

Pitting Oedema in a Patient with Lumbar Disc Herniation

Case report of an unusual association

Homa Sadeghian¹ and *Rouzbeh Motiei-Langroudi^{2,3}

وزمة منطبعة عند مريض مصاب بانفتاق قرصي قطني

تقرير حالة عن ترابط غير معتاد

هوما صادقيان و روزبه مطيعي لنجرودى

ABSTRACT: Oedema refers to the excessive accumulation of fluid within intercellular tissues as a result of disequilibrium between the capillary hydrostatic and oncotic pressure gradients. Lumbar disc herniation (LDH) commonly causes lower back pain and radicular leg pain. We report a 57-year-old female who presented to the neurosurgery clinic of the Bam University of Medical Sciences, Bam, Iran, in 2015 with pain and pitting oedema in the bilateral lower extremities. Magnetic resonance imaging confirmed a diagnosis of LDH of the L3–L4 and L4–L5 vertebrae. The patient subsequently underwent a bilateral laminotomy and foraminotomy of the involved vertebrae to relieve her pain. Following the surgery, there was a complete resolution of the LDH-related symptoms as well as the oedema. Although LDH has never before been associated with oedema, it may nevertheless cause lower limb oedema in exceptional and rare cases, as highlighted in this patient.

Keywords: Intervertebral Disc Disease; Lumbar Vertebrae; Lower Extremities; Edema; Discectomy; Case Report; Iran.

الملخص: الوزمة هي تراكم مفرط للسوائل في داخل خلايا الأنسجة نتيجة لاختلال التوازن في مدروجات الضغط الهيدروستاتيكي الشعري والضغط الجرمي. ويسبب الانفتاق القرصي القطني ألما في الظهر وألما جذريا في القدم. وهذا تقرير عن حالة لامرأة عمرها 57 سنة حضرت لعيادة الجراحة العصبية بكلية الطب في جامعة بام بإيران في عام 2015، تشكو من ألم ووزمة منطبعة في الأطراف السفلية ثنائية الجانب. وأكد التصوير بالرنين المغناطيسي أن تشخيص الحالة هو انفتاق قرصي قطني في الفقرات القطنية 3-4 و 4-5. وأجريت للمريضة عملية قطع ثنائية الجانب للصحيفة الفقرية، وعملية لبضع الثقبة للفقرات المتأثرة لوقف الألم. واختفت عقب العملية كل الأعراض التي سببها الانفتاق القرصي القطني، ومعها الوزمة المنطبعة. وعلى الرغم من أن الوزمة لم تعرف أبدا كعرض مرتبط بالانفتاق القرصي القطني، إلا أن هذا الانفتاق قد يسبب وربما في الطرف السفلي في حالات استثنائية ونادرة، كما هو في حالة المريضة المذكورة.

الكلمات المفتاحية: مرض القرص بين الفقرتين؛ الفقرات القطنية؛ الأطراف السفلى؛ وزمة؛ استئصال القرص؛ تقرير حالة؛ إيران.

OEDEMA IS A STATE OF EXCESSIVE FLUID accumulation within intercellular tissues as a result of disequilibrium between hydrostatic and oncotic pressure gradients across the capillary.¹ In the extremities, it may be either unilateral or bilateral and acute or chronic, with potential differences in the underlying mechanisms for each type. Bilateral chronic oedema can be caused by congestive heart failure, chronic renal or hepatic disease, hypo- or hyperthyroidism, malabsorption and protein-calorie malnutrition, obstructive sleep apnoea, pulmonary hypertension, lymphoedema, pregnancy, a premenstrual state, immobility or the use of certain medications.¹

Lumbar disc herniation (LDH) is a common musculoskeletal condition that affects up to 40% of adults at some point during their life.² It generally follows a favourable course and the majority of patients

recover with conservative therapy.³ Although LDH commonly causes pain in the lower back and radicular leg (i.e. radicular chronic pain [RCP]), it has never before been reported in association with oedema of the lower extremities. This case report describes a patient with LDH and bilateral pitting oedema in the lower extremities. Following a discectomy, both the LDH-related pain and oedema resolved rapidly. To the best of the authors' knowledge, this is the first reported case of lower limb pitting oedema which was completely resolved following the successful surgical treatment of LDH.

Case Report

A 57-year-old female patient presented to the neurosurgery clinic of the Bam University of Medical Sciences, Bam, Iran, in 2015 with complaints of pain in

¹Neurovascular Research Laboratory, Massachusetts General Hospital, Boston, Massachusetts, USA; ²Division of Neurosurgery, Department of Surgery, Pastor Hospital, Bam University of Medical Sciences, Bam, Iran; ³Neurosurgical Service, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA

*Corresponding Author's e-mail: rmotiei@bidmc.harvard.edu

the bilateral lower extremities of one year's duration. The patient described the pain as shooting down her anterior and lateral legs to her feet and *halluces*; she also mentioned that the pain was of greater severity on the right side. The distribution of the pain was compatible with RCP. In addition, the patient had persistent pitting oedema in both legs, which had appeared at the same time as the pain had begun and had continued over the course of the preceding year. The patient denied any previous history of lower back or leg pain or any spinal issues before the onset of the symptoms. She had undergone a total hysterectomy and chemotherapy with carboplatin and paclitaxel for a uterine carcinoma three years beforehand. There was no reported history of trauma.

Between episodes of pain, the patient was very active as a result of her work as a police lieutenant which did not allow extended leave; as such, she had never undertaken complete bed rest for more than two days at a time during the previous year. Prior to presentation, the patient had received two courses of a four-week-long conservative therapy regimen for her pain, including physical and medical therapy, the latter of which had consisted of a combination of two or three medications at a time, including acetaminophen, ibuprofen, naproxen, intramuscular methylprednisolone injections (40 mg once weekly for four weeks) and gabapentin. The methylprednisolone was prescribed only once for a total of four doses. Nevertheless, the patient's symptoms persisted despite the treatment.

Upon presentation, the patient's body mass index was normal. A general examination showed bilateral oedema of the calves and feet. The swelling was symmetrical, non-tender, without notable changes in skin colour and with pitting upon pressure which resolved in under a minute. A neurological examination was unremarkable, including motor force, light touch and deep tendon reflex testing. Colour Doppler ultrasonography of the lower extremities showed no evidence of acute or chronic deep vein

thrombosis, venous insufficiency or varicosity. However, an echocardiograph revealed grade 1 left ventricular diastolic dysfunction, trivial aortic insufficiency (AI) and mild mitral regurgitation (MR). All laboratory test results were within normal limits, including a complete blood count; serum electrolyte tests (including sodium, potassium, calcium and phosphorus levels); blood urea nitrogen, creatinine, albumin and total protein levels; thyroid and liver function tests (including aspartate aminotransferase, alanine aminotransferase and gamma-glutamyl transferase levels); prothrombin and partial thromboplastin times; international normalised ratio; creatine phosphokinase (CPK), lactate dehydrogenase and aldolase levels; erythrocyte sedimentation rate; C-reactive protein levels; a 24-hour urinary analysis (including creatinine and protein levels); and rheumatological tests (including rheumatoid factor, anti-cyclic citrullinated peptide, antinuclear antibody and anti-double stranded DNA).

Magnetic resonance imaging (MRI) showed broad-based disc protrusion of the L3–L4 and L4–L5 vertebrae with evidence of bilateral L4 and L5 foraminal *stenosis* [Figure 1]. The protrusion of the L3–L4 and L4–L5 vertebrae was more severe on the right side. The decision was made to perform a diskectomy. The patient was informed that the purpose of the surgery was to relieve her RCP and not the pitting oedema. She underwent a bilateral L3–L4 and L4–L5 laminotomy and L4 and L5 foraminotomy via a mid-line incision. Postoperatively, subcutaneous heparin was administered as a thromboembolism prophylactic measure. She also received acetaminophen, gabapentin, diazepam and two doses of cefazolin during the postoperative period. Within one hour of the surgery, there was no evidence of RCP or any neurological complications. She was allowed out of bed on the first postoperative day and undertook a few short walks within the hospital room. A substantial decrease in oedema was also noted that same morning before she got out of bed.

A postoperative MRI scan revealed that the foraminal *stenosis* had completely resolved. The patient was discharged from the hospital on the second postoperative day with a four-week prescription for ibuprofen (400 mg), nortriptyline (10 mg) and gabapentin (100 mg) three times a day. The oedema had completely subsided within one week of the surgery. At subsequent one-month and one-year follow-up visits, there were no further complaints of RCP, no surgery-related complications and no evidence of recurrence of the oedema.

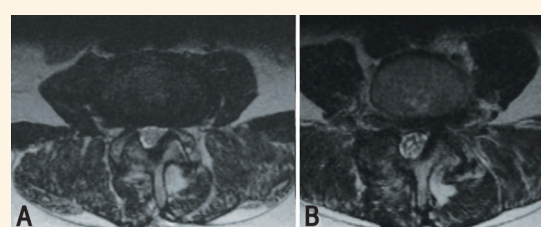


Figure 1: Preoperative magnetic resonance imaging of a 57-year-old female with radicular chronic pain and pitting oedema in the bilateral lower extremities showing disc protrusion of the (A) L3–L4 and (B) L4–L5 vertebrae with foraminal *stenosis*.

Discussion

Extravascular water content follows a formula for equilibrium generally known as the Starling equation, with any disequilibrium potentially resulting in acute or chronic tissue oedema.^{1,4} Medications that can cause oedema include antidepressants (especially monoamine oxidase inhibitors and trazodone), antihypertensives (e.g. β -adrenergic blockers, calcium channel blockers, clonidine, hydralazine, methyldopa and minoxidil), corticosteroids, hormones (e.g. androgen, oestrogen, progesterone and testosterone), chemotherapy agents (e.g. cytosine arabinoside and mithramycin), immunosuppressives (e.g. cyclophosphamide and cyclosporine), cytokines (e.g. granulocyte colony-stimulating factor, granulocyte-macrophage colony-stimulating factor, interferon- α and interleukin-2 and -4), antiviral drugs (e.g. acyclovir) and non-steroidal anti-inflammatory drugs (NSAIDs).^{1,5} Although obstructions in the venous or lymphatic drainage pathways, like in cases of deep vein thrombosis or pelvic tumours, may lead to oedema formation, this mostly occurs in a unilateral and localised manner.¹

Theoretically, LDH never interferes with the Starling equation.^{1,4} Moreover, an association has never been reported with lower limb oedema, although there are some reports of LDH cases presenting with swollen calves.⁶⁻⁹ Khan *et al.* reported a patient with a swollen calf who was diagnosed with LDH of the L5-S1 intervertebral disc after deep vein thrombosis and a local tumour were ruled out; electromyography and a muscle biopsy indicated inflammatory myopathy, suggesting a diagnosis of radiculopathy/calf hypertrophy syndrome.⁶ A similar case attributed to radiculopathy/calf hypertrophy syndrome has also been described.⁷ Gross *et al.* reported unilateral calf swelling associated with symptomatic LDH of the L5-S1 vertebrae in which increased CPK levels and muscle biopsy findings were in accordance with S1 radiculopathy-associated inflammatory myopathy/myositis.⁸ This condition has also been reported with L5 radiculopathy.⁹ Yet, there were essential differences in the current case which eliminated similar diagnoses. First, levels of CPK, lactate dehydrogenase and the more muscle-specific aldolase were all normal. Second, the swelling was clearly due to oedema as it was bilateral, non-tender and pitting whereas myopathy and myositis-related swelling is usually unilateral and always non-pitting.¹⁰

An evaluation was undertaken to determine the cause of the oedema in the present case. Although the patient had left-sided heart failure, AI and MR, all of these features were mild and could not have caused pitting oedema of the limbs. While limb oedema is

to be expected in cases of right-sided and congestive heart failure, these elements were not present in the current case.¹ Moreover, the patient was symptom-free during her daily activities and while asleep, excluding a causative role for the mild AI and MR noted during echocardiography. Ultrasonography findings and laboratory results also excluded deep vein thrombosis, venous insufficiency and other known causes of oedema.

The patient's medical history and use of prior medications were also reviewed in the current case. She had had a uterine carcinoma three years prior to the onset of her symptoms; accordingly, microvasculature changes in the pelvic floor could have caused the oedema.¹¹ However, her medical records indicated that the carcinoma was not locally extensive and had been cured following a hysterectomy and adjuvant therapy. She had also received carboplatin and paclitaxel before her hysterectomy and had more recently been prescribed NSAIDs and corticosteroid injections for her LDH-related symptoms. However, these medications were ruled out as possible causative factors as they all had been prescribed intermittently whereas the oedema had remained consistent. Furthermore, carboplatin and paclitaxel are not common causes of oedema; in addition, these chemotherapy agents were administered two years before the oedema had initially presented.¹ While the patient had been prescribed NSAIDs, gabapentin and corticosteroids, the drugs had been administered only after the oedema had already presented; moreover, several were also prescribed after the LDH surgery, once the oedema had subsided.

Ultimately, the oedema in the present case began to resolve soon after the successful LDH surgery, thus excluding prior medications and diseases as potential causes. Another factor to consider is that lower limb oedema usually forms in patients with intervertebral disc herniation who restrain their daily activities; indeed, increased bed rest has been associated with some degree of lower limb oedema.¹² However, due to her occupational responsibilities, the patient in the present case remained active without long periods of bed rest. This cause can also be excluded by the timing of the resolution of oedema, which had started to subsist by the first postoperative day when the patient had not yet resumed her normal daily activities.

Although LDH has never before been considered responsible for causing oedema, the current case report shows that it may exceptionally cause lower limb oedema. However, as this is a single case, a causal or anatomical relation between LDH and lower limb pitting oedema cannot be proposed at this stage. Moreover, the underlying mechanism by which LDH

may cause pitting oedema is unclear. Further cases need to be reported and comprehensive studies undertaken to elucidate the exact association between these two conditions and to determine a pathophysiological explanation. Until then, the existence of oedema and LDH in a single patient should be considered and treated as separate conditions. Moreover, all known underlying causes of oedema should be evaluated thoroughly, with LDH considered only if all other causes are excluded.

Conclusion

This case report indicates that LDH and foraminal *stenosis* may cause pitting oedema of the lower extremities in exceptional cases. However, all other known aetiologies of lower limb oedema should be excluded first prior to confirming the diagnosis.

References

1. Traves KP, Studdiford JS, Pickle S, Tully AS. Edema: Diagnosis and management. *Am Fam Physician* 2013; 88:102–10.
2. Frymoyer JW. Lumbar disk disease: Epidemiology. *Instr Course Lect* 1992; 41:217–23.
3. Motiei-Langroudi R, Sadeghian H, Seddighi AS. Clinical and magnetic resonance imaging factors which may predict the need for surgery in lumbar disc herniation. *Asian Spine J* 2014; 8:446–52. doi: 10.4184/asj.2014.8.4.446.
4. Starling EH. On the absorption of fluids from the connective tissue spaces. *J Physiol* 1896; 19:312–26. doi: 10.1113/jphysiol.1896.sp000596.
5. Volke V, Matjus S. Unilateral pitting edema of the leg as a manifestation of Graves' disease: A case report. *J Med Case Rep* 2012; 6:258. doi: 10.1186/1752-1947-6-258.
6. Khan SY, Hilton-Jones D, Rigby SP. A swollen calf. *Lancet* 2005; 365:1662. doi: 10.1016/S0140-6736(05)66517-8.
7. Dorrell W. Another swollen calf. *Lancet* 2005; 366:27. doi: 10.1016/S0140-6736(05)66822-5.
8. Gross R, Degive C, Dernis E, Plat M, Dubourg O, Puéchal X. Focal myositis of the calf following S1 radiculopathy. *Semin Arthritis Rheum* 2008; 38:20–7. doi: 10.1016/j.semarthrit.2007.09.004.
9. Kottlors M, Mueller K, Kirschner J, Glocker FX. Muscle hypertrophy of the lower leg caused by L5 radiculopathy. *Joint Bone Spine* 2009; 76:562–4. doi: 10.1016/j.jbspin.2009.01.009.
10. Chawla J. Stepwise approach to myopathy in systemic disease. *Front Neurol* 2011; 2:49. doi: 10.3389/fneur.2011.00049.
11. Greven KM, Paunesku T. Radiation complications of the pelvis. In: Small W, Woloschak GE, Eds. *Radiation Toxicity: A practical guide*. Boston, USA: Springer, 2008. Pp. 125–53.
12. Suehiro K, Morikage N, Murakami M, Yamashita O, Ueda K, Samura M, et al. A study of leg edema in immobile patients. *Circ J* 2014; 78:1733–9. doi: 10.1253/circj.CJ-13-1599.