SHIVERS-STRINGHALT SYNDROME

PART 3: ANATOMY & STRUCTURES RESPONSIBLE

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DECLUE EQUINE, LLC
IN 1882 WILLIAM WILLIAMS STATED:
- Professor Dick was of opinion that it was due to the presence of tumours in the lateral ventricles of the brain, and supported his views by a post mortem proof. But tumours in the ventricles may be present without chorea; and chorea is very often present without such tumours.
- Other writers have traced its origin to a hypertrophied condition of the nerves given off from the lumbar plexus, to the pressure of some exotoses on a nerve, and to paralysis of the muscles antagonistic to those affected with the spasm.

IN 1930 WILLIAM MITCHELL STATED:
- From the frequency with which specimens were obtained in this region in September, I was led to believe that the Lumbar Vertebrae, with their more complicated articulations associated with the transverse processes of the 4th, 5th and 6th., would in all probability show similar changes.
- Remembering that the Lumbo-Sacral plexus of nerves was formed by the ventral roots of the 4th, 5th and 6th Lumbar and 1st and 2nd Sacral nerves, and that the ventral intervertebral foramina, by which the first three of these roots emerge, were in close proximity to joints medially, and laterally, it struck me that the nerves emerging from these foramina were peculiarly liable to suffer from the effects of osteo-arthritis change if these neighbouring joints should ever be affected.
- From this deduction I began to wonder if the conditions shivering and stringhalt might be explained in this way. It so happened that about this time a shiverer came to my notice which I managed to get the Zoo to buy for slaughter and I thus got an opportunity of testing the hypothesis I had formulated. (See Case 1 below.)
LET’S GET TO THE POINT!
FOR LITERALLY...

138 YEARS (W.WILLIAMS) & 90 YEARS (W.MITCHELL)
THEY HAD THE SOME OF THE ANSWERS SO MANY YEARS AGO!
UNFORTUNATELY...
SO MANY HORSES HAVE LOST THEIR LIVES AND CAREERS
So... what is causing shivers and stringhalt?
It is an injury to several:

Musculoskeletal structures

Nerve plexus

Nerve injury
WHAT ARE THE RIGHT QUESTIONS??

- **WHAT**
  - Structures

- **WHERE**
  - Located

- **WHEN**
  - There is an Injury

- **HOW**
  - Does it occur?

- **WHY**
  - Is it occurring
WHAT MUSCULOSKELETAL STRUCTURES ARE THE CAUSE?
THE ILIOPSOAS MUSCLE:

a. PSOAS MINOR
b. PSOAS MAJOR
c. ILIACUS
THE Iliopsoas IS THE TENDERLOIN THAT YOU EAT!
THESE 3 MUSCLES TOGETHER ARE CALLED THE “ILIOPSOAS”
Horse Pelvic Muscles
WARNING!

NECROPSY PICTURES WILL BE SHOWN!
NORMAL
ILIOPSOAS

Fig. H.17 Ventral aspect of the roof of the abdomen and pelvis. Cranial is to the left.

1- Left fifteenth rib; 2- Right fifteenth rib; 3- Left eighteenth rib; 4- Right eighteenth rib; 5- Sixth lumbar vertebra (body); 6- Left ilium, 6a- tuber coxae, 6b- neck, 6c- body; 7- Right tuber coxae; 8- Left pubis (body); 9- Left ischium; 10- Left acetabulum; 11- Pelvic symphysis; 12- Sacrum; 13- First sacral vertebra (sacral wings); 13a- left transverse process, 13b- right transverse process; 14- Right femur, 14a- body, 14b- head (in the right acetabulum*), 14c- lesser trochanter; 15- Lumbosacral disc (L6 disc); 16- Left sacroiliac joint; 17- Left sacrosciatic ligament; 18- Major ischiatic foramen; 19- Iliocostal ligament; 20- Ventral longitudinal ligament covering the lumbar vertebral bodies; 21- Left major psoas muscle (cut); 22- Right iliopsoas muscle, 22a- major psoas muscle, 22b- iliac muscle (lateral part), 22c- iliac muscle (medial part); 23- Left minor psoas muscle, 23a- muscle body, 23b- tendon inserted on the tuberculum of the minor psoas of the ilium neck; 24- Right minor psoas muscle, 24a- muscle body, 24b- tendon; 25- Iliac fascia; 26- Intercostal muscle; 27- Intercostal nerve; 28- Prepubic tendon (insertion of the rectus abdominis on the pubis); 29- Obturator externus muscle; 30- Left sciotic nerve; 31- Right sciotic nerve; 32- Right femoral nerve.
NORMAL ILIOPSOAS

8 MTH OLD HORSE
Normal Iliopsoas

- Iliacus
- Psoas Major
- Psoas Minor
ABNORMAL ILIOPSOAS

ATROPHY & FIBROSIS OF PSOAS MAJOR & PSOAS MINOR
FIBROSIS OF PSOAS LEFT MINOR
(RIGHT PSOAS MINOR REMOVED)
WHAT NERVES ARE INJURED & WHAT PLEXUS IS INVOLVED?
NERVE INURY TO THE
LUMBOSACRAL PLEXUS WHICH IS
THE NERVE ROOTS OF:
L4-L5-L6-S1-S2
FEMORAL NERVE
OBTURATOR NERVE
SCIATIC NERVE
<table>
<thead>
<tr>
<th>SPECIES COMPARISON</th>
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<tbody>
<tr>
<td><strong>Table 1. Vertebral Formulas and Spinal Nerve Roots Supplying Major Peripheral Nerves in the Horse, Ox, and Dog</strong></td>
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<tr>
<td><strong>Vertebral Formula</strong></td>
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<tr>
<td><strong>Brachial Plexus Nerves</strong>[1,2]</td>
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<tr>
<td>Suprascapular</td>
</tr>
<tr>
<td>Subscapular</td>
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<tr>
<td>Musculocutaneous</td>
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<td>Axillary</td>
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<td>Radial</td>
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<td>Median</td>
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<tr>
<td>Ulnar</td>
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<tr>
<td>Lumbosacral Plexus Nerves[5,6]</td>
</tr>
<tr>
<td>Obturator</td>
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<tr>
<td>Sciatic</td>
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<tr>
<td>Common peroneal</td>
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<td>Tibial</td>
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[1] Numbers in parentheses designate the number of animals containing particular fiber distributions out of the total number studied. In some cases, conflicting data or no numerical data are available on nerve root distribution. In these instances, brackets are used to denote less frequently seen contributing nerves according to the cited references.


FEMORAL NERVES RUN BETWEEN THE PSOAS MINOR AND MAJOR MUSCLES!
Methyl Blue Study & Necropsy
Methyl Blue Study & Necropsy
Methyl Blue Study & Necropsy
Methyl Blue Study & Necropsy
Methyl Blue Study & Necropsy
VERY SIMPLE TO FIGURE OUT...

IF YOU CAN UNDERSTAND...

**BASIC WIRING DIAGRAMS!**
WHAT ARE THE RIGHT QUESTIONS??

- WHAT
- WHERE
- WHEN
- HOW
- WHY

- Located
WHERE ARE THESE STRUCTURES?
UNDER THE SPINE!
H.4.2 Transverse sections

Fig. H.20 Transverse section of the thoracolumbar area between the last thoracic vertebra and the first lumbar vertebra.

1- Vertebral arch of the eighteenth thoracic vertebra (T18); 2- Caudal articular process of T18; 3- Articular process joint between T18 and the first lumbar vertebra (L1); 4- Vertebral fossa of T18; 5- Ventral crest of T18; 6- Vertebral head of L1; 7- Intervertebral disc between T18 and L1; 8- Eighteenth (last) rib; 9- Multifidus muscle; 10- Multifidus fascia; 11- Erector spine muscle, 11a- aponeurosis, 11b- iliocostalis lumborum muscle; 12- Thoracolumbar fascia; 13- Psoas minor muscle; 14- Psoas major muscle; 15- Costotransverse muscle; 16- Intercostal muscles; 17- Vertebral canal; 18- Spinal cord; 19- Internal vertebral plexus; 20- Intervertebral foramen; 21- Dorsal costoabdominal artery, vein and nerve; 22- Skin.

Fig. L.17 Transverse section of the lumbosacral junction passing through the body of the sixth lumbar vertebra (L6).

1- Sixth lumbar vertebra (L6), 1a- body, 1b- transverse process, 1c- caudal articular process; 2- First sacral vertebra (S1), 2a- transverse process, 2b- cranial articular process; 3- Iliac wing, 3a- base of the sacral tuber; 4- Lumbosacral intertransverse joint, 4a- joint space, 4b- ventral lumbosacral intertransverse ligament; 5- Sacroiliac joint, 5a- joint space, 5b- ventral sacroiliac ligament, 5c- intersosseus sacroiliac ligament; 6- Multifidus muscle; 7- Dorsolateral sacrocaudal muscle; 8- Gluteus medius muscle; 9- Psoas minor muscle and tendon; 10- Psoas major muscle; 11- Lateral part of the iliac muscle; 12- Tensor fascia latae muscle; 13- Internal iliac artery; 14- Common iliac vein; 15- Iliolumbar artery and vein; 16- Sacral canal with end of the spinal cord, dural cone and origin of the cauda equina; 17- Dorsal ramus of the sixth lumbar nerve; 18- Ventral ramus of the fifth lumbar nerve.
Jean-Marie Denoix
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Biomechanics & Physical Training of the Horse

- M. obliquus externus
- M. rectus abdominis
- M. rectus lumbofemoralis
- M. obliquus internus
- M. transversus abdominis
- M. iliocostalis
- M. psoas major
- M. quadratus lumborum

4.4.2 Muscles and tendons involved in bending of the neck:
- Posterior to the spinous processes of the thoracic vertebrae (T1-T12), the muscle fibers insert into the sacral tubercles.

4.4.3 Location of the spinous processes of the thoracic vertebrae:
- The spinous processes are located on the posterior aspects of the vertebrae, appearing as prominent protuberances on the vertebral column.

Effects on the vertebrae and muscles of the neck:
- Flexion of the neck causes a pull on the vertebrae, stretching the muscles and tendons.
- The degree of flexion can vary depending on the position and mobility of the vertebrae.
Sincere thanks and gratefulness to:

Jean-Marie Denoix
THANKS TO:

WILLIAM WILLIAMS & WILLIAM MITCHELL
GRATEFUL THANKS

TO THE HORSES WHO HAVE SACRIFICED THEIR LIVES FOR THIS INFORMATION
WHAT IS NEXT?
WHAT IS THE DIFFERENCE AND STRUCTURES INVOLVED IN THE CLINICAL SIGNS OF:

SHIVERS VERSUS STRINGHALT?
FRONT LIMB VERSUS HIND LIMB SHIVERS & STRINGHALT
WHAT CAN YOU DO?

- SUBSCRIBE TO THIS CHANNEL
- STAY TUNED TO THIS CHANNEL
- SHARE THIS CHANNEL
- LISTEN TO: THE HORSE FIRST PODCAST
- DONATE TO THE KINEMATIC RESEARCH AT DECLUE EQUINE.COM