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CELIOMESENTERIC AFFERENCE OF THE DORSOLUMBAR NEUROMERS IN PIG

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Abstract: The frequent variability of the splanchnic branches in all species creates difficulties both in carrying out physiological experiments and; particularly; in interpreting the clinical data; given the need for an in depth study of the comparative physiology; this paper presents some specifications concerning the neuroglandular relations in the mesenteric area in pigs.

A total of 32 dissections were conducted on fresh; non-mummified corpses and were accompanied by comparative evaluations. The nervous formations were tracked up to the limit of visibility with the magnifying glass of 15 dioptres. To make possible the differentiation of the nervous fibres; the arteries were injected with a red dye. The ganglion formations were investigated with histological methods of differentiation.

The dissection also revealed that the efferent fibres which approach the celiomesenteric plexus do not belong; as thought; only to the large and small splanchnic; but also to the lumbar splanchnic nerves which were regarded as being small accessory splanchnic nerves. According to these wrong data; the renosuprarenal plexus would only include abdominal splanchnic afferences and not also lumbar splanchnic afferences; as it actually happens. Speaking of pigs; the data reveal the existence of peculiarities regarding the dorsolumbar efferences of the celiomesenteric plexus which detach in most cases from the interganglionar connectives and not directly from the paravertebral ganglia. Another observation is related to the existence of the renal nerves (one or two small fibres); nerves which detach from the abdominal splanchnic nerves which; crossing over the lateral side of the suprarenal gland seem to link it to the kidneys. The existence of postrenal nervous loops might provide evidence; if not on the ontogeny; at least on the way of postembryonic migration of this organ.

INTRODUCTION

The frequent variability of the splanchnic branches in all species creates difficulties both in carrying out physiological experiments and; particularly; in interpreting the clinical data; given the need for an in depth study of the comparative physiology; this paper presents some specifications concerning the neuroglandular relations in the mesenteric area in horses.

The celiac afference of the dorsolumbar neuromers in the domesticated species has been analysed tangentially on several occasions by the collective of the discipline of compared anatomy and by other researchers. Most data known so far are either fragmented; or incomplete.

The anthropometric data allowed by their simplicity the generalization of the constitutive design which; assumed by the veterinarian anatomists (1; 2) has been long-time considered as being final. However; Uchida offered several additional data regarding especially the thoracic and abdominal areas in pig. Urematsu insists particularly on the constitutive centripetal fibres of the large splanchnic; while Weltner insists especially on the sympatic in the cat.

Pintea et al.; analyzing the dorsolumbar communicants specified only roughly the Celiomesenteric afferences; while Muller; analysing the hepatic nerves insists particularly on the zonal solar efferences. Among the papers we consulted we noticed the work of Kolda also cited by Ellenberger and Baum (1). The analysis of the abdominal sympatic in the horse seemed; however; quite generic and the specifications on the splanchnic nerves and ganglions; quite brief. Besides the

topographical specifications; the veterinary nomenclature required alignment with the "Nomina Anatomica Veterinaria".

MATERIAL AND METODE

A total of 32 dissections were conducted on fresh; non-mummified corpses and were accompanied by comparative evaluations. The nervous formations were tracked up to the limit of visibility with the magnifying glass of 15 dioptres. To make possible the differentiation of the nervous fibres; the arteries were injected with a red dye. The ganglion formations were investigated with histological methods of differentiation.

RESULTS AND DISSCUTIONS

On the right side we observed multiple variants; the celiac ganglion being located not on the lateral side of the celiac artery or between it and the cranial mesenteric artery; but on the lateral side of the origin of the cranial mesenteric trunk.

In 15 of the dissected cases the large splanchnic appeared double; isolated exclusively by the thoracic ganglions 8-9; approaching separately the celiac ganglion. While the actual large splanchnic approached the ganglion at the height of its dorsal border; the accessory large splanchnic after entering the abdominal cavity; recurved around the diaphragmatic pillar and crept underneath the cranial angle of the ganglion; making an anastomosis with the fibres of the suprarenal plexus; to approach thereafter the medial side of the ganglion mass. The small splanchnic also displayed a double appearance; existing a small cranial splanchnic; isolated from the interganglionar connective 17-18 T; which approached the celiac ganglion at the height of the dorsal border close to its cranial pole; and a small caudal splanchnic; isolated from the interganglionar connective 18 T-1L (with origin in 18 T) which; after circling the insertion of the diaphragmatic pillar approached the semilunar ganglion at the height of the upper border. No direct lumbar afferences were observed; only through the renal plexus and through a small ganglion located on the lateral wall of the vena cava beneath the origin of the renal artery (Fig. 1).

In 50% of the cases (16 cases); the large splanchnic constituted according to the common norm; but receiving afference up to ganglion 16 & inclusive; before entering the abdominal cavity; issued 2 small nervous fibres for the right intermediary diaphragmatic pillar then; after crossing the diaphragm; ended completely in an evident suprarenal ganglion which it approached by a bifurcation. From the suprarenal ganglion; part of the fibres irradiated towards the suprarenal gland; while most of them joined the celiac plexus and the celiac ganglion. The small splanchnic presented in these cases a particular configuration detaching from the level of a true small splanchnic plexus (Fig. 2). From this plexus emerged 3 efferents: one fine branch joined the large splanchnic by a bifurcation; a second branch; more evident; detached from the same plexus passed beneath the cava affluence of the first lumbar vein; approaching the suprarenal ganglion and forming together with one of the terminal ramifications of the large splanchnic a true suprarenal loop; the third branch detached from the caudoventral part of the interganglionar sympatic plexus was insinuating beneath and then “over” the origin of the renal artery joining subsequently at the celiac plexus and forming thus a true “post renal loop”.

In a case; the large splanchnic; receiving the last bundle of fibres from the interganglionar connective 17-18 T (with origin in 16 T); presented on its border a fine cordon which dissociated in 4 small fibres: one small fibre attached briefly to the trajectory of the abdominal small splanchnic nerve; the end thereafter in the renal plexus; the second small fibre which represented a true caudal small splanchnic descended towards the area of cava affluence of the first lumbar vein where is bifurcated approaching by a branch the celiac ganglion and by the other branch it participated in the formation of an evident suprarenal loop; the third small fibre joined the preceding one to form a suprarenal loop around the cava affluence of the first lumbar vein and the last small fibre; creeping beneath the same vein; thereafter over the origin of the right renal vein; went towards a small ganglion located beneath the origin of the renal artery; this last ganglion joining the celiomesenteric plexus.

In a proportion of 50%; the large splanchnic received in the area of the interganglionar connective 15T-16T three major bundles of short fibres and ended in the mass of the right celiac ganglion; after it issued small nervous fibres which ended in the cranial pole of the suprarenal. The small cranial splanchnic became isolated at the level of the interganglionar connective 17-18 T descending separately and ending in the mass of the celiac ganglion. Two additional small fibres representing 2 small accessory splanchnic nerves became detached at the level of the interganglionar connective 18T-1 L. The first nervous fibre became isolated by a double root which approached the dorsal border of the celiac ganglion; while the second nervous fibre; fine; descended obliquely over the origin of the renal artery and ended in the cranial mesenteric ganglion.

In 30% of the cases the celiac ganglion displayed a particular aspect having two distinct parts on the right side: one portion represented the main ganglion mass which stretched behind the celiac trunk; while the second portion appeared like a laterodorsal extension of the caudal vena cava; much of it insinuating between the cava and aorta; merging with the main ganglion portion. This second portion received most of the afferents.

On the left side can be observed from the beginning the rather cranial location of the semilunar ganglion (Fig. 3). 30% of the large splanchnic individualized from the 14th dorsal ganglion to the 15th ganglion; crossed the diaphragm at the level of the diaphragmatic pillar presenting a slight ganglion thickening which merged with the border of the celiac ganglion. The small cranial splanchnic isolated at the level of the interganglionar connective 16-17T crossed the diaphragm separately forming on the caudal border of the diaphragmatic pillar an evident plexiform tissue in which a branch of the large splanchnic also took part. An evident small cranial splanchnic formed from the convergence of two roots; one detached from the 17-18T connective; the other from ganglion 18T; became isolated from the ganglion chain and ended in the dorsocranial angle of the plexiform tissue formed from the joining of the two small splanchnics. A third short and fine connection detached from the level of ganglion LI was directed cranially and ended in the same plexus. Thee categories of fibres became isolated from the plexus: some formed by addition a true renal nerve which ended in the renal plexus; other provided a link with the efferents of 1L-2L connective; the last category of fibres bifurcated towards the celiac ganglion and towards the origin of the renal artery where they were forming a loop around this origin.

In 3 of the dissected cases; the large splanchnic individualized from the level of the 8th and 9th thoracic ganglion received the last reinforcement branches at the level of the 15th ganglion. After issuing the cranial suprarenal nerves; the large splanchnic widened slightly and approached the celiac ganglion at the level of its median intumescence. The small splanchnic isolated and perfectly individualised from the level of the 15th thoracic ganglion; received successively reinforcement branches detached from the interganglionar connectives subsequent to its origin; up to its exit through the thoracic cavity. After passing the orifice through which it crosses the diaphragm it oriented parallel with the large splanchnic nerve and received one more reinforcement branch from the interganglionar connective TI8-L1. The small splanchnic thus formed approached the celiac ganglion and the suprarenal ganglion. The splanchnic nerve LI was in all cases compared to a branch resulting from the convergence of two roots: one detached from the first lumbar ganglion going towards the renal ganglion and another detached from the interganglionar connective L1-L2 which; after a short distance joined the first branch to form an evident renal nerve.

In about 10% of the cases the celiac afference of the dorsolumbar neuromers appeared extremely simple; the small splanchnic joining the large splanchnic and both approaching the celiac ganglion.

In one case; the large splanchnic; extremely developed; formed by the merging of the fibres from the 7th to the 17th thoracic ganglia; exit the diaphragm becoming excessively wide after that; displaying a small ganglion formation right after its exit from the thoracic cavity (Fig. 3). This formed; the large splanchnic receives fibres from the interganglionar connective TI8-L1 and participated by a bundle of fibres to the formation of the celiac plexus; by another bundle to the formation of the renosuprarenal plexus (also formed by some fibres detaching directly from ganglion 18T) and; by another bundle; to the formation of the cranial mesenteric plexus.

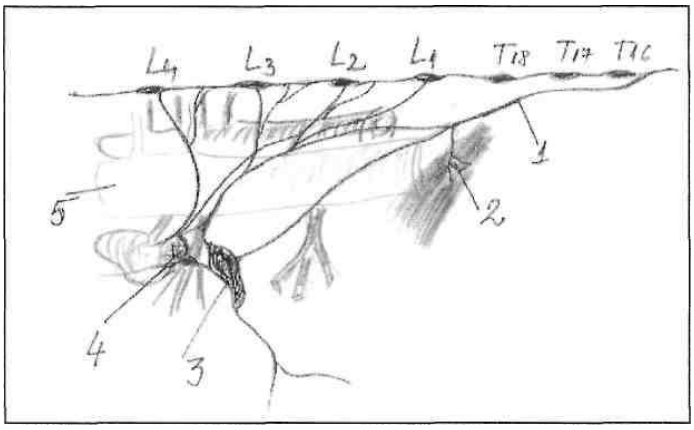

Fig. 1- Celiac afferences (right). 1- large splanchnic; 2 – diaphragm pillar muscle; 3 –celiac ganglion; 4- renosuprarenal ganglion; 5- vena cava

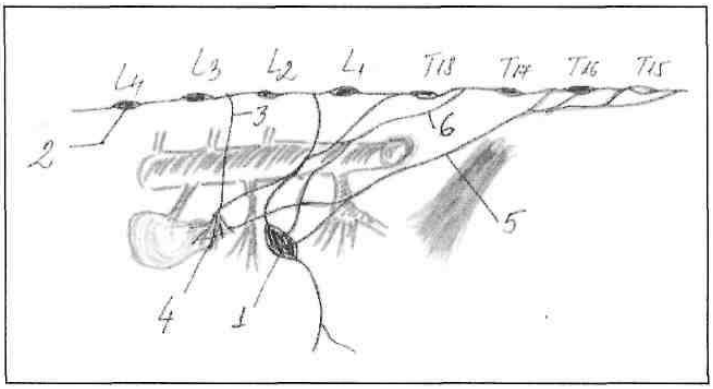

Fig.2 Celiac afferences -var.2- (right). 1 - celiac ganglion; 2 - paravertebral ganglion chain; 3 - lumbar splanchnic nerve; 4 - renosuprarenal plexus; 5 - large splanchnic nerve;6- small splanchnic nerves

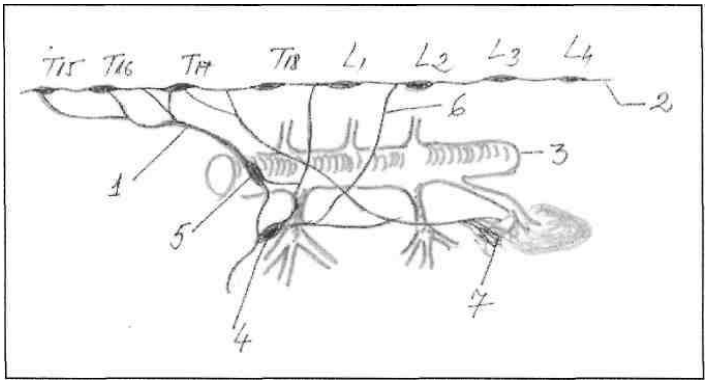

Fig.3 Celiac afferences (left). 1 - large splanchnic nerve; 2- paravertebral ganglion chain; 3 – aorta artery; 4 - celiac ganglion; 5 – ganglion located in the path of the large splanchnic nerve; 6 - lumbar splanchnic nerve; 7- renosuprarenal plexus.

The presentation shows the polymorphism of the vegetative plexus formed in the abdominal cavity; these vegetative branches are impossible to be classified in a typology. The dissection also revealed that the efferent fibres which approach the celiomesenteric plexus do not belong; as thought; only to the large and small splanchnic; but also to the lumbar splanchnic nerves which were regarded as being small accessory splanchnic nerves. According to these wrong data; the renosuprarenal plexus would only include abdominal splanchnic afferences and not also lumbar splanchnic afferences; as it actually happens. Speaking of horses; the data reveal the existence of peculiarities regarding the dorsolumbar efferences of the celiomesenteric plexus which detach in most cases from the interganglionar connectives and not directly from the paravertebral ganglia. Another observation is related to the existence of the renal nerves (one or two small fibres); nerves which detach from the abdominal splanchnic nerves which; crossing over the lateral side of the suprarenal gland seem to link it to the kidneys. The existence of postrenal nervous loops might provide evidence; if not on the ontogeny; at least on the way of postembryonic migration of this organ.

CONCLUSIONS

- In pigs; the efference of the sympathetic dorsolumbar branches display special particularities; the somatic branches becoming frequently detached in the interganglionar areas; while the visceral branches converge towards the celiac plexus.
- The celiac plexus receives not only dorsal but also lumbar afferences; most of them approaching the celiac ganglion.
- Te large splanchnic also issues fibres for the suprarenal gland and for the kidneys; while the small splanchnic nerves also issue fibres for the celiomesenteric plexus.
- The presence of ganglia on the trajectory of the large splanchnic appears to be more frequent on the left side than on the right side.

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