

Schiff - Sherrington Phenomenon in Dog

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Abstract

In some animals with acute, severe lesions of the spinal cord between T2 and L4, the pelvic limb paralysis is accompanied by an extensor rigidity of the thoracic limbs when the animal is in lateral recumbency. This occurs because of an interruption of an ascending spinal cord tract from the lumbar intumescence, which inhibits extensors of the forelimb. Although a severe lesion produces this syndrome, the prognosis is probably not hopeless if deep pain sensation can be elicited from the pelvic limbs. In this review Article we will more Acquaint with the specifications of Schiff-Sherrington Phenomenon.

Keywords: Schiff-Sherrington; SSP; Spinal Cord; Dog; Thoracolumbar Lesions

Abbreviations

T: Thoracic Vertebra; L: Lumbar Vertebra; C: Cervical Vertebra; S: Sacral Vertebra; UMN: Upper Motor Neuron; LMN: Lower Motor Neuron; CT: Computed Tomography Scan; MRI: Magnetic Resonance Imaging; SSP: Schiff-Sherrington Phenomenon

Introduction

The occurrence of acute spinal cord injury has been abundantly reported in veterinary medicine.

Schiff-Sherrington is a phenomenon caused by a lesion in the thoracic or lumbar spinal cord segments (T2-L4) [3], accurately in T3-L3 [1,2,4,5], subsequent to intervertebral disk hernia or traumatic issues.

This phenomenon is a posture specified by rigid extension of the thoracic limbs (with keeping the thoracic limb function) concomitant with pelvic limb paresis or plegia.

This posture will be more recognizable with redundant extensor tone especially when the patient is in lateral recumbency, but there are no associated thoracic limb neurologic deficiency.

Most patients with this phenomenon have T3-L3 spinal cord disorders, probably because this is very common neuroanatomic presentation, and most are non-ambulatory in the pelvic limbs.

Schiff-Sherrington is an anatomic phenomenon without prognostic magnitude.

It is a common condition in dogs with spinal traumatic injury but rarely reported in large animals [1-5].

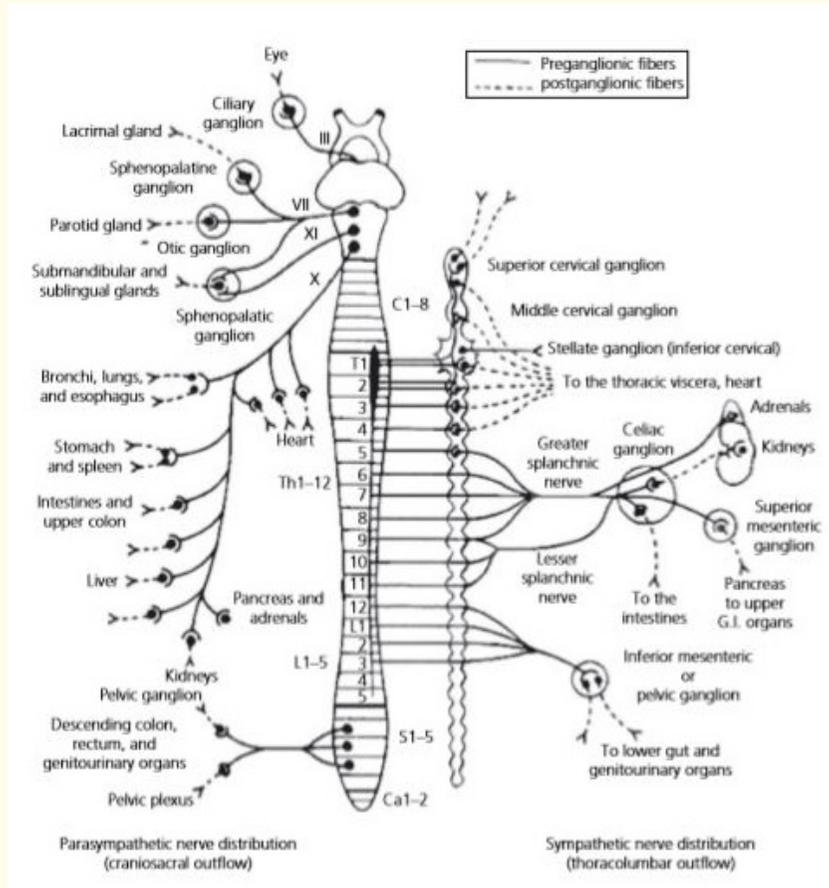


Figure 1: Schematic view of the craniosacral (parasympathetic) and thoracolumbar (sympathetic) nervous system [6].

Symptoms and signs

1. Extension in the head and neck region
2. Abnormal movement
3. Motion restrictions
4. Thoracic limb contraction
5. Opisthotonus
6. Hind limbs spastic paralysis
7. Ataxia
8. Paraplegia/Paraparesis
9. Hypalgesia and Analgesia of pelvic limb [1-14].

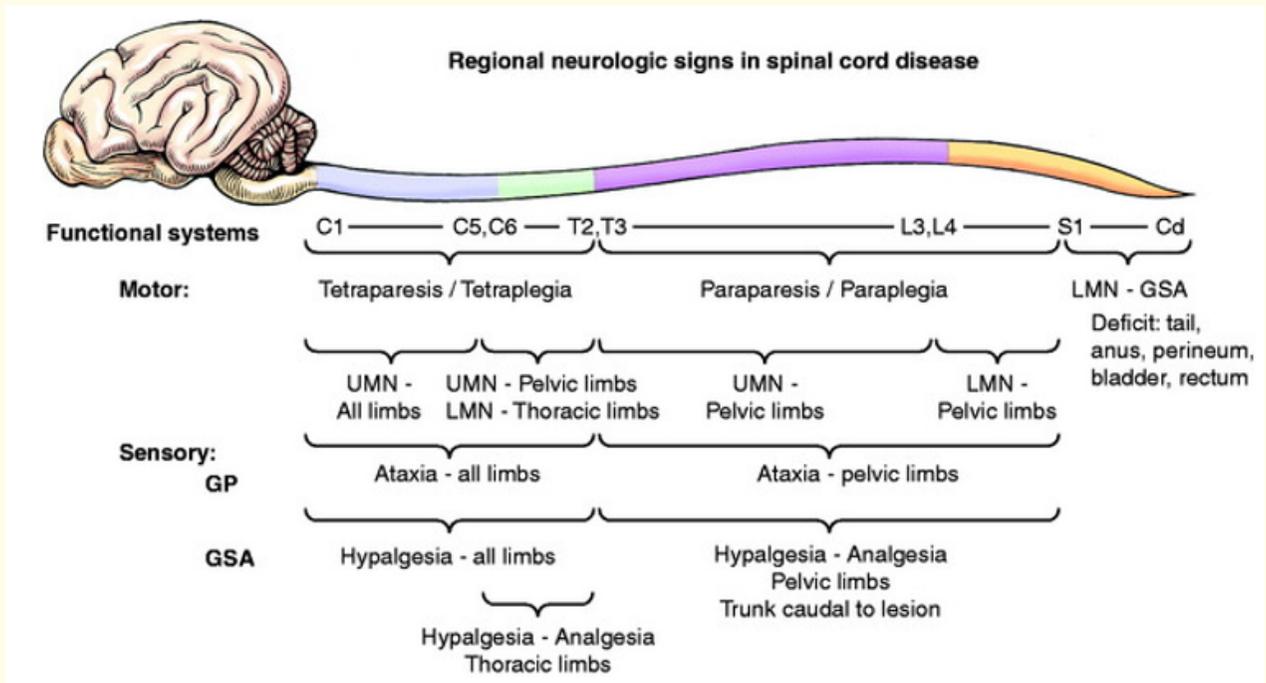


Figure 2: Regional neurologic signs in spinal cord disease.

Source: (<https://veteriankey.com/>).



Schiff-Sherrington Phenomenon: lower back (lumbar) spinal damage that paralyze back legs and removes inhibition to the front legs (can't relax)

Figure 3: Schiff-sherrington phenomenon clinical sign; forelimb contraction.

Source: (<https://ifunny.co>).

Causes

The presenting nerves in thoracolumbar area (T2-L4) play an inhibitory role in the contraction and tone of the thoracic limb [3]. Hence, damage to these nerves due to the interruption of a group of cells in the lumbar gray matter called *border cells* prevents them from acting as a deterrent (Figure 6). These cells project their axons cranially to tonically inhibit the lower motor neurons (LMNs) of thoracic limb extensor muscles [1-5]. Patients with this phenomenon show signs of permanent contraction of the thoracic limb [1-14].

Dogs and cats with lower lumbar spinal cord lesions can also display this posture as the result of interruption of the border cells directly (they are located in the dorsolateral ventral gray matter from L1-L7 spinal cord segments) [1,4,5].

Furthermore, Nervous organs that stimulate the hind limb's tonicus are also affected and reduce contraction of the limb accompanied by the presence of stimulant reflexes, Or even leading to a complete hind limb paralysis.

Fractures of the vertebral column are the most common cause of such lesions.

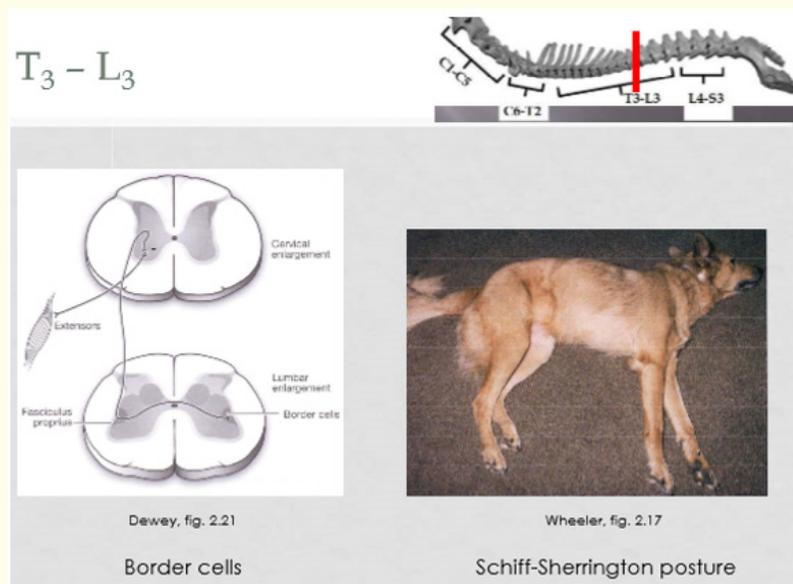


Figure 4: Schiff-Sherrington posture and border cells.

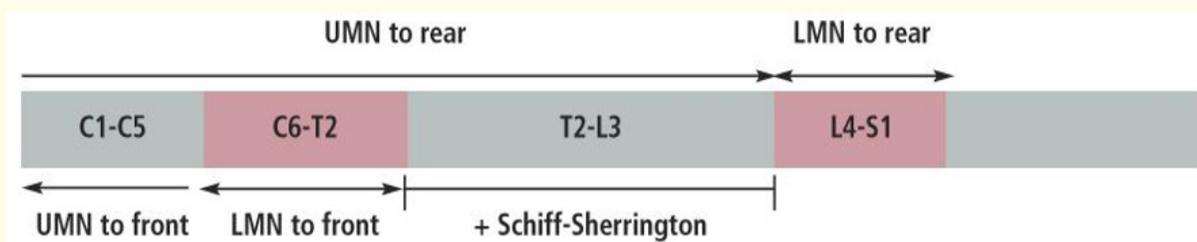


Figure 5: Region of vertebral injuries lead to different phenomenon's especially, Schiff-Sherrington.

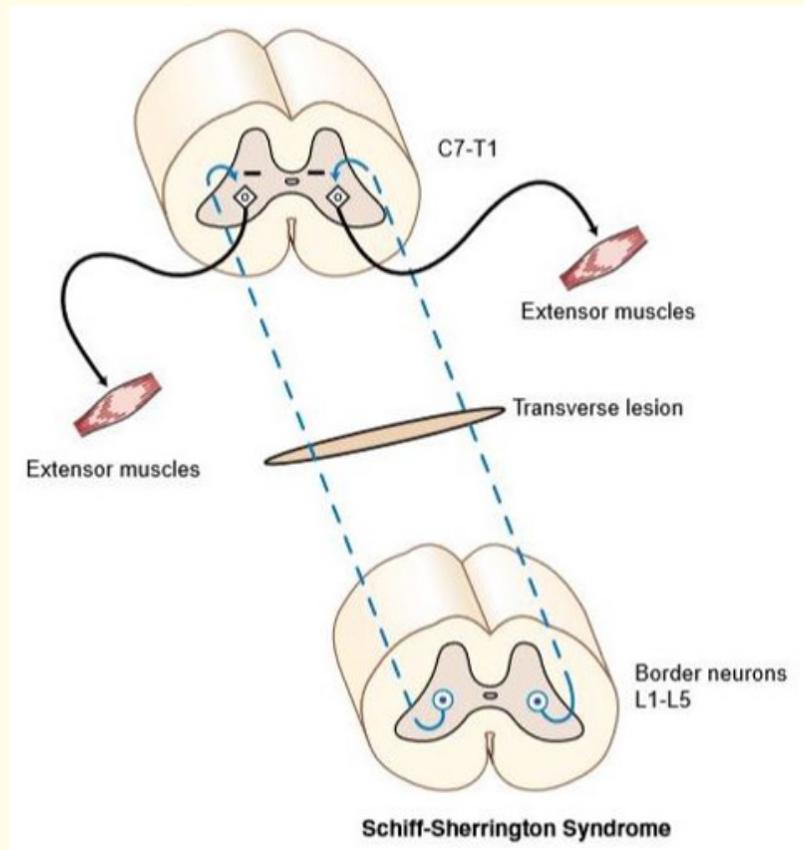


Figure 6: Schematic view of the Spinal Cord, Showing the Process, Causing the Schiff-Sherrington phenomenon.

Source: (<https://veteriankey.com>).

Diagnosis

1. First step is History taking (Is it trauma induced or not?)
2. Complete Blood Count
3. Evaluating limb's anatomical structures
4. Radiography (lateral and ventro dorsal (V-D) view): for considering the structure of spinal column
5. Magnetic Resonance Imaging (MRI) for evaluation of the spinal cord (showing the lesions)
6. Computed Tomography Scan (CT scan)
7. Myelography [1-5,7,8,11].

Treatment

Depending on the severity and location of the lesion the treatment is different. In hopeful cases surgical treatment is useful.

Preoperative management

1. Motion restrictions.

2. Thorough neurologic examination
3. Minimum manipulations.
4. Oral administration of Prednisolone (0.5 mg/kg q12h) in the case of myelopathies is often effective in relieving pain.
5. Polyethylene glycol may be effective
6. Injectable opioid drugs (such as fentanyl)
7. Antiseizure agents (i.e. Gabapentin and Pregabalin) [1].

Anesthetic considerations

1. Risk factors like hypotension, blood loss, cardiac arrhythmias, ventilatory compromise and pain management should be considered.
2. Opioid premedication is helpful for pain management [1,6].

Antibiotics

Intra venous antibiotics (e.g. Cefazolin 22 mg/kg) should be administered 30 minutes before the beginning of the operation and is made every 90 to 120 minutes during surgery and discontinued after operation or within 24 hours [1].

Postoperative care

1. Critical care observation (monitoring vital signs in first 24 hours).
2. Administering analgesics.
3. Observing for seizure activity and gastric dilation-volvulus.
4. Hydrotherapy.
5. Physical therapy.
6. Teaching pet owners about bladder management in the case of urinary incontinence.
7. Neurologic examination should be performed at 1, 2, 3, 6, 9 and 12 months after the surgery or until the fully recovery [1].

Complications

1. Pneumothorax
2. Unintentional injury to thoracic or lumbar nerve roots during operation
3. Excessive hemorrhage
4. Postoperative infection
5. Vertebral luxation
6. Urinary tract infection in the case of recumbent patients [1,2].

Prognosis and recovery

The presence of the Schiff-Sherrington phenomenon is usually a sign of serious injury to the spinal cord and has a Prudential Prognosis but does not show the failure of recovery.

This is because many patients with severe thoracolumbar spinal cord lesions may not demonstrate the former performance.

Although, an animal with good feeling of pain usually indicate a good prognosis even in the attendance of the Schiff-Sherrington phenomenon.

With rapid and aggressive treatment, the patient, can feel pain in its extremities lower than the spinal injury [1,3-6].

Differential diagnosis

As there is no correlation between brain and this phenomenon it should not be confused with other postures that reveal thoracic limb rigid extension; like decerebrate and decerebellate rigidity.

Decerebrate rigidity (Figure 7) is a posture due to a drastic brainstem injury; it is characterized by rigid extension of all thoracic and pelvic limbs and often includes opisthotonus.



Figure 7: Decerebrate rigidity caused by a brainstem lesion in felne.

Source: Fossum, T.W. 2018. Small animal surgery.

Because of the location of the lesion, dogs and cats with decerebrate rigidity commonly have severe unconsciousness (like stupor or coma).

Decerebellate rigidity is less happened and is due to acute cerebellar damage. This posture is Characterized by hyperextension of the thoracic limbs and flexion of the pelvic limbs.

And also it shouldn't misdiagnosed with cervical spinal cord problems for example C1-C5 lesions [1,4,5].

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