

SUPPLEMENTARY STUDIES ON THE SENSORY INNERVATION OF THE PARIETAL PERITONEUM

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by

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1. SPINAL SEGMENTS OF THE AFFERENT NERVES OF THE PARIETAL PERITONEUM OF THE CAT.

The parietal peritoneum is afferently innervated by the intercostal and lumbar nerves, and some afferents are also considered to be in phrenic nerves.

I selected one point in the parietal peritoneum and decided the spinal segments of the afferent nerves of the parietal peritoneum.

Experimental Materials and Methods.

Adult cats (2.4kg-3.1kg) were used.

I used noci-reflexes (avoiding reactions and changes of the respiration and the blood pressure) as indicators. The changes of respiration and the blood pressure through a carotid artery were recorded on kymograms respectively.

One point at the height of the 3rd lumbar vertebra in the retroperitoneum was selected, and the stimuli used were pinching with a forceps and electric faradization (2 volt, 14-16cm, 1-3sec.)

Laminectomy was performed under subcutaneous injection of 20% Urethan solution (3cc per kg).

In order to decide the upper border of spinal segments, transection of the spinal cord was performed and to decide the lower border of spinal segments, posterior rhizotomy was done.

Experimental Results

Stimulation of the parietal peritoneum of a normal cat shows marked noci-reflexes, but noci-reflexes disappear after transection of the spinal cord (Th. 7-Th. 8)(Fig. 1. and 2.)

This proves that the upper border is the 8th thoracic cord. And noci-reflexes are seen after posterior rhizotomy (Th. 8-L. 4) but they disappear after posterior rhizotomy (Th. 8-L. 5). The lower border is the 5th lumbar cord.

Summary

I studied the spinal segments of the afferent nerves in the parietal peritoneum (the retroperitoneum at the height of the 3rd lumbar vertebra) using noci-reflexes as indicators. The spinal segments are Th8-L5.

2. THE AFFERENT PHRENIC INNERVATION OF THE ABDOMINAL VISCERA

LUSCHKA claimed that the phrenic nerve is distributed till at the navel in the

peritoneum of the anterior abdominal wall, but RAMSTROEM denied. And the bile ducts and gall bladder are afferently innervated by the vagi and the sympathetic nerves. Shoulder-tip pain in cholelithiasis is thought a symptom resulting from stimulation of the phrenic nerve.

I studied, from the physiological standpoint, on the existence of the afferent phrenic innervation of the abdominal viscera (mainly the parietal peritoneum, bile ducts and gall bladder).

Methods of Study

The afferent paths of the upper abdominal viscera except the phrenic nerve are intercepted after transection of the spinal cord (above the upper border of the spinal segments) and bilateral vagotomy in the neck. To decide the area innervated by the phrenic nerve it needs to decide the upper border of spinal segments of the afferent nerves (except the phrenic nerve) in the upper abdominal viscera.

Experiments 1.

The upper border of spinal segments of the afferent nerves in the upper abdominal viscera.

Experimental Materials and Methods

The animal dies immediately when phrenic exeresis is bilaterally performed at the same time.

Phrenic exeresis at one side, bilateral vagotomy in the neck and transection of the spinal cord were performed.

6 adult cats were used. Right phrenic exeresis was performed in 4 cats and left phrenic exeresis in 2 cats.

I measured the blood pressure through a carotid artery.

Experimental Results

In cats in which right phrenic exeresis, bilateral vagotomy and transection of the spinal cord (Th.4-Th.5) were performed noci-reflexes were seen by stimulation of the right upper abdominal viscera and the right parietal peritoneum but they disappeared after transection of the spinal cord (Th.3-Th.4) (Fig. 3).

Left phrenic exeresis produced similar results.

The upper border of spinal segments of the afferent nerves in the upper abdominal viscera is the 4th thoracic cord.

Experiments II

Phrenic innervation of the abdominal viscera.

As shown in the experiments I the observation of noci-reflex resulting from stimulation of the abdominal viscera after transection of the spinal cord (Th.3-Th.4) and bilateral vagotomy in the neck is sufficient to decide the area innervated by the phrenic nerve.

Experimental Materials and Methods

20 adult cats were used.

Electrical and mechanical stimuli were given to the bile ducts and gall bladder

P. P. : Stimulation of parietal peritoneum
 Ach. : Acetylcholine injection
 V. : Vomiting

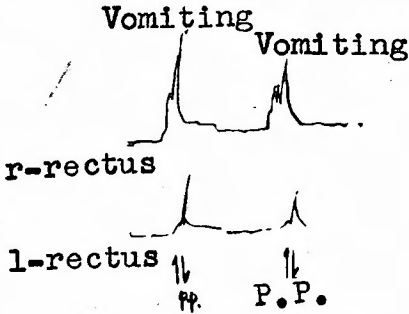


Fig. 1

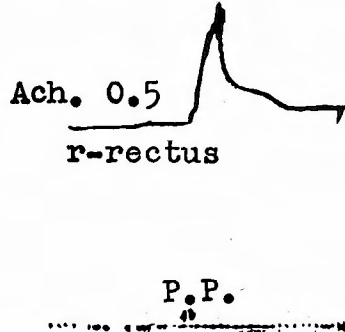


Fig. 3

2.8 kg ♀

decerebration

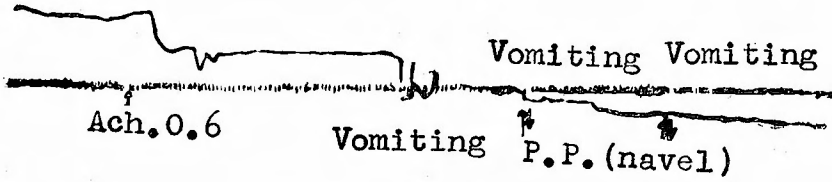


Fig. 2

2.5 kg ♂

bilateral splanchnectomy

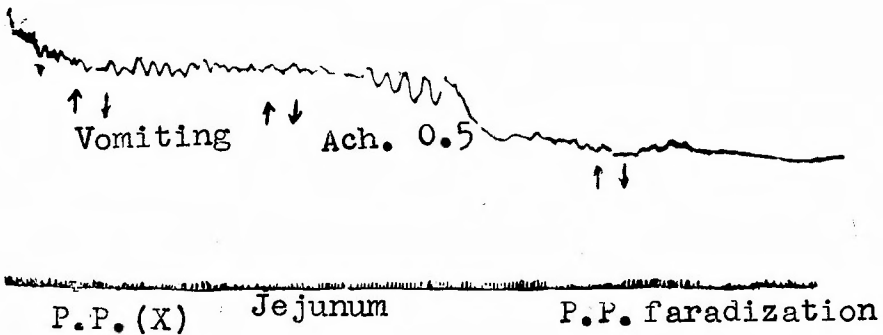


Fig. 4

and the parietal peritoneum of the cat in which transection of the spinal cord(Th.3-Th.4) and bilateral vagotomy in the neck were performed.

The changes of the blood pressure through a carotid artery were recorded on kymograms(Fig. 4).

Experimental Results

Noci-reflexes were seen in the whole length of the common bile duct, hepatic duct and cystic duct.

Summary

I examined the afferent innervation of the abdominal viscera by the phrenic nerve using noci-reflexes as indicators.

The phrenic innervation is dense in the common bile duct, hepatic duct and cystic duct, but it is not proved in the gall bladder.

The parietal peritoneum of the anterior abdominal wall is not innervated by the afferent fibres of phrenic nerve, but the upper parts of the retroperitoneum have their sensory supply.

The most parts of the diaphragmatic peritoneum, a part of lig. teres hepatis and lig. falciforme hepatis are afferently innervated by the phrenic nerve.

I am much indebted to Assistant Prof. Dr. CHUJI KIMURA of our clinic for his constant help throughout my study.

- Fig. 1** A. Response of respiration by electric faradization of the parietal peritoneum.
 B. Change of respiration by pinching the parietal peritoneum with a forceps.
- Fig. 2** A. Response of the blood pressure by electric faradization of the parietal peritoneum.
 B. Response of the blood pressure by mechanical stimulation of the parietal peritoneum.
- Fig. 3** The rise or fall in the blood pressure by pinching the common bile duct with a forceps.
- Fig. 4** Response of the blood pressure by mechanical stimulation of the common bile duct, hepatic duct and cystic duct under bilateral vagotomy and spinal transection. Th. 3-Th. 4

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和文抄録

体壁腹膜の知覚神経支配に関する研究補遺

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尾 辻 貞 夫

- 1) 猫体壁腹膜の求心性神経の所属脊髄断区
 猫を使用して、体壁腹膜として後腹膜第3腰椎の高さの一点を選び、侵害反射を指標としてその所属脊髄断区を決定した。その所属脊髄断区は第8胸髄—第5腰髄である。
- 2) 猫横隔膜神経(求心神経)の腹腔臓器支配
 猫を使用して、横隔膜神経(求心神経)の腹腔臓器、特に胆道及体壁腹膜支配を侵害反射、(血圧の変化を

主として)を指標として研究して、以下の如き結論に達した。

輸胆管、肝管、胆嚢管は横隔膜神経の支配濃厚で、胆嚢は之を欠き、体壁腹膜は前腹壁に於いてはみられないが、後腹膜では上部にはその支配がみられる。

その他、横隔膜腹膜は大部分その支配を受け、肝門靱帯、肝鎌状靱帯も一部その支配を受ける。