Online Resource 1

Supplementary Methods

Data extracted from medical records

Collected data for both ILA and LOA groups included age at surgery, sex, symptomatic/asymptomatic status, history/comorbidity (presence of concomitant malformation), spinal conus height, pre- and postoperative changes in symptoms (urodynamic studies [UDSs] and physical-therapy evaluation of motor function [PT]), operation time, blood loss, complications, and reoperation. Concomitant malformations included VATER syndrome, VACTERL association, cloacal anus, urogenital sinus remnants, common excretory cavity remnants, trisomy 21, and Noonan syndrome. Operation time was defined as the time from skin incision to skin closure. Volume of blood loss was defined as the volume (mL) collected intraoperatively by aspiration or gauze. PT evaluation performed by a physical therapist (PT) assessed lower-extremity motor-sensory function and pain. UDS evaluation was performed by a pediatric urologist.

Surgical procedures

The LOA technique

Under general anesthesia, the patient was placed in a prone position such that the surgical field was at its highest elevation. Skin incisions were made at the upper and lower ends of the spinous process of the target vertebral arch. A median longitudinal incision was made through the fascia and supraspinous ligament, and the lumbar dorsal muscles were dissected under the periosteum. Bilateral or unilateral vertebral arches were incised using a Mayo shear or a sagittal saw. The epidural fat was separated laterally to expose the dura mater. Microscopic manipulation was performed, and the dura was suspended using a 6-0 proline through a median longitudinal incision. A terminal filum lipoma was identified by direct nerve stimulation and was amputated after adequate coagulation and hemostasis. We routinely performed pathological diagnosis of the excised specimen. The dura mater was ligated and sutured with 6-0 proline, and the Valsalva maneuver was performed to confirm the absence of CSF leakage. If there was a concern about CSF leakage, fibrinogen was sprayed on the dural suture surface. The epidural fat was returned to the dural suture surface as much as possible, and the vertebral arch was fixed with a 2-0 or 3-0 silk thread at the transected end.

The ILA technique

The patient was positioned similarly to that for the transverse incision. The skin incision was made either through a longitudinal incision that included the target intervertebral space or through a 3-cm transverse incision over the target intervertebral space. A median longitudinal incision was made through the fascia and supraspinous ligament, and the lumbar dorsal muscles were dissected from the periosteum. The intervertebral ligaments between the target vertebrae were removed to provide sufficient space for the entire procedure. A minimal portion of the vertebral arch was removed if the operative field was narrow and deep. Dural incisions were made using a scalpel suitable for deep microincisions with a tip width of 1.3 mm (Fig. 2A). The subsequent process from the terminal lipoma amputation to closure was the same as that for the transverse incision (Fig. 1). Furthermore, wound openers were used in cases with narrow intervertebral spaces (Fig. 2B).

Neurological monitoring

Before 2021, only mapping by direct stimulation and bulbocavernosus reflex was performed. However, transcranial motor-evoked potential and SEP monitoring are currently undertaken in all cases of spinal-cord surgery.

Postoperative protocol

MRI requires sedation but is performed because of its importance in screening for early postoperative complications, including CSF leakage.

Supplementary Results

Perioperative management

There was no significant difference in perioperative management, including rest period, between the ILA and LOA groups. The average length of hospital stay for the ILA and LOA groups was 20.4 and 25 days, respectively. Postoperatively, the patient remained hospitalized until the wound healed. In Japan, owing to the insurance regime, which likely differs from those worldwide, universal health insurance and subsidies for pediatric care enable children to receive medical care at a minimal cost. Consequently, patients in Japan commonly remain hospitalized until the wound is healed after surgery, resulting in the aforementioned length of hospitalization.