

ヒト幽門の神経支配について

易 勤¹ 三輪晃一² 太田哲生³ 宮木孝昌¹ 林 省吾¹
寺山隼人¹ 内藤宗和¹ 田中重徳⁴ 伊藤正裕¹

¹東京医科大学人体構造学

²富山労災病院

³金沢大学がん局所制御学

⁴同大学神経分布路形態形成学

背 景

幽門へ分布する神経は交感神経の節後線維と副交感

神経からなる。従来副交感神経である迷走神経肝枝からの枝、いわゆる幽門枝は肝胃間膜の中を走ると記載

されていたが、最近の研究では右胃動脈に沿って幽門へ分布する経路は幽門の神経支配にとって重要な意味を持つという。この領域における立体的な神経分布に関する詳細な記載は乏しい。

対象と方法

本研究は10体の解剖学実習体を用いて、0.001%アリザリンレッド S・エタノールで内臓の末梢神経の染色により、実体顕微鏡下で幽門区域の神経分布を剖出した。さらに、実験動物スunksを用い、Whole mount 免疫染色法で、スunksの幽門区域における神経支配を解析し、ヒトと比較した。

結 果

ヒト幽門の神経支配は右胃動脈に沿って走行する肝神経叢からの枝と、胃小弯に沿って走行する Latarjet からの枝、および胃十二指腸動脈や、右胃大網動脈から分岐してきた幽門下部

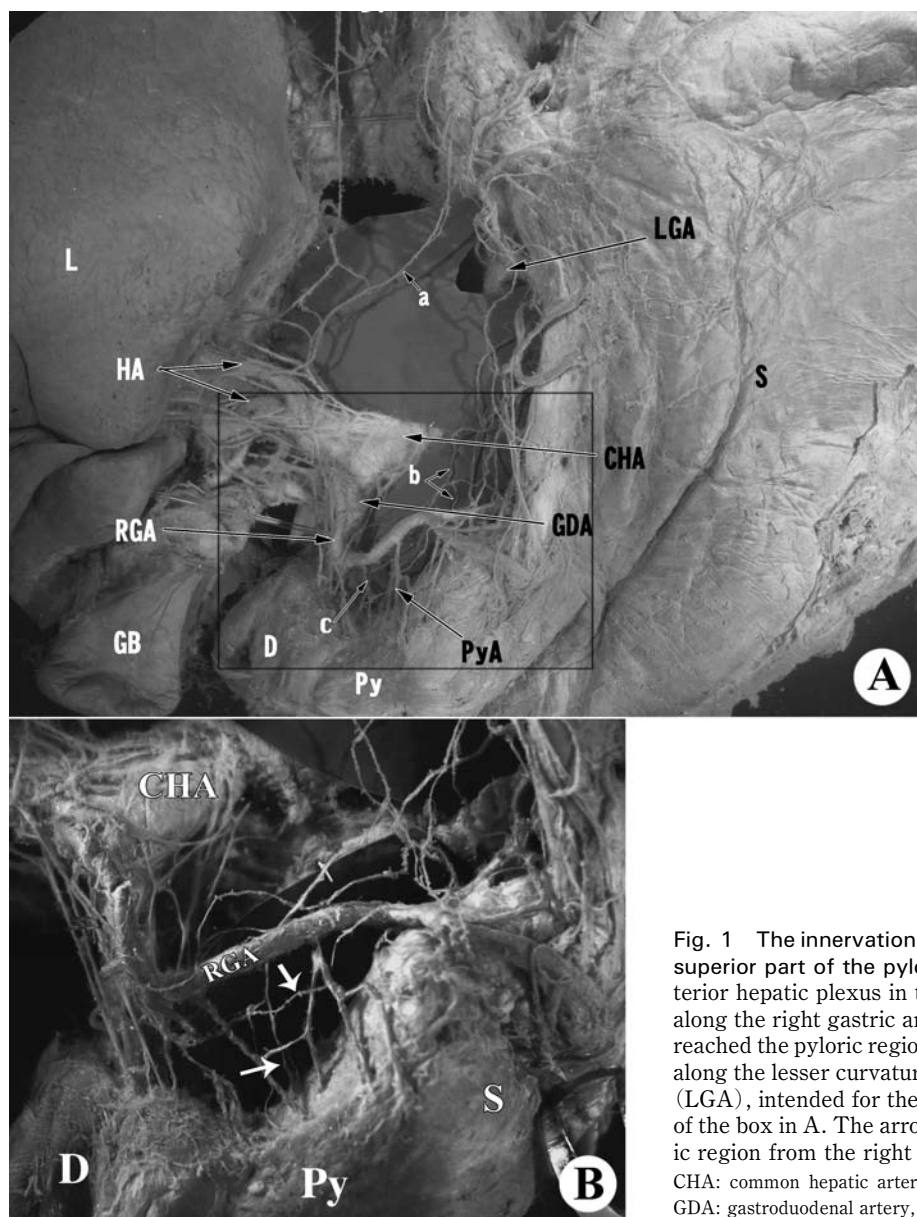


Fig. 1 The innervation of the pyloric region from the view of the superior part of the pylorus. Hepatic divisions (a) join in the anterior hepatic plexus in the proper hepatic artery. The nerves ran along the right gastric artery (RGA) and its branches (PyA), and reached the pyloric region (Py) (c). The nerves (b) of Latarjet ran along the lesser curvature or the branches of the left gastric artery (LGA), intended for the antro-pyloric region. B is an enlargement of the box in A. The arrows show the nerves innervating the pyloric region from the right gastric artery.

CHA: common hepatic artery, D: duodenum, E: esophagus, GB: gallbladder, GDA: gastroduodenal artery, HA: hepatic artery, L: liver, S: stomach

を支配する動脈枝に沿ってくる神経枝であることが全10体で観察された。一方、胃噴門と肝門の間にある迷走神経肝枝から直接肝胃間膜を通して幽門部に至る枝は4例しか観察されなかった (Fig. 1)。実験動物スunksの場合には幽門下動脈が存在していない。そして、右胃動脈に沿ってくる枝と胃小弯からの枝はすべての例で観察された (Fig. 2)。

考 察

これらの結果より、ヒト幽門の神経支配は幽門区域の上下および裏側から立体的に分布しており、しかも主な神経線維は右胃動脈に由来し、右胃動脈を温存すれば、幽門の神経支配は保存される。なお、幽門温存胃切除術に対して、たとえ右胃動脈が損傷されても、理論的に幽門下部の動脈支配さえ温存されていれば、幽門の神経支配による機能回復は可能だと考えられる。

文 献

- 1) Yi SQ, Ohta T, Miwa K et al: Surgical anatomy of the innervation of the major duodenal papilla in human and *Suncus murinus*,

from the perspective of preserving innervation in organ-saving procedures. *Pancreas* **30**: 211-217, 2005

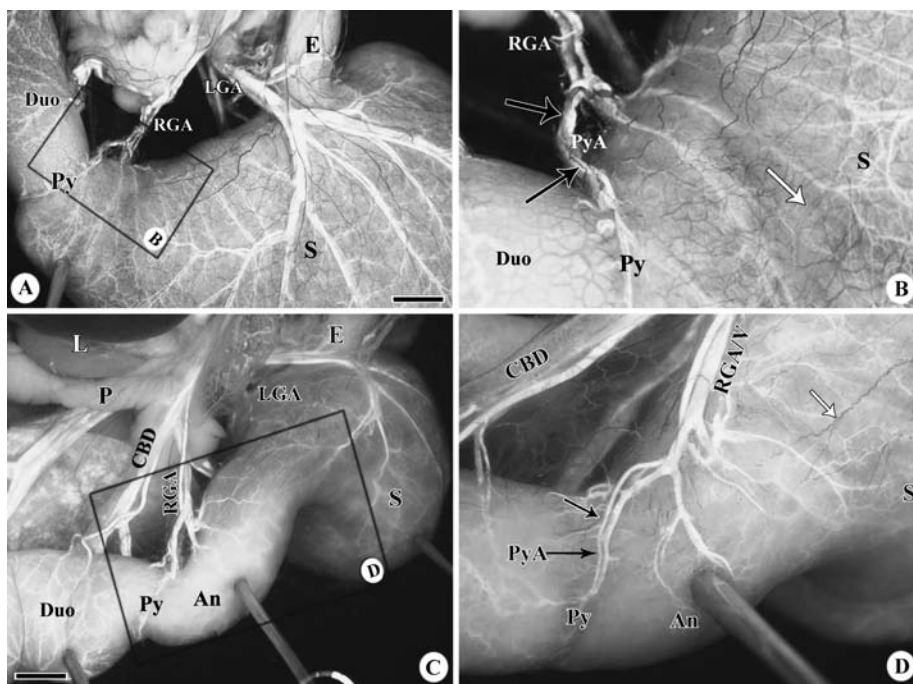


Fig. 2 Two cases showing innervation of the pyloric region (Py) in *Suncus murinus* by whole-mount immunostaining. High magnifications of the boxed areas in A and C are shown in B and D. White arrows show the nerves of Latarjet intended for the antro-pyloric region. Black arrows indicate the nerves for the right gastric artery (RGA), running along the pyloric artery (PyA), and reaching the pyloric region.

An: pyloric antrum, CBD: common bile duct, Duo: duodenum, E: esophagus, L: liver, LGA: left gastric artery, P: pancreas, RGA/V: right gastric artery/vein, S: stomach, Scale bar = 2 mm in A and C

Surgical anatomy of the innervation of the pylorus in humans and shrew (*Suncus murinus*)

¹Shuang-Qin YI, ²Koichi MIWA, ³Tetsuo OHTA, ¹Takayoshi MIYAKI, ¹Shogo HAYASHI, ¹Hayato TERAYAMA, ¹Munekazu NAITO, ⁴Shigenori TANAKA, ¹Masahiro ITOH

¹Department of Anatomy, Tokyo Medical University, ²Rousai Hospital of Toyama,

³Departments of Gastroenterologic Surgery and ⁴Anatomy and Neuroembryology, Kanazawa University

To clarify the innervation of the antro-pyloric region in humans from a clinico-anatomical perspective. The stomach, duodenum and surrounding structures were dissected in 10 cadavers, and immersed in a 10 mg/L solution of alizarin red S in ethanol to stain the peripheral nerves. The distribution details were studied to confirm innervation in the above areas using a binocular microscope. Similarly, innervations in 10 *Suncus murinus* were examined using the method of whole-mount immunohistochemistry. The innervation of the pyloric region in humans involved three routes. One arose from the anterior hepatic plexus via the route of the suprapyloric/supraduodenal branch of the right gastric artery. The second arose from the anterior and posterior gastric divisions. The third originated from the posterior-lower region of the pyloric region, which passed via the infrapyloric artery or retroduodenal branches and was related to the gastroduodenal artery and right gastroepiploic artery. For *Suncus murinus*, results similar to those in humans were observed. There are three routes of innervation of the pyloric region in humans, wherein the route of the right gastric artery is the most important for preserving pyloric region innervation. Function can be preserved by more than 80% by preserving the artery in pylorus-preserving pancreaticoduodenectomy (PPPD). However, the route of the infrapyloric artery should not be disregarded. This route is related to several arteries (the right gastroepiploic and gastroduodenal arteries), and the preservation of these arteries is advantageous for preserving pyloric innervation in PPPD. Concurrently, the nerves of Latarjet also perform an important role in maintaining innervation of the antro-pyloric region in PPPD. This is why pyloric function is not damaged in some patients when the right gastric artery is dissected or damaged in PPPD.

Key words: innervation, pylorus, right gastric artery, *Suncus murinus*, whole mount immunohistochemistry