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Case Report | Open Access

Adequate Decompression of Adult Lumbar Intradural Lipoma without Dysraphism Using a Monopolar Stimulation Electrode for Intraoperative Monitoring: Case Report

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Abstract

Adult non-dysraphic intradural spinal lipomas are rare entities. Here we report two cases of adult non-dysraphic intradural lumbar lipoma.

Case 1: A 66-year-old man experienced gradual progression of sensory disturbance and numbness in the lower extremities bilaterally over the course of 2 years. Magnetic resonance imaging (MRI) suggested an intradural lipoma at T12 with no evidence of dysraphism. Adequate decompression and duraplasty were performed with intraoperative monopolar stimulation to elicit evoked electromyography responses.

Case 2: A 54-year-old man with a 10-year history of lower back pain and gradual progression of weakness of the right lower extremity over the course of 2 years was referred to our hospital, where he presented with urinary disturbance. An MRI suggested intradural lipoma at L2 without evidence of dysraphism. Roentgenograms revealed L5 isthmic spondylolisthesis. Adequate resection, duraplasty, and L4-S posterior lumbar interbody fusion were performed with intraoperative monopolar stimulation monitoring. Both patients received pathological diagnoses of lipomas, and neurological symptoms improved postsurgically in both cases. Adequate resection is recommended for adult lumbar lipomas without dysraphism in order to achieve a good clinical outcome. The evoked electromyography response was a simple and useful intraoperative tool to demonstrate adequate decompression of adult non-dysraphic intradural spinal lipomas in both of these cases.

Keywords: Adult; Lumbar; Intradural; Lipoma; Non-dysraphic; Intraoperative monopolar stimulation

Introduction

Non-dysraphic spinal cord lipoma is a rare entity [1-10]. Patients with intradural spinal lipomas typically present during the second and third decades of life. There were no patient older than 60 years, and 5 patients older than 50 years of lumbar lipomas [3-11]. The thoracic spine is the most common location for these lesions, followed by the cervical region [3-6]. The lumbar spine is rare location of intradural spinal lipomas. Non-dysraphic spinal cord lipoma frequently involves the dorsal spinal cord, therefore dorsal column disturbances are first to appear, leading to gait disturbances and numbness. Pain is not radicular, but rather localized to the area involved [12-18]. Most patients are symptomatic for two years before diagnosis [1-7,18]. The optimal management remains controversial because lipomas are very slow growing and benign tumors, and complete adhesion to the spinal cord limits the extent of resection [2-10]. Here we present a case of 66 years, and 54 years of non-dysraphic intradural lumbar lipoma treated successfully by adequate decompression using monopolar stimulation to elicit evoked electromyography responses for intraoperative monitoring.

Case Report

Case 1

A 66-year-old man experienced gradual progression of sensory disturbance and numbness in the lower extremities bilaterally over the course of 2 years. The past medical history was positive for hypertension and hyperlipidemia. He reported no allergies and there was no pertinent family history. The neurological examination revealed numbness below L2, hypesthesia below L4, and decreased deep tendon reflexes in the lower extremities bilaterally. The Romberg sign was positive. Routine laboratory examinations yielded results within the normal range. The patient was non-diabetic and non-rheumatoid. The CT showed widening of the spinal canal with spreading and thinning of the pedicles (Figure 1A-1E). Magnetic resonance imaging (MRI) showed intradural high intensity lesions on T1WI and T2WI at T12 without dysraphism (Figure 1A, 1 B, 1D and 1E). A T12 laminectomy provided exposure to the dura from the inferior aspect of T11 to the superior aspect of L1. A midline durotomy and opening of the arachnoid mater revealed the cauda equina and fatty tissues (Figure 2A-2C).

Using an ultrasonic surgical aspirator, 50% tumor resection and duraplasty were performed with intraoperative neuromonitoring (Figure 3A and 3B); intraoperative electrical stimulation with compound muscle action potential (CMAP) recordings was used to identify and monitor the nerve roots, and a monopolar stimulation electrode was used to elicit evoked electromyography (EMG) responses. Electrical stimulation began at 0.0 mA and was raised to 2 mA in 0.1 mA increments. The pulse width was 0.2 msec. EMG electrodes were placed in the quadriceps, tibialis anterior, gastrocnemius, extensor hallucis longus, and anal sphincter muscles; these are generally known to be innervated by the lumbar roots. The NIM Response (Medtronic Inc., Minneapolis, MN) device for was used to stimulate the nerve roots for these areas. General anesthesia was achieved through intravenous

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Figure 1: Case 1. Lumbar spinal magnetic resonance images. Preoperative sagittal and axial images showed a high intensity area at T12 on T1WI (A and D) and T2WI (B and E). CT showed widening of the spinal canal with spreading and thinning of the pedicles at T12 (D).

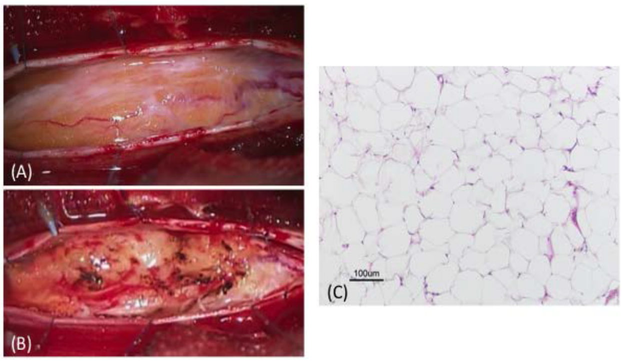

Figure 2: Case 1. Surgical exposure revealed the cauda equina and fatty tissues (A). Fatty tissues adhered to the nerve roots. Resection was performed with intraoperative neuromonitoring (B). Histology revealed the typical mature fatty tissue; hematoxylin and eosin stain; original magnification x100; Scale bar=100 μm (C).

Figure 3: Case 1. Postoperative sagittal and axial images reveal a decrease of the high intensity area at T12 on T1WI (A and B).

administration of propofol or fentanyl, with volatile inhalational agents only administered during intubation. Muscle relaxants were used during intubation, and a minimum of 1 hour had to pass before root testing took place.

A minimal number of nerve roots were isolated. Because fatty tissues adhered to the nerve roots, detachment manipulations provide possibilities for injury of neural structures (Figure 2B). The pathological diagnosis was lipoma (Figure 2C). Thin but distinct fibrous capsules are present at the margin of the tumor. The patient's neurological symptoms improved postoperatively during the 1.5-year follow-up period.

Case 2

A 54-year-old male smoker had a 10-year history of lower back pain. Right lower extremity weakness gradually progressed during the course of 2 years, and he was referred to our hospital; he presented with urinary disturbance. The neurological examination revealed weakness of the right gatrocnemius muscle, hypesthesia in the right S1 area, and normal tendon reflexes in the lower extremities bilaterally. The Romberg sign was negative. Routine laboratory examinations yielded results within the normal range. The patient was non-diabetic and non-rheumatoid. An MRI showed intradural high intensity lesions on T1WI and T2WI at L2 without dysraphism (Figure 4A and 4B). Oblique roentgenograms revealed L4 isthmic spondylolysis (Figure 4E and 4F). Roentgenokymograms indicated L4/5/S instability (Figure 4C and 4D). Under microscope, a 50% resection, adequate duraplasty, and L4-S posterior lumbar interbody fusion were performed with intraoperative neuromonitoring as reported above for Case 1 (Figure 5). The neurological symptoms improved postoperatively during the 1-year follow-up period.

Discussion

Lipomas are very slow growing and benign tumors [2-10]. Patients present with neurological deficits secondary to the mass effect [17]. As lipomas adhere closely to the adjacent spinal parenchyma, they generally cannot be entirely resected, and the aim of surgery is decompression [17]. A very satisfactory and long-lasting clinical effect may be obtained after achieving a subtotal excision [13]. In these cases, the evoked electromyography response was a simple and useful intraoperative tool to demonstrate adequate decompression of adult non-dysraphic intradural spinal lipomas.

There are several theories regarding the genesis of spinal intradural lipoma. The lipoma develops as aberrant tissues, which adipocytes migrate during the formation of the neural tube [1-6,12-18]. The connective tissue may lead to deposition of fat within the dura [12]. The adipocytes could arise from cells that give rise to the spinal vessels. These theories raise the possibility that the origin of spinal lipomas is at the early developmental stage such as neural tube closure. The sex determination develops after the neural tube closure. Although it has been reported that these tumors occur more commonly in men [1,12-18], recent reports presented that males and females are equally affected [2-6,16].

The fat of the lipoma is metabolically identical to normal body fat. Although conservative therapy had been advocated, such as aggressive weight loss and scrupulous diet control, this was queried by those who observed rapid growth of the intradural lipoma at the cones [12-15,19]. In the lumbar region, large studies have not shown that any functional nerve roots traverse the lipoma [8]. The nerve bundles were involved predominantly at the periphery of the lesion [12]. This finding suggests the secondary entrapment of adjacent nerve roots by the lipoma.

Figure 4: Case 2. Lumbar spinal magnetic resonance images. Preoperative sagittal and axial images showed a high intensity area at L2 on T1WI (A), T2WI (B). Preoperative roentgenokymograms indicated L4/5/S instability (C, D). Preoperative oblique roentgenograms revealed L4 isthmic spondylolysis (E, F) (yellow arrow).

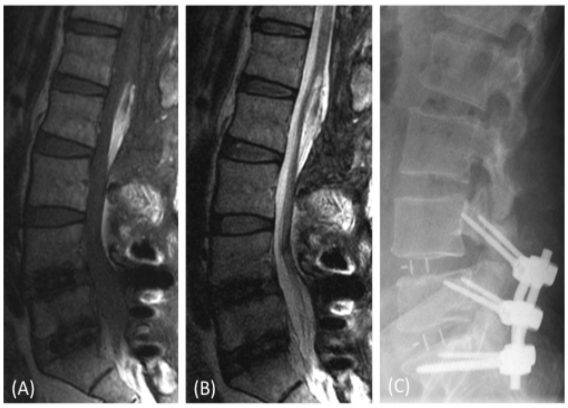

Figure 5: Case2. Postoperative sagittal images showed a high intensity area at L2 on T1WI (A) and T2WI (B). L4-S posterior lumbar interbody fusion was performed (C).

Elsberg discussed the dangers of total removal of intradural lipomas [14] Ammerman reported that total removal of intradural lipomas resulted in development of postoperative paraplegia [12]. Lee et al. reported neurological deterioration in patients who underwent 70% resections and neurological improvement in patients who underwent 40% resections [14]. Lee et al. and Kabir et al. also demonstrated that the degree of resection is not directly related to the postoperative clinical outcome [3-6].

Mori et al. recommended that recognition of the necessary extent of surgical decompression was aided by intraoperative neuromonitoring of muscular evoked potentials (MEP) [9]. We used a monopolar stimulation electrode to elicit evoked EMG responses, but neither MEP nor somatosensory evoked potentials. The NIM Response was a simple and useful intraoperative tool to demonstrate adequate decompression of adult non-dysraphic intradural spinal lipomas.

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Disclosure

The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper.

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