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Four Leg News

"An animal's eyes have the power to speak a great language."

- Martin Buber

Welcome to 2019!

THE STENOSIS ISSUE!

Join me in learning about this condition – as it presents in dogs and humans, some about evaluation & imaging, a little bit about surgery, and discussion regarding conservative management. Scroll on down or print and flip! Either way, enjoy the learning! A great way to start out 2019! (AND… can you believe it? This is Volume 8!!!!!) I can't believe I'm going into my 8th year of Four Leg! Wow, what a ride! Cheers! ~ Laurie Edge-Hughes

Boxer with degenerative lumbosacral stenosis. (photo credit: Meij & Bergknut, 2010)

AN OVERVIEW OF LumboSacral STENOSIS IN DOGS

THE SCOOP

Degenerative lumbosacral stenosis (DLSS) is a common disorder, also known as cauda equina syndrome, cauda equina compression, lumbosacral stenosis or disease, and lumbosacral instability. More commonly seen in large breed dogs, DLSS is a multifactorial degenerative disorder in which intervertebral disc (IVD) degeneration plays a major role. IVD degeneration, and bony and soft-tissue proliferations contribute to spinal stenosis and cauda equina compression leading to pain, lameness, and neurologic signs. DLSS bears considerable similarities to human degenerative lumbar spinal disease, since both affect the cauda equina and may cause lameness, back and limb pain and/or neurologic deficits. DLSS is an acquired condition with clinical signs that are initiated by degenerative changes and nerve compression caused by changes in the annulus of the L7 intervertebral disc, interarcuate ligament, sacral lamina and synovial joint capsules.

Several pathologies contribute to DLSS such as:

- Hansen type II (or less commonly type I) IVD herniation, preceded by degeneration of the disc.
- Ventral subluxation of S1 (lumbosacral instability) and misalignment of the facet joints
- Congenital vertebral anomalies such as transitional vertebrae
- Proliferation of the soft tissues surrounding the cauda equina such as hypertrophy of the interarcuate ligament, the joint capsule, and epidural fibrosis
- Sacral osteochondrosis
- Vascular compromise of the blood supply to the spinal nerves.

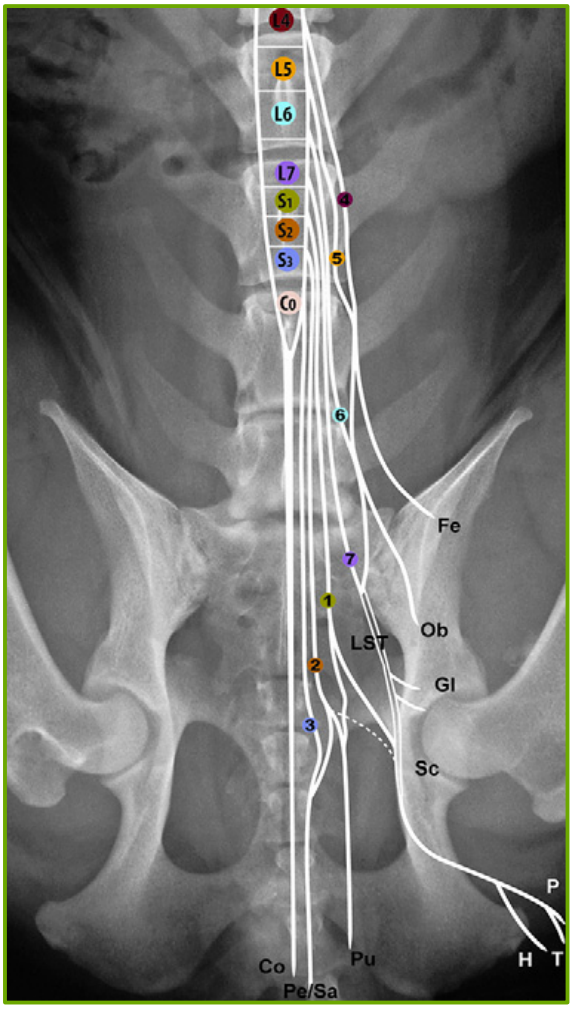


Photo credit: Meij & Bergknut, 2010

A WEE BIT OF ANATOMY

In most dogs the conus medullaris (end point) is located in the caudal half of L6 and the cranial part of L7, farther caudally in smaller breed dogs. The dural sac extends into the sacrum in most dogs but varies in its caudal extension. The cauda equina originates from the conus medullaris and is composed of the spinal nerves L6, L7, S1-S3, and Cd1-Cd5 and stretches from vertebra L6 to Cd5. The structures surrounding the cauda equina are:
ventral - the dorsal longitudinal ligament, the L7-S1 IVD, and neighboring vertebral bodies;
lateral - the pedicles of L7 and S1 and intervertebral foramina;
dorsal - the interarcuate ligament and the lamina of L7 and S1.
The IVD and 2 synovial facet joints connect L7 and S1, which is further stabilized by the ventral and dorsal longitudinal ligaments, the interarcuate ligament, the interspinous ligament, and the surrounding fascia and muscular tissues.

HISTORY

The majority of dogs with DLSS are presented with a history of caudal lumbar or lumbosacral pain. Symptoms may include pelvic limb lameness, hyperesthesia or self-mutilation of the lumbosacral area or pelvic limbs, difficulty with rising, sitting, or lying down, reluctance to jump or climb, dragging of toes, a low tail carriage, and urinary or fecal incontinence.

In people, lumbar spinal stenosis (LSS) is defined as back pain or lower extremity pain associated with the reduction of the available space for nerves and vessels in the lumbar canal. Typically, symptoms will appear during walking or lumbar extension with relief upon lumbar flexion or rest, and most cases are found to be asymptomatic.

TESTING

Physical Evaluation

Findings during clinical examination are related to the compression of the cauda equina that can be seen as pain evoked by pressure applied over the lumbosacral region. An experienced clinician is able to differentiate between pain evoked by hyperextension of the hip joints and pain on hyperextension of the lumbosacral region.

Deductive Reasoning Regarding Clinical Tests

Profound neurologic deficits in dogs with DLSS are rare, simply because the stenosis affects the cauda equina, which is resistant to compressive forces. Neurologic deficits in DLSS include lower motor neuron signs of the pelvic limbs such as paresis, atrophy of muscles innervated by the sciatic nerve, hyporeflexia of the withdrawal reflex or cranial tibial reflex, or pseudo-hyperreflexia of the patellar reflex. The patellar reflex is not affected by lumbosacral disease so the muscle tone of the stifle extensors will override that of the flexors.

DIAGNOSITIC IMAGING / MEASURES – VERY BRIEFLY!

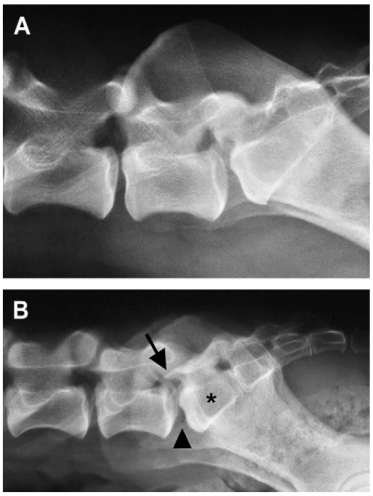


Fig. 6. Lateral radiograph of the lumbosacral region. (*A*) Normal dog. (*B*) Dog with degenerative lumbosacral stenosis and a transitional vertebra (*asterisk*), telescoping of the lamina of S1 into the caudal aperture of L7 (*arrow*), and vacuum phenomenon between L7 and S1 (*arrowhead*).

Radiography

The lateral radiographic view is the most informative and common findings include collapse of the IVD space, sclerosis of the vertebral end plates, elongation of the sacral lamina in the caudal aperture of L7, lumbosacral step formation with ventral subluxation of S1, the vacuum phenomenon, and ventral spondylosis. Sacral osteochondrosis, symmetric or asymmetric transitional vertebrae, an additional eighth lumbar vertebra, or congenital sacral anomalies may also play a role in DLSS. Survey radiographs help to exclude neoplasia with bone involvement, traumatic luxation, and discospondylitis. Stress radiography of the lumbosacral region, such as dynamic flexion/extension studies, may enhance the lumbosacral step formation.

Computed tomography (CT)

CT provides better soft-tissue contrast resolution than conventional radiography. The CT findings in DLSS are the same as for radiography, but in addition CT shows Hansen type II disc herniation, hypertrophy of the interarcuate ligament, and joint capsules.

Magnetic Resonance Imaging (MRI)

CT is often less sensitive than MRI for discriminating soft tissues within the spinal canal but is more sensitive for soft-tissue calcifications, cortical bone spurs, and degenerative changes in the facet joints. MR findings in dogs with DLSS are the same as for CT, but MRI provides more detailed information on IVD degeneration, dural sac, and/or nerve root displacement as well as loss of epidural fat.

Electromyography (EMG)

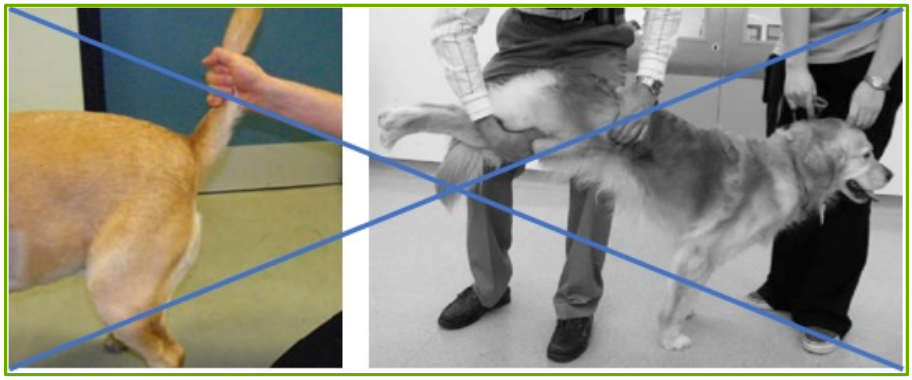
EMG is a diagnostic tool that can be used to support the diagnosis of DLSS, but it does not provide information regarding the source and direction of compression. Somatosensory evoked potentials (SEPs) provide information about lesion location and sensory nerve root involvement. SEP abnormalities (delay in latency and reduction in amplitude) occurred before deficits in an experimental canine model of lumbosacral stenosis.

References:

1. Meij BJ, Bergknut N. Degenerative Lumbosacral Stenosis in Dogs. Vet Clin Small Anim 40 (2010) 983–1009.
2. Jeffery ND, Barker A, Harcourt-Brown T. What progress has been made in the understanding and treatment of degenerative lumbosacral stenosis in dogs during the past 30 years? The Veterinary Journal 201 (2014) 9–14.
3. Ma X-L, Zhao X-W, Ma J-X, et al. Effectiveness of surgery versus conservative treatment for lumbar spinal stenosis: A system review and meta-analysis of randomized controlled trials. International Journal of Surgery 44 (2017) 329-338.

LAURIE'S COMMENTARY:

In regards to testing, I hate (capital H.A.T.E.) the tail jack test and the hyperextension of both hind legs test! Find L7 spinous process and push it (downwards and from side to side). In my Advanced Spine Course, I also have a couple of other tests that are more localized and specific. IF you want to hyperextend that region, try doing it with the dog in side lying, push ventrally on L7 and then begin to extend the legs and pelvis – you will get to a lumbar extension in this way, before you maximize hip extension. I also find a high correlation of L7 vertebral pain and L7 nerve irritation in conjunction with SIJ dysfunctions. So, check for both! I have found on more than one occasion that correcting the SIJ problem immediately resolves the L7 pain! Worth working the SIJ first, in my opinion!!



SURGICAL INTERVENTIONS

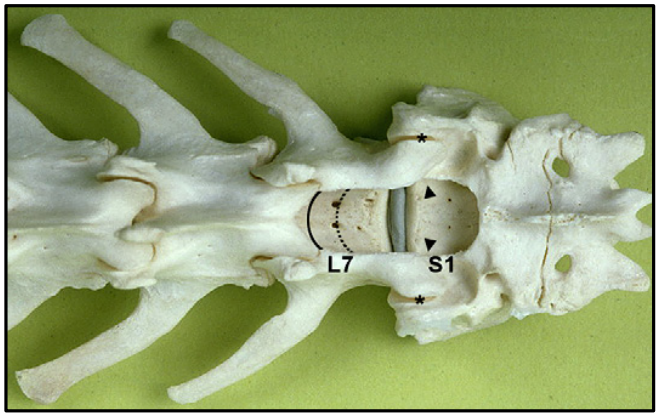
Surgical treatment of DLSS is indicated in dogs with moderate to severe lumbosacral pain unresponsive to conservative treatment and in dogs with neurologic deficits.

Laminectomy

Dorsal laminectomy has long been used for treatment of suspected DLSS. During the 1990s, lumbosacral laminectomy was advocated to decompress compressed nerves in the vertebral canal and was often combined with discectomy to remove compression ventral to the cauda equina. Facetectomy should be avoided whenever possible because this will increase lumbosacral instability. De Risio et al. (2001) reported no difference in outcome between dogs treated by laminectomy alone and those with concomitant discectomy. Dorsal laminectomy does have limitations.

Unless it can be proved that compression of the S1 nerve root is the cause, rather than compression of the L7, it is a poor choice for treatment of pelvic limb lameness.

A further problem possibly associated with laminectomy is the formation of adhesions between the nerves and surrounding soft tissues following surgical intervention.



Objective assessment of gait using FPA showed that propulsive forces were not restored after decompressive surgery in dogs with DLSS, although owners were very satisfied with the outcome of surgical treatment. Resolution of urinary and/or fecal incontinence after surgery is poor. Recurrence of clinical signs has been reported in 18% of dogs after dorsal laminectomy.

Fixation – Fusion Surgery

Fixation-fusion surgery aims to reduce pain or cauda equina dysfunction by eliminating the dynamic components of nerve compression within the vertebral canal or foramina by fixing the bones to prevent motion and slightly flexing the lumbosacral joint so as to open the foramina and decrease annular protrusion.

There are several potential drawbacks to stabilization techniques. First, articular fracture with consequent loss of stability can result from screw placement. Second, long-term rigid fixation is not guaranteed, because it may be difficult to ensure that there is sufficient bone–bone contact across the disc space to ensure eventual bony fusion, even if the region receives a bone graft.

Foraminotomy

Lateral foraminotomy was developed and reported by Gödde and Steffen (2007) as a method by which precisely located lesions affecting the L7 nerves in the L7/S1 intervertebral foramina can be decompressed. Andrade Gomes et al (2018) retrospectively reported on 45 cases of DLSS treated via foraminotomy. Short-term outcomes were considered good in five cases and excellent in 40 cases and is maintained long term despite some episodes of recurrence.

Failure in cases following decompression may be related with an increased risk of articular facet fractures, instability and inappropriate foraminal stenosis decompression.

Post-Operative Care

The one review paper stated: Postoperative treatment consists of analgesic medication and limited, controlled exercise. It is important to fit rehabilitation programs to the needs of the individual patient. Cooperation between veterinary surgeons and qualified animal physiotherapists during the rehabilitation program can improve long-term functional outcome.

References:

1. Meij BJ, Bergknut N. Degenerative Lumbosacral Stenosis in Dogs. Vet Clin Small Anim 40 (2010) 983–1009.
2. Jeffery ND, Barker A, Harcourt-Brown T. What progress has been made in the understanding and treatment of degenerative lumbosacral stenosis in dogs during the past 30 years? The Veterinary Journal 201 (2014) 9–14.
3. Andrade Gomes, S., Lowrie, M., Targett, M. (2018) Long-term outcome following lateral foraminotomy as treatment for canine degenerative lumbosacral stenosis. Veterinary Record 183, 352.

LAURIE'S THOUGHTS:

Okay, so none of these techniques are perfect, nor do they guarantee success. However, they are usually considered only after an unsuccessful trial of 'conservative therapy' (which in veterinary literature still tends to mean pharmaceutical only.) It's also important to know what complications to be aware of (i.e. adhesions or instability). While a surgery might minimize compression, none will immediately address pain or inflammation. Additionally, as rehab practitioners, we should be thinking about functional retraining, postural retraining (i.e. addressing avoidance behaviours), and muscular retraining, as well as ensuring proper neural gliding post operatively. (Tail pulls are simple and safe!)

CONSERVATIVE MANAGEMENT

Traditional Conservative Veterinary Interventions

The conservative treatment of DLSS consists of the use of nonsteroidal anti-inflammatory drugs (NSAIDs), a change in exercise pattern, and body weight reduction. Lumbosacral epidural injections of corticosteroids have recently been reported as a treatment method in dogs, showing improvement in 79% of the patients.[1] The exercise pattern in dogs with DLSS should include regular short leash walks to maintain muscle mass.

Often, mild neurologic deficits also resolve with time, perhaps because of resolution of inflammation. Conservative treatment does not cure the underlying problem but may result in sufficient pain management.

Reference:

1. Janssen L, Beosier Y, Daems R. Lumbosacral degenerative stenosis in the dog. The results of epidural infiltration with methylprednisolone acetate: a retrospective study. Vet Comp Orthop Traumatol. 2009, 22(6): 486-491.

What goes on in HUMAN physiotherapy clinics to treat lumbar stenosis?

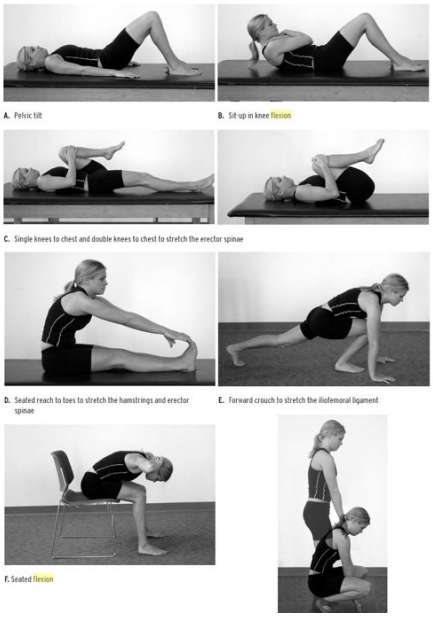
Lumbar spine stenosis is often treated conservatively as a first therapeutic strategy in human healthcare. The most common type of conservative management is with medications such as nonsteroidal anti-inflammatory analgesics (NSAIDs), with additional administration of gabapentin, pregabalin, and limaprost. Acetaminophen is usually recommended for safety purposes since patients with LSS are usually older and at a greater risk of the adverse reactions.[2]

Physical therapy tends to comprise of community-based group exercise and clinic-based manual therapy with individualized exercise. Successful protocols (as found in the literature) were as follows:

- The protocol for inpatient conservative treatment consisted of pelvic traction, the application of a body cast, and an epidural steroid injection; performed in that order until the symptoms improved. Patients were normally admitted for 2–3 weeks. Pelvic traction was used 8 h a day for 2–3 days as a guide. If pelvic traction was ineffective, a body cast was applied for 2 or 3 days to keep the patient's lumbar spine into a slightly flexed position, since the spinal canal had been shown to decrease with extension and increase with flexion. If the body cast was effective, a Williams corset was occasionally fitted after discharge. The patients were asked to wear a Williams corset mainly when going out. When needed, an epidural block was injected into the epidural space a maximum of two times. For radicular pain a selective nerve root block was administered around the epiradicular membrane a maximum of two times.[3]

  Outcome: Although the probability of symptom preservation after the successful conservative treatment of LSS gradually decreased over time, it remained 68.3% at 5 years post-discharge and 57.2% at 7 years post-discharge.

- In the medication group, the patients took 900 mg of acetaminophen 3 times a day.



  In the exercise group, the program included **simple back flexion exercises** for the first 2 weeks. After receiving instructions and a manual from a physical therapist, the participants performed a total of 6 sets of 10 repeats per day. The manual included information on the exercises and evidence-based information on treatment and prevention of LSS, including self-management and risk factors.

  In the acupuncture group, therapy was performed 5 times a month (twice in the first week and once each week from 2 to 4). The acupuncture sites were BL-23, BL-25, BL-5 (3: bilateral area 9 cm outward from the spinous process of S2), BL-54, BL-40, GB-34, BL-57.

  In all three groups, loxoprofen or celecoxib can be used as needed when pain is present.

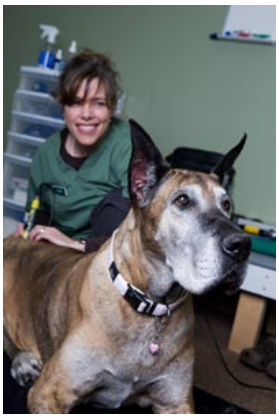
  Outcomes: Symptom severity Zurich claudication questionnaire (ZCQ) scores were improved significantly after treatment in the medication, exercise, and acupuncture groups. Physical function ZCQ scores were improved significantly after treatment in the acupuncture group but not in the medication and exercise groups. The mean ZCQ score for treatment satisfaction was significantly greater after acupuncture than after medication.[2]

- Patients were scheduled for twelve 45- to 60- minute physical therapy sessions over 6 weeks (twice weekly). In addition to the physical therapy visits, all patients were asked to take a daily walk at a pace and distance that did not irritate lower extremity symptoms and to perform a home exercise program.

  Group 1: Flexion Exercise and Walking Group (FExWG). Treatment for this group included lumbar flexion exercises, performance of a progressive treadmill walking program, and subtherapeutic ultrasound.

  Group 2: Manual Physical Therapy, Exercise, and Walking Group (MPTExWG). Patients in this group received manual physical therapy to the thoracic and lumbar spine, pelvis, and lower extremities. Selection of specific manual therapies were therapist-selected and based on identified underlying impairments. Exercises were performed in the clinic and as part of a home exercise program. Finally, patients participated in a body-weight supported (BWS) treadmill ambulation program. BWS systems use a cable and trunk harness system to unload a specific amount of weight from the patient while the patient walks on a treadmill. Compressive forces, or axial loading, has been demonstrated to decrease the cross-sectional area (CSA) of the neuroforamen and central spinal canal and non–weight-bearing positions have been demonstrated to increase CSAs.

Outcomes: A greater proportion of patients in the manual physical therapy, exercise, and walking group reported recovery at 6 weeks compared with the flexion exercise and walking group. At 1 year, 62% and 41% of the manual therapy, exercise, and walking group and the flexion exercise and walking group, respectively, still met the threshold for recovery. Improvements in disability, satisfaction, and treadmill walking tests favored the manual physical therapy, exercise, and walking group at all follow-up points.[4]



- Additionally, there is the possibility that adding modalities might help with lumbosacral stenosis. Shockwave therapy (SWT) showed better long-term results compared to facet joint injections in patients with lumbar facet joint pain. Additionally, SWT showed significant long-term improvement in daily activities limitation.[5]

- Additionally, Laser therapy is able to provide clinically important benefits for patients with non-specific low back pain.[6, 7]

LAURIE'S TAKE-AWAY POINTS:

Firstly, I think it makes sense to try conservative management that includes rehabilitation therapies for degenerative lumbosacral stenosis (DLSS) in dogs, prior to any other therapy or in conjunction with other therapies. From the literature reviewed, I believe you could justify therapies that include manual therapies (mobilizations, traction, stretching, and soft tissue techniques), a walking regime (several short bouts, that do not push past signs of pain or discomfort), specific strengthening (check abdominals, glutes, and quads), and even underwater treadmill therapy with water at hip-high height so as to minimize body weight while walking. On the last point, I think it would be very important to monitor the dog's comfort and to provide sufficient breaks during the exercise. Additional therapies could include acupuncture, laser therapy or shockwave therapy.

Now, be sure to pass this along!

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1. Lynch AD, Bove AM, Ammendolia C, Schneider M. Individuals with lumbar spinal stenosis seek education and care focused on self-management - results of focus groups among participants enrolled in a randomized controlled trial. The Spine Journal 18 (2018) 1303–1312.
2. Oka et al. A comparative study of three conservative treatments in patients with lumbar spinal stenosis: lumbar spinal stenosis with acupuncture and physical therapy study (LAP study). BMC Complementary and Alternative Medicine (2018) 18:19.
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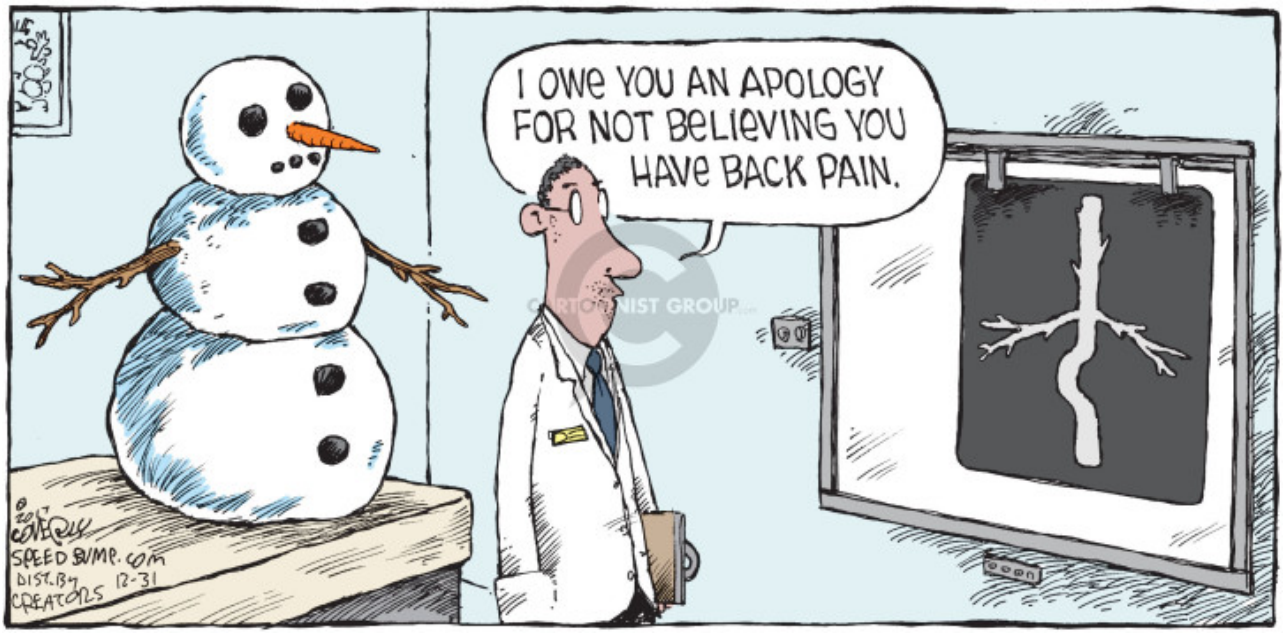
7. Huang Z, Ma J, Chen J, et al. The effectiveness of low-level laser therapy for nonspecific chronic low back pain: a systematic review and meta-analysis. Arthritis Res Ther. 2015 Dec 15;17:360.



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