

Aspects referring to the morphological variability of the abdominal branches of pneumogastric nerve (*nervus vagus*)

M. C. NICULESCU, V. NICULESCU, ECATERINA DĂESCU,
IULIA-CAMELIA CIOBANU, ALINA-MARIA ȘIȘU, ADELINA JIANU,
CODRUȚA-ILEANA PETRESCU, S. BOLINTINEANU

*Department of Anatomy and Embryology,
"Victor Babeș" University of Medicine and Pharmacy, Timișoara*

Abstract

Terminal part and the abdominal branches of pneumogastric nerve were and still is an up-to-date problem not only through the anatomic importance but also through its implications in surgical practice. The study was done on 50 corpses using the dissection method. We are looking after torsion variants of pneumogastric nerves around the esophagus, morphological variability of the periesophageal pneumogastric plexus among with the pneumogastric nerves loose their individuality through the mixture and the anastomoses of the fibers and the morphological variability of abdominal branches of the nerve, grouped by us in anterior and posterior branches.

Keywords: *pneumogastric nerves, periesophageal pneumogastric plexus, abdominal branches of pneumogastric nerve.*

Introduction

The study of the terminal part and the abdominal branches of pneumogastric nerve was and still is an up-to-date problem not only through the anatomic importance but also through its implications in surgical practice – performing the pneumogastrotomies [1–15].

In this paperwork we decide to study the torsion variants of pneumogastric nerves around the esophagus, the morphological variability of the periesophageal pneumogastric plexus and the abdominal branches of pneumogastric nerve.

Material and methods

The study of morphological variability of the abdominal branches of pneumogastric nerve was done on 50 corpses from the anatomy laboratories. The research has been made through the dissection method and it aims the behavior of pneumogastric nerves into their terminal part, periesophageal pneumogastric plexus and the abdominal branches detached from this plexus (Figure 1, a–e).

Each dissected case was noted on files which were separated studied, centralized, discussed and analyzed. These files of the abdominal branches of the pneumogastric nerve were each compared with the existing data. The results obtained were statistic-mathematic processed and after that discussed and analyzed, becoming the base of the suppositions and the conclusions of this study.

Results and discussions

Variants of torsion of the pneumogastric nerves around the esophagus

The torsion of the pneumogastric nerves around the

esophagus it's a causal phenomena which can be explained by the spinning of last part of the esophagus and the stomach. During the morphogenetic development the movement is from the sagittal into frontal plane, and so, the left face becomes anterior and the right one goes posterior. It is normal for the pneumogastric nerves, which flank the esophagus and the stomach, to follow their torsion during the morphogenesis.

From the study we've done, we discovered three variants of torsion, never found in the literature:

- the first variant (62%), left pneumogastric is in the middle of the anterior face of esophagus and the right pneumogastric on the middle of the posterior face;
- the second variant (34%), left pneumogastric is situated anterior and towards the right flank of esophagus and right pneumogastric is situated towards posterior and to the left flank;
- the third variant (4%) shows us left pneumogastric situated anterior and almost near left flank of esophagus, while the right pneumogastric is posterior and near the right flank.

Morphological variability of the periesophageal pneumogastric plexus

Periesophageal pneumogastric plexus represents a mixture of fibers came from the dissociation of the pneumogastric nerves (right and left) at the level of esophagus diaphragm's orifice.

Into the periesophageal plexus the pneumogastric nerves loose their individuality, the plexus representing a mixture of dissociated and anastomosed fibers in a network inside which is extremely difficult, almost impossible, to say which fibers came from right pneumogastric and which from the left one (Figures 2–5).

We observed few cases (8%) when the left

pneumogastric nerve presents a precocious dissociation of its fibers, so it may appear divided in two (6%) or even divided in three (2%). The right pneumogastric nerve did not appear precocious divided.

The periesophageal pneumogastric plexus can have a big surface (44%) or a little one (56%) and it can be richer (38%) or poorer (62%) in fibers, percents that we didn't find in bibliographies.

Morphological variability of the abdominal branches of pneumogastric nerve

We consider that beginning with periesophageal pneumogastric plexus, where the two nerves loose their identity, we cannot talk about branches of the left (anterior), or of the right (posterior) pneumogastric nerve but of pneumogastric branches coming from this plexus. According to that, we propose that the branches coming from the periesophageal pneumogastric plexus, to be divided in anterior and posterior branches.

The anterior branches came from a common trunk (82%) or rarely from two (14%) or even three (4%) trunks, the last two possibilities not being specified in literature. The anterior branches are divided in hepatic and gastric anterior. The hepatic branches are three (100%) with a plexiform aspect and that's the reason for the proposal of naming it hepatic plexus, not forgetting that it came from three branches.

The gastric anterior branches did not anastomose between them, kept their individuality, and lay only to the antrum pyloric. They are four (32%), five (50%) and six (18%). The right branch, the most medial one, represents the anterior principal nerve of the little curve of the stomach, witch anastomose with the sympathetic plexus around the left gastric artery (Figures 6–11).

The posterior branches come from a common trunk (100%) and are divided in solear and gastric posterior.

We propose that the solear braches to be considered terminal one and the posterior gastric branches collateral. The solear branches are three (100%): a right one (the most voluminous one) for the medial horn of the right crescent ganglion; a left one (less voluminous) for the medial horn of the left semilunul ganglion; a middle one to the celiac plexus, superior and inferior mesenteric plexus. The last one can be sometimes double (12%) or triple (4%) (Figures 12–16).

In the specialized literature is found a spleen branch that we discovered in just one case and a posterior hepatic branch that we never discovered.

The posterior gastric branches have the same characteristics with the anterior ones. Their number is four (58%) or five (42%) and come from a common trunk (80%) or from two trunks (20%).

The right branch, the most voluminous and the most medial is the principal posterior nerve of the little curve of the stomach, shorter and thinner than the anterior one witch has anastomose with the sympathetic system. The other branches do not have anastomose.

☒ Conclusions

The torsion of the pneumogastric nerves around the esophagus is the result of the morphogenetic

development.

The torsion presents three variants:

- the nerves situated in the middle of the anterior face respectively posterior face of the esophagus (62%);
- the nerves situated towards the right flank the left one and towards the left flank the right one (34%);
- the nerves situated towards the left flank the left one and towards the right flank the right one (4%).

So the torsion can be normal, more or less accented.

Periesophageal pneumogastric plexus is a mixture of fibers coming from the pneumogastric nerves, so at this level these nerves are loosing their individuality being almost impossible to say witch fibers come from the right or the left nerve. While the right nerve divides only at the plexus level, the left pneumogastric has sometimes a precocious dissociation of its fibers (8%).

Periesophageal pneumogastric plexus can have a big surface (44%) or small surface (56%) and can be richer (38%) or poorer (62%) in fibers.

We consider that the two pneumogastric nerves merge into one another and we cannot talk about left (anterior) or right (posterior) branches but of abdominal pneumogastric branches coming from this plexus. That is the reason why we propose to divide those branches into anterior and posterior.

The anterior branches come from a common trunk (82%) or rarely from two trunks (14%) or even three (4%).

The hepatic branches in number of three (100%) have a plexiform aspect and that is why we propose the name of hepatic plexus.

Anterior gastric branches did not anastomose between them, except the right branch (principal nerve of the little curve of the stomach) witch anastomose with the sympathetic plexus around the left gastric artery. These branches always came from a common trunk and could be four (32%), five (50%) or six (18%).

The solear branches do not have any difference from the classical descriptions.

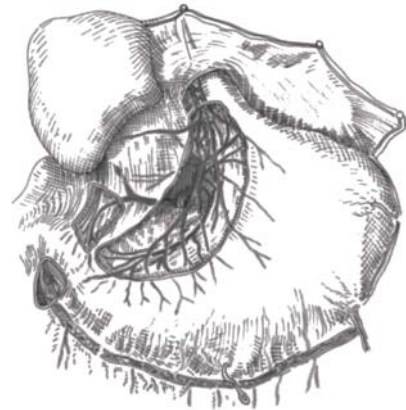
Posterior gastric branches have the same characteristics with the anterior ones and come through a common trunk (80%) or two trunks (20%). These branches are four (58%) or five (42%). From these ones, the right branch (principal nerve of the little curve of the stomach) has anastomose with the sympathetic system, while the other branches do not anastomose.

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(a)



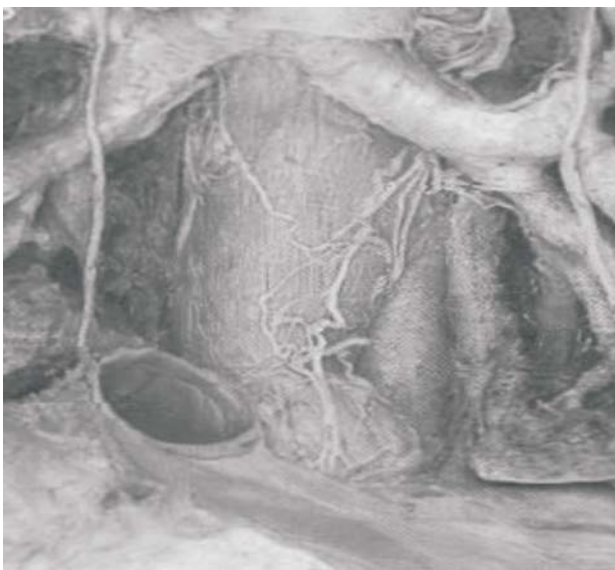
(b)



(c)



(d)



(e)

Figure 1 – (a) pneumogastric nerves; (b) anterior gastric branches of the pneumogastric nerve; (c) posterior gastric branches of the pneumogastric nerve; (d) periesophageal pneumogastric plexus; (e) periesophageal pneumogastric plexus (another aspect)



Figure 2 – Periesophageal plexus with big surface and rich network



Figure 3 – Periesophageal plexus with big surface and poor network



Figure 4 – Periesophageal plexus with little surface and rich network

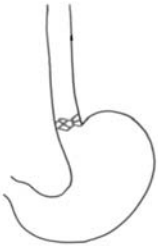


Figure 5 – Periesophageal plexus with little surface and poor network



Figure 6 – Anterior branches. Common trunk. Periesophageal plexus. Anterior gastric branches and hepatic branches



Figure 7 – Anterior branches. Two trunks. Periesophageal plexus. Anterior gastric branches and hepatic branches



Figure 8 – Anterior branches. Three trunks. Periesophageal plexus. Anterior gastric branches and hepatic branches



Figure 9 – Anterior branches. Periesophageal plexus and common trunk. Plexiform hepatic branches (3). Gastric branches (5)



Figure 10 – Anterior branches. Periesophageal plexus and common trunk. Plexiform hepatic branches (3). Gastric branches (4)



Figure 11 – Anterior branches. Periesophageal plexus and common trunk. Plexiform hepatic branches (3). Gastric branches (6)

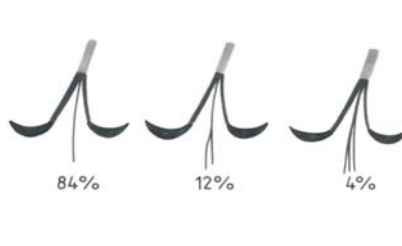


Figure 12 – Solear branches. Common trunk. Semilunar ganglions



Figure 13 – Posterior branches. Common trunk. Solear branches. Gastric branches (4 through common trunk)



Figure 14 – Posterior branches. Common trunk. Solear branches. Gastric branches (4 through two trunks)



Figure 15 – Posterior branches. Common trunk. Solear branches. Gastric branches (5 through common trunk)



Figure 16 – Anterior branches. Two trunks. Periesophageal plexus. Anterior gastric and hepatic branches

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Mailing address

Marius Corneliu Niculescu, Assistant Professor, M. D., Ph. D., Department of Anatomy and Embryology, "Victor Babeș" University of Medicine and Pharmacy, 2 Eftimie Murgu Square, 300 041 Timișoara, Romania; Phone / Fax +40256–220 479, E-mail: niculescu@umft.ro

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