

“Lil Butt’s Blowout”

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Introduction

Intervertebral disk extrusion (IVDE) is one of the most common neurologic diseases encountered in the canine patient¹⁻⁶. Two types of intervertebral disk extrusion have been described. Hansen Type I is characterized by extrusion of the nucleus pulposus, while Hansen Type II is characterized by continued degradation and protrusion of the annulus^{3-5,7}. This case report will detail the history and presentation, diagnostic approach, surgical correction, and pathophysiology of Hansen Type I disease in a Dachshund.

History & Presentation

Lil Butt is an approximately 5-year-old male neutered Dachshund. On 8/16/21, Lil Butt presented to the Mississippi State University College of Veterinary Medicine Neurology Service after an acute onset of paraplegia. On 8/11/21, Lil Butt's owner first noted that he had been acting abnormal, began hiding under furniture, and had become disinterested in his usual walks. On the morning of 8/15/21, Lil Butt was found unable to walk with his pelvic limbs and presented to his primary care veterinarian.

While under the care of his family veterinarian, radiographs and bloodwork were performed. The radiographs had revealed herniated mineralized disc material and his bloodwork was unremarkable. Lil Butt was given tramadol, methocarbamol, and butorphanol before being referred to MSU-CVM.

On presentation to MSU, Lil Butt was bright, alert, and responsive. He weighed 8.7 kg and was overweight with a body condition score of 8/9. His heart rate was 80 bpm and his respiratory rate was 48 brpm. Cardiopulmonary auscultation revealed no crackles, wheezes, murmurs, or arrhythmias. His mucous membranes were pink, moist, and had a capillary refill

time of less than two seconds. He had moderate dental tartar on all teeth. On abdominal palpation, no palpable masses or organomegaly were appreciated.

Lil Butt had an alert and appropriate mentation during neurologic examination. Cranial nerves and forelimbs were normal. He displayed no motor function of his hindlimbs nor conscious pain sensation and was classified as paraplegic pain negative. Reflexes were intact in the hindlimbs and there was no hyperpathia on spinal palpation.

Diagnostic Approach/Considerations

Injury to the spinal cord can cause varying clinical signs depending on the type and location¹. A thorough neurologic examination allows for localization of the lesion to one of four spinal cord segments (C1-C5, C6-T2, T3-L3, L4-L6)⁵. Lil Butt's condition was characterized by proprioceptive, motor, and nociceptive deficits in his pelvic limbs, absent cutaneous trunci reflex, and otherwise intact spinal reflexes in all four limbs. Based on his clinical signs, Lil Butt's lesion was localized to the T3-L3 segment.

After neurolocalization, advanced imaging can be used both for definitive diagnosis and as a surgical planning tool. Radiographs are often used as a diagnostic tool for suspected cases of IVDE in the general practice setting. Radiographic changes consistent with the disease include narrowing of the disc space as well as mineralized disc material within the vertebral canal. Radiographic findings are suggestive of disease but are not considered diagnostic⁴. Calcification of a disk *in situ* can be suggestive of disk degeneration. However, significant mineralization must be present to detect these changes radiographically, and the presence of a mineralized disc *in situ* is also not diagnostic for disc extrusion⁴. As previously mentioned, spinal radiographs had already been performed by Lil Butt's primary care veterinarian prior to presentation at MSU. His

radiographs revealed a mineralized disc *in situ* as well as mineralized disc material in the spinal canal. Myelography may be used to definitively diagnose an extradural lesion; although this technique has been largely replaced with MRI or CT imaging due to their less invasive nature as well as their higher diagnostic accuracy^{4,5}. Furthermore, three dimensional imaging is superior for surgical planning for decompression of the spinal cord.

Computed tomography (CT) can be used for the diagnosis of IVDE with or without intravenous or subarachnoid contrast administration. Characteristics that are indicative of an extruded disk include hyperattenuating material in the vertebral canal and distortion of the spinal cord. Magnetic Resonance Imaging (MRI) is considered the gold standard of diagnosis and allows for visualization of the herniated disk without the use of contrast^{4,5}.

In our case, an emergency MRI was not available and due to the *in situ* disk material seen on radiographs, a CT was considered appropriate for Lil Butt. This revealed soft tissue and mineral attenuating material in the left side of the spinal canal at the level of T12-T13. The material was compressing the spinal cord and causing a right-sided displacement of the cord.

Pathophysiology

Hansen Type I disease occurs most commonly in chondrodystrophic breeds^{2,5,7}. Popular examples of chondrodystrophic breeds include Dachshunds, English Bulldogs, and Pekingese^{5,7}. In these dogs, degenerative disc disease occurs more rapidly and at a younger age than their non-chondrodystrophic counterparts⁷. The normal anatomy of the intervertebral disc consists of the gelatinous nucleus pulposus surrounded by the annulus fibrosis. In affected animals, Hansen Type I disc extrusion occurs when degenerated and calcified nucleus pulposus extrudes suddenly through the annulus fibrosis.

The healthy nucleus pulposus is primarily composed of water and proteoglycans⁶. However, in diseased patients, the nucleus pulposus undergoes chondroid metaplasia wherein the normal nucleus pulposus is replaced by chondroid-like cells. This process of chondrification involves the degradation of glycosaminoglycans combined with an increase in collagen content^{6,7}. In many dogs, this chondrification is completed in most intervertebral discs by the time they reach 1 year of age⁷. These structural changes leave the intervertebral discs more prone to injury⁶.

Chondrification of the nucleus pulposus and their subsequent dysfunction leads to degeneration of the annulus. These degenerative changes can lead to a complete or partial rupture of the lamellae^{6,7}. This rupture most commonly occurs in the dorsal annulus fibrosis, resulting in abrupt dorsal herniation of the nucleus pulposus into the vertebral canal⁷. This sudden expulsion of the calcified and degenerated nucleus pulposus occurs rapidly and leads to compression and contusion of the spinal cord^{2,5,7}. Contusive and compressive injury then leads to a variety of clinical signs depending on rate, size, and location. These clinical signs include loss of proprioception, motor function, and nociception.

Treatment and Management Options

Medical or conservative management may be elected for select patients. However, medical management should be reserved for those animals displaying only mild clinical signs. The cornerstone of medical management is strict activity restriction. Therefore, client education is paramount when electing to pursue medical management. Further treatment typically consists of analgesics, anti-inflammatory medications, and physiotherapy^{1,5}.

The treatment of choice for animals with proprioceptive deficits to absent nociception is surgical decompression of the spinal cord. Multiple surgical options for intervertebral disk extrusion have been described in published literature. These include a ventral slot, hemilaminectomy, mini-hemilaminectomy, corpectomy, dorsal laminectomy, and fenestration of the intervertebral disk^{1,5}. A hemilaminectomy is currently the most widely performed procedure for the treatment of thoracolumbar disc extrusions. Hemilaminectomy is superior to a dorsal laminectomy for compression due to the improved ability of the surgeon to remove ventral and lateralized herniated disk material¹. Fenestration may also be prophylactically performed in conjunction with a hemilaminectomy to prevent re-herniation of the disk^{1,5}. Some surgeons have suggested that fenestration alone may be a suitable alternative in dogs with mild clinical signs, but few studies have been published on the efficacy of this procedure alone¹.

Historically, literature has indicated that dogs with absent nociception must be treated with early decompression (<24 hours). This recommendation stems from the theory that in dogs with absent nociception, a prolonged period prior to decompression results in poorer neurological outcomes⁵. There is little data available to definitively describe a relationship between duration of injury and likelihood of recovery^{1,2}. However, recent studies have described an increased risk of progressive myelomalacia in patients whom surgery was delayed for >12 hours after onset of non-ambulatory status². Therefore, most neurologists still recommend urgent decompression in patients with nociceptive deficits^{1,2,5}.

After his CT on 8/16/21, Lil Butt immediately underwent a left T12-T13 hemilaminectomy with fenestration of the same disk space. The hemilaminectomy procedure involved the removal of the articular facet joint, a portion of the caudal vertebral pedicle and lamina of the cranial vertebra, and a cranial portion from the caudal vertebra. The extruded disk

material was removed, exposing the spinal cord. The disc site was then fenestrated. The area was copiously lavaged, and a previously harvested fat graft was placed over the surgical site prior to closure.

Strict cage rest is indicated postoperatively. Patients should be confined to a kennel and allowed brief leash walks for urination and defecation⁵. When walking the patient, it may be necessary to use a sling or other device to support their pelvic limbs and prevent further injury. For patients with bladder dysfunction, it is necessary to monitor and express their bladder as needed. This can be accomplished via manual expression or catheterization. Most clinicians and studies agree that anti-inflammatory drugs or other analgesics should be used postoperatively. However, there are conflicting studies on the use of steroids post-operatively. One study found an association with increased complications, while another study suggests that corticosteroids may have a protective effect for the prevention of progressive myelomalacia (PMM)^{1,5}. Therefore, the use of corticosteroids is left to the clinician's discretion.

Lil Butt received a Fentanyl CRI for postoperative analgesia immediately after surgery. He additionally received diazepam (0.6 mg/kg) and bethanechol (0.25 mg/kg) for management of his bladder. After discontinuation of his fentanyl CRI, Lil Butt received acetaminophen with codeine (Tylenol 4) as well as gabapentin (11 mg/kg) for analgesia. Due to hypersalivation and vomiting, Lil Butt was also treated with maropitant citrate (2 mg/kg). His surgical incision was iced every 4 hours for approximately 10-15 minutes for the remainder of his time in the hospital. An ultrasound of his bladder was performed, and his bladder was manually expressed as needed every 6 hours until he began to reliably urinate on his own.

Lil Butt was monitored closely for complications postoperatively. Although he did not encounter significant complications, it should be noted that they can arise. One of the most

common complications is urinary tract infection (UTI). Having a nonambulatory status, the inability of the dog to voluntarily urinate, and indwelling urinary catheters are all factors associated with a higher occurrence of UTI. Patients should be monitored closely for occurrence and treated accordingly⁵. Another rare but fatal complication is PMM. Progressive myelomalacia is defined as ascending and descending necrosis of the spinal cord⁸. The chance for this complication is significantly increased in patients with absent nociception, as well as those with lesions in the caudal lumbar vertebrae².

Expected Outcome and Prognosis

The overall prognosis for animals with intervertebral disc extrusions varies depending on clinical presentation and treatment. Perhaps the most commonly discussed prognostic indicator is the presence or absence of nociception, often called “deep pain perception.” The prognosis for patients with intact nociception is good to excellent, with some texts estimating functional recovery in 80-95% of patients that are treated surgically. However, the prognosis for those patients with absent nociception is less clear. Outcomes in various published literature have ranged anywhere from 30-75%^{1,2,5}. Furthermore, patients with absent nociception may have a higher likelihood of complications such as PMM¹.

Although the role of physiotherapy in association with prognosis has not been significantly studied in the canine patient, physiotherapy is routinely recommended by both human and veterinary neurologists for recovery after an intervertebral disk extrusion. Physiotherapy exercises typically include passive range of motion, supported walking, and underwater treadmill work¹.

Conclusion

The morning following surgery Lil Butt had regained intact nociception in his hindlimbs. By two days post-op, he had gained motor function in both hindlimbs. Lil Butt was discharged 4 days after surgery. At the time of discharge, he was ambulatory paraparetic. Lil Butt's owners were given directions for at-home physiotherapy which included passive range of motion exercises, bicycling, and standing exercises among others. Lil Butt's owners elected to bring him back to MSU-CVM the following week to receive a week of formal rehab, as they were not comfortable performing his physiotherapy exercises at home.

At his final recheck examination one month after surgery, Lil butt was fully ambulatory and had made significant improvement. All medications were discontinued, and he was discharged with instructions for a gradual return to normal activity. It was discussed with Lil Butt's owners that high-impact activity such as jumping would be discouraged for lifelong management and prevention of further disc extrusion.

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