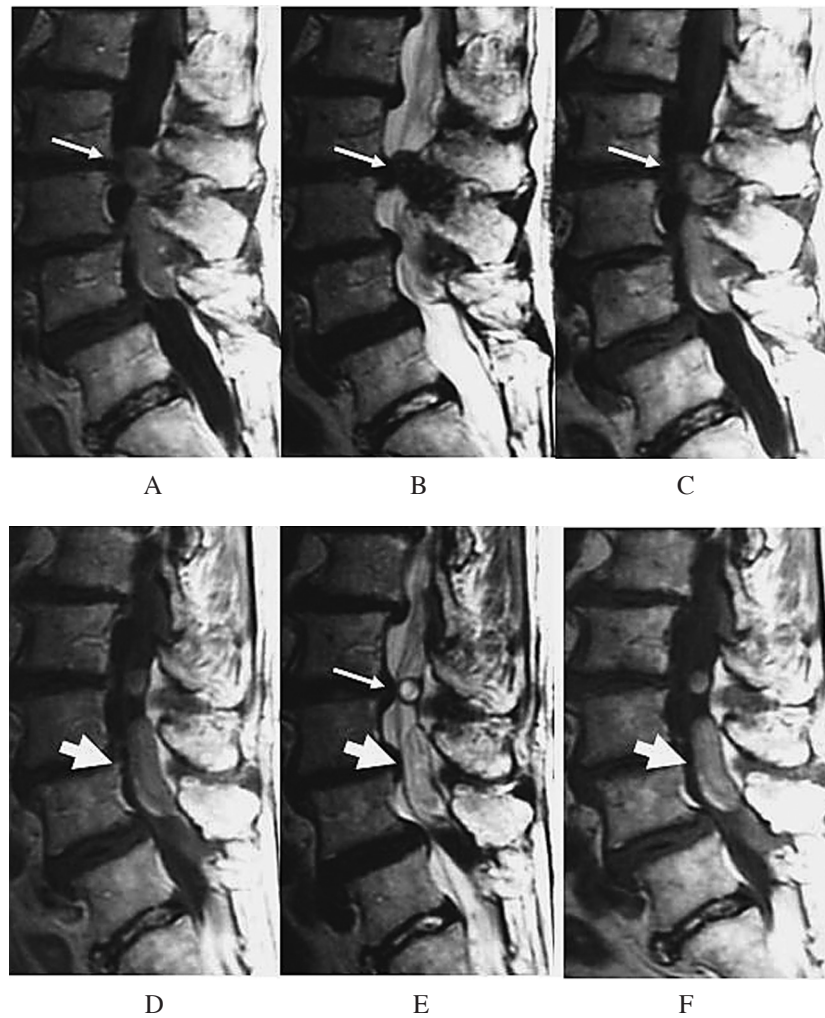


Fig. 1. Sagittal MR images of lumbar spine.

Preoperative sagittal MRI demonstrating hematomas in the ligamentum flavum and cystic mass and the subdural space. Images in the upper row were scanned at the right para-median of the spinal canal and images in the lower row were scanned at the center of the spinal canal. The enlarged ligamentum flavum of the right side (small arrows of the upper row) exhibits iso-signal intensity on the T1-weighted image (Fig. 1A) and low-signal intensity on the T2-weighted image (Fig. 1B), and is shown without enhancement on the T1-weighted Gd-DTPA image (Fig. 1C). A part of the hematoma that continues with the ligamentum flavum shows high-signal intensity on the T2-weighted image (small arrow on Fig. 1E). A subdural hematoma showing iso-signal intensity on the T1-weighted image (Fig. 1D), iso- to hyper-signal intensity on the T2-weighted image (Fig. 1E), and no enhancement on the T1-weighted Gd-DTPA image (Fig. 1F) extending from the L3 vertebral body to the L4-L5 level (big arrows).

a small amount of red blood cells in the elastic fibers (Fig. 4A). Furthermore, histological examination of the hematoma in cystic mass continuous with the ligamentum flavum also showed granulation and degenerative fibrous tissue surrounded by the intact fibrous tissue (Fig. 4B). These find-

ings indicated that chronic changes in the hematoma and fibrous tissue occurred after hemorrhage in the ligamentum flavum and cystic mass. There was no evidence of neoplasm or infection. The severe pain in her right lower extremity disappeared after the operation and she was able to

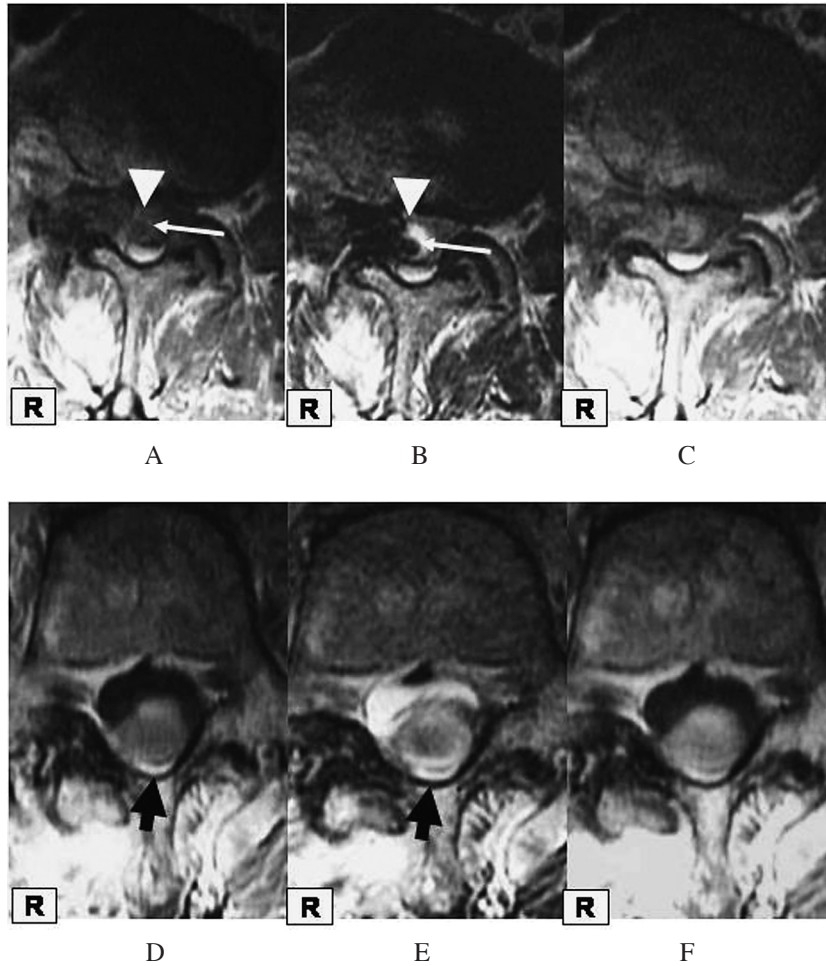


Fig. 2. Axial MR images at the L2-L3 level and L4 vertebral body level.

Preoperative axial MR images showing the hematoma in the ligamentum flavum and cystic mass at the L2-L3 level (upper row) and the subdural hematoma at the L4 vertebral body level (lower row). The right side of the ligamentum flavum is enlarged, revealing an iso-signal intensity on T1-weighted images (Fig. 2A) and low-signal intensity on T2-weighted images (Fig. 2B) with mild enhancement after Gd-DTPA administration (Fig. 2C). The central part of the hematoma in cystic mass (small arrows) reveals low-signal intensity on the T1- and T2-weighted images (Fig. 2A and B) and the peripheral part (white arrowheads) reveals iso-signal intensity on the T1-weighted images (Fig. 2A) and hyper-intensity on the T2-weighted images (Fig. 2B). The subdural hematoma exhibits iso-signal intensity on the T1-weighted image (Fig. 2D) and iso- to hyper-signal intensity on the T2-weighted image (Fig. 2E), and is shown with no enhancement after Gd-DTPA administration (Fig. 2F). A high signal intensity lesion on T1- and T2-weighted images indicating fat tissue suggests that a hematoma is located in the subdural space (black arrows, Fig. 2D and E). R, right side of the patient.

walk with a T-cane at the time of discharge from our hospital. Six months after the operation, she could walk without the cane and without pain.

## DISCUSSION

In the present case, surgical findings have demonstrated that a hematoma coexisted in the ligamentum flavum and subdural space of the

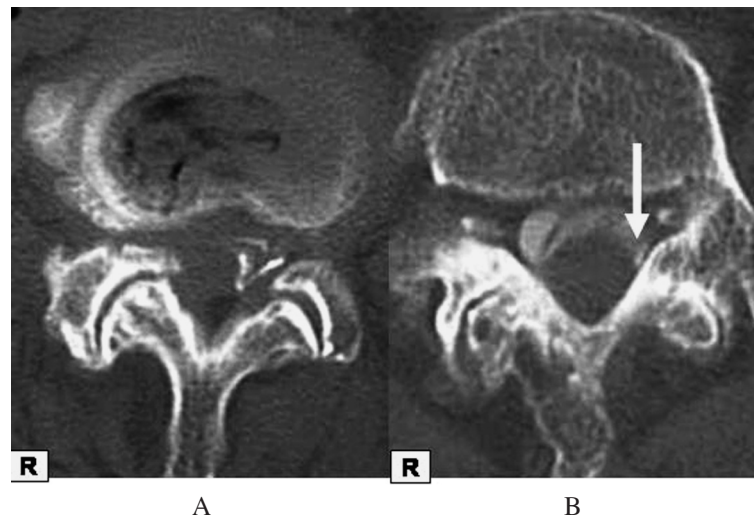


Fig. 3. Computed tomography (CT) after myelography.

Axial CT images performed after the myelography revealed a severe postero-lateral compression of the dural sac from the right side crossing the midline of the spinal canal at the L2-L3 level and degenerative changes in the right L2-L3 facet joint (Fig. 3A). CT after myelography demonstrated posterior compression of the dural sac at the L4 vertebral body level and the edges of the dural sac facing the mass were sharp (arrow), indicating that the mass could be in an intra-dural space (Fig. 3B). R, right side of the patient.

lumbar spine. Both chronic spinal subdural hematomas and hematomas in the ligamentum flavum are very rare entities to cause a dysfunction of the spinal cord or nerve root. Although most cases of spinal subdural hematoma are the acute or sub-acute type, Harris (1911) reported the first case of spinal cord compression by a spontaneous chronic subdural hematoma. Following this report, only 26 cases have been reported as chronic spinal subdural hematomas treated by surgery in the English literature reviewed by Jimbo et al. (2006). Compared with those reports, this is the first case of the chronic spinal subdural hematoma coexisting with the epidural hematoma continuous with the hematoma in ligamentum flavum causing neurological symptoms, and the complete removal of the hematomas resulted in the pain relief of the patient. On the other hand, only eight cases of hematoma in the ligamentum flavum have been described in the English literature (Miyakoshi et al. 2005).

The pathogenesis of chronic spinal subdural hematoma is still controversial and two hypothe-

ses have been reported. The first theory is that the initial hemorrhage in the subarachnoid space is thought to be the primary lesion that subsequently ruptured into the subdural space and the subarachnoid hemorrhage was washed out by cerebrospinal flow (Lee et al. 1996; Leber et al. 1997). The other theory states that the spinal subdural hematoma may be related to a hemorrhage of the intracranial subdural space and its expansion may be secondary to chronic changes (Kotwica et al. 1989; Leber et al. 1997). Furthermore, the pathophysiological mechanisms of hemorrhage in the ligamentum flavum are also not elucidated well. It has been speculated that vessel rupture within the degenerative ligamentum flavum (Minamide et al. 1999; Maezawa et al. 2001) or hemorrhage from the degenerated facet joint may cause the hematoma (Nishida et al. 2003). However, several reports have suggested that an increase in abdominal pressure after minor trauma could elevate the intravenous pressure of small and thin-walled vessels in the subdural space or ligamentum flavum and result in a hemorrhage in the subdural space or ligamentum flavum (Rader

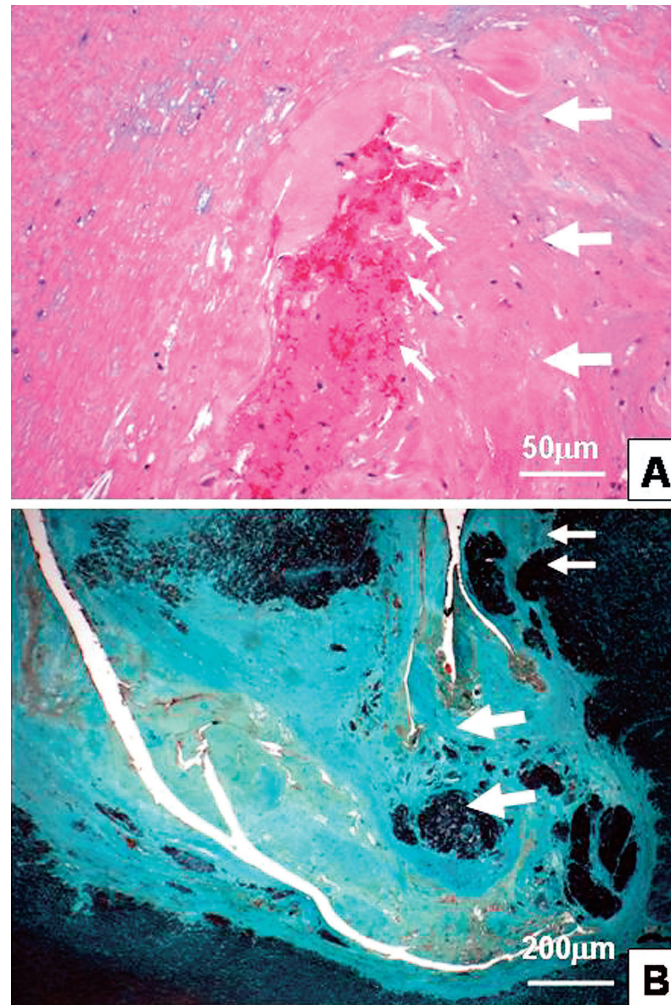


Fig. 4. Histological features of the hematoma in the ligamentum flavum and cystic mass. Granulation tissue and degenerative fibrous tissue (big arrows) with a small amount of red blood cells (small arrows) were observed in the elastic fibers of the ligamentum flavum (Fig. 4A; H & E). Degeneration and granulation of fibrous tissue were observed in the hematoma of cystic mass (big arrows) and of ligamentum flavum (small arrows) (Fig. 4B; elastica-Masson).

1955; Minamide et al. 1999).

Considering that the hematoma was coexisting in the spinal subdural space and ligamentum flavum, the mechanisms of hematoma in the spinal subdural space might not be caused by hemorrhage in the intracranial subdural space in the present case. Furthermore, the intensities of the hematoma located in the epidural space at the L2-L3 level and the hematoma in the subdural space are quite similar, showing iso- to hyper-signal intensity on T1-weighted and T2-weighted images without enhancement after Gd-DTPA

administration. This finding indicates that the hematoma in the spinal subdural space might have occurred in the same time and manner as the hematoma in the epidural space continuous with the ligamentum flavum. Because the dura mater is known to be a very tight and tough structure, a possible source of the chronic spinal subdural hematoma might be a ruptured small vein in the subdural space.

#### CONCLUSIONS

We have demonstrated the first case of a

chronic hematoma coexisting in the spinal subdural space and ligamentum flavum. Chronic spinal subdural hematoma and hematoma in the ligamentum flavum should be considered as a one of the cause of nerve root compression in patients with anticoagulant therapy, and an appropriate diagnosis lead to complete decompression of the spinal nerve root by removal of the hematoma in the ligamentum flavum and evacuation of the hematoma in the spinal subdural space relieved the pain for the patient.

### References

- Cruz-Conde, R., Berjano, P. & Buitron, Z. (1995) Ligamentum flavum hematoma presenting as a progressive root compression in the lumbar spine. *Spine*, **20**, 1506-1509.
- Harris, W. (1911) Two cases of spontaneous hematorrhachis or intrameningeal spinal haemorrhage: one cured by laminectomy. *Proc. R. Soc. Med.*, **5**, 115-122.
- Hirakawa, K., Hanakita, J., Suwa, H., Matsuoka, N., Oda, M., Muro, H. & Fukushima, T. (2000) A post-traumatic ligamentum flavum progressive hematoma: a case report. *Spine*, **25**, 1182-1184.
- Jimbo, H., Asamoto, S., Mitsuyama, T., Hatayama, K., Iwasaki, Y. & Fukui, Y. (2006) Spinal chronic subdural hematoma in association with anticoagulant therapy. *Spine*, **31**, E184-E187.
- Kotwica, Z., Stawowy, A. & Polis, L. (1989) Spinal chronic subdural haematoma in a 7-year old girl. *Eur. J. Pediatr.*, **148**, 779-780.
- Leber, K.A., Pendl, G., Kogler, S., Kammerhuber, F. & Ebner, F. (1997) Simultaneous spinal and intracranial chronic subdural hematoma. Case illustration. *J. Neurosurg.*, **87**, 644.
- Lee, J.I., Hong, S.C., Shin, H.J., Eoh, W., Byun, H.S. & Kim, J.H. (1996) Traumatic spinal subdural hematoma: rapid resolution after repeated lumbar spinal puncture and drainage. *J. Trauma*, **40**, 654-655.
- Maezawa, Y., Baba, H., Uchida, K., Kokubo, Y., Kubota, C. & Noriki, S. (2001) Ligamentum flavum hematoma in the thoracic spine. *Clin. Imaging*, **25**, 265-267.
- Minamide, A., Yoshida, M., Tamaki, T. & Natsumi, K. (1999) Ligamentum flavum hematoma in the lumbar spine. *J. Orthop. Sci.*, **4**, 376-379.
- Miyakoshi, N., Shimada, Y., Okada, K., Hongo, M., Kasukawa, Y. & Itoi, E. (2005) Ligamentum flavum hematoma in the rigid thoracic spinal segments. Case report. *J. Neurosurg. Spine*, **2**, 495-497.
- Nishida, K., Iguchi, T., Kurihara, A., Doita, M., Kasahara, K. & Yoshiya, S. (2003) Symptomatic hematoma of lumbar facet joint: joint apoplexy of the spine? *Spine*, **28**, E206-E208.
- Rader, J.P. (1955) Chronic subdural hematoma of the spinal cord: report of a case. *N. Engl. J. Med.*, **253**, 374-376.
- Russell, N.A. & Benoit, B.G. (1983) Spinal subdural hematoma: a review. *Surg. Neurol.*, **20**, 133-137.
- Shimada, Y., Sato, K., Abe, E., Miyakoshi, N. & Tsutsumi, Y. (1996) Spinal subdural hematoma. *Skeletal Radiol.*, **25**, 477-480.
- Sweasey, T.A., Coester, H.C., Rawal, H., Blaivas, M. & McGillicuddy, J.E. (1992) Ligamentum flavum hematoma. Report of two cases. *J. Neurosurg.*, **76**, 534-537.
- Yuceer, N., Baskaya, M.K., Smith, P. & Willis, B.K. (2000) Hematoma of the ligamentum flavum in the lumbar spine: case report. *Surg. Neurol.*, **53**, 596-600.