



Intraoperative Visualization of a Spinal Arachnoid Cyst Using Pyoktanin Blue

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■ **BACKGROUND:** Spinal arachnoid cysts (SACs) are filled with cerebrospinal fluid, and they include the arachnoid membrane, making it difficult to distinguish the walls of the cyst from the arachnoid membrane and excise the cyst as a lump. Here we report a technique for the intraoperative visualization of SACs, involving the use of pyoktanin blue.

■ **METHODS:** Four patients with spinal intradural arachnoid cysts underwent total excision of the cysts between October 2016 and April 2017. In 1 case, magnetic resonance imaging revealed the cyst clearly, but in the other cases, the cysts were unclear. All cysts were injected with 1% pyoktanin blue (Wako Pure Chemical Industries, Osaka, Japan) diluted 500 times with physiological saline before excision. When it was difficult to distinguish the cyst from the normal arachnoid membrane, 1% pyoktanin blue diluted 1000 times with physiological saline was injected into both the cyst and the subarachnoid space, and the spread of the stain was observed.

■ **RESULTS:** The cysts were better visualized after pyoktanin blue injection than before injection. When it was difficult to distinguish the cyst from the normal arachnoid space, pyoktanin blue injection was useful for judging the cyst space. There were no perioperative complications, and the patients' symptoms improved partially or completely after treatment.

■ **CONCLUSIONS:** Our technique of pyoktanin blue injection into SACs could make their excision easy and safe.

INTRODUCTION

A spinal arachnoid cyst (SAC) is a sac filled with cerebrospinal fluid, involving the arachnoid membrane.¹ SAC is a relatively rare condition, and its management remains controversial.^{1,2}

Differentiating the walls of SACs and the arachnoid membrane is difficult, and thus it sometimes cannot be excised as a lump and must be excised in pieces. The incomplete excision of these cysts can lead to recurrence, and the forceful excision of small fragments might lead to complications.

Here we present a technique for the intraoperative visualization of SACs, involving the use of pyoktanin blue. We believe that this technique allows the safe excision of SACs.

METHODS

Patients

Four patients with SACs underwent total cyst excision at Hokkaido University Hospital between October 2016 and April 2017. All patients had some symptoms, which were suspected to be caused by the cysts. The patient details are presented in **Table 1**. Magnetic resonance imaging (MRI) revealed the cyst clearly in case 1 (**Figure 1**); conversely, the borders of the cysts were obscure in cases 2 (**Figure 2**), 3 (**Figure 3**), and 4 (**Figure 4**). All patients underwent excision of the cysts according to the procedure presented below.

Surgical Procedure

All SACs were approached via laminectomy. If the border of the cyst was unclear on preoperative MRI, we kept the laminectomy small to avoid wasted effort. After a dural incision, cysts were injected with 1% pyoktanin blue (Wako Pure Chemical Industries, Osaka) diluted 500 times with physiological saline, and then total excision was performed with guidance from the staining. When it was difficult to distinguish the cyst from the normal arachnoid membrane, we injected 1% pyoktanin blue diluted 1000 times with physiological saline into both the cyst and the subarachnoid space, and observed the spread of the stain.

After cyst excision, the dural incision was sutured with a Gore-Tex suture (W.L. Gore & Associates, Tokyo, Japan). To prevent cerebrospinal fluid leakage, fat tissue and a Neoveil

Key words

- Excision
- Injection
- Pyoktanin blue
- Spinal arachnoid cyst

Abbreviations and Acronyms

MRI: Magnetic resonance imaging
SAC: Spinal arachnoid cyst

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Table 1. Characteristics of Spinal Intradural Arachnoid Cysts

Patient	Age (Years), Sex	Cyst Location	Gait Disturbance	Leg Numbness	Side Chest Pain	MRI Finding
1	68, male	Th2/3	+	+	–	Clear
2	72, female	Th5/6	–	+	–	Unclear
3	44, male	Th2/3	+	–	–	Unclear
4	44, female	Th4/5	–	+	+	Unclear

MRI, magnetic resonance imaging.

sheet (Gunze, Osaka, Japan) with fibrin glue were placed on the suture line. Then the wound was closed in layers.

RESULTS

The mean operative duration was 239 minutes (range, 207–256 minutes), and the mean duration of cyst excision was 13.8 minutes (range, 5–22 minutes). There were no perioperative complications. Compared with the cyst before staining (Figure 5A), pyoktanin blue allowed for clear visualization of the

cyst wall and made excision of the stained cyst easy and safe (Figure 5B).

In case 4, it was difficult to distinguish the cyst from the normal arachnoid space (Figure 6A). In this case, we injected 1% pyoktanin blue diluted 1000 times with physiological saline into both the cyst and the subarachnoid space (Figure 6B and D). The stain was stagnant at 1 minute after injection in 1 of the spaces (Figure 6C), and it washed out 1 minute after injection in the other space (Figure 6E). We considered the former space a part of the

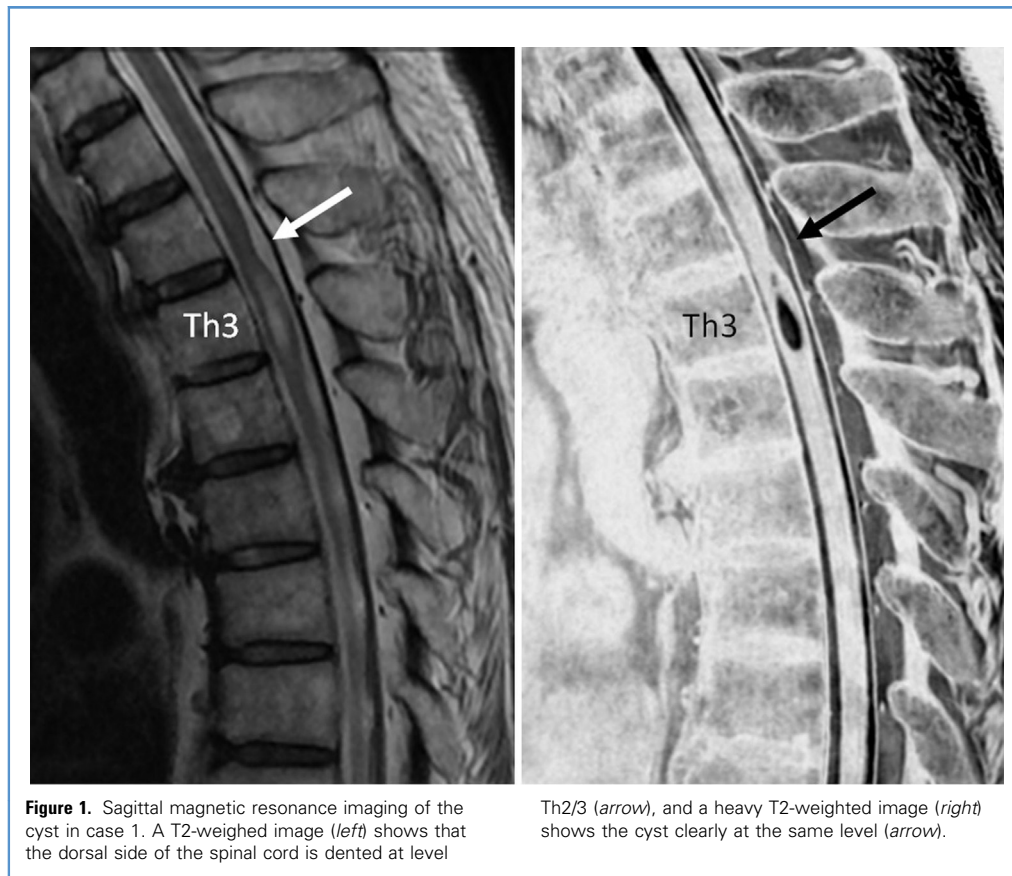


Figure 1. Sagittal magnetic resonance imaging of the cyst in case 1. A T2-weighted image (left) shows that the dorsal side of the spinal cord is dented at level

Th2/3 (arrow), and a heavy T2-weighted image (right) shows the cyst clearly at the same level (arrow).

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