

Branching Pattern of the Anterior Nerve of Latarjet and Its Clinical Significance

K.C.SHANTHI, SUDHASESHAYAN

ABSTRACT

Highly selective or proximal gastric vagotomy is one of the definitive treatments for gastric ulcers. The results of this operation, in comparison to truncal vagotomy, is well appreciated by the surgeons. On the contrary, the incomplete and inadequate performance of this procedure results in the recurrence of the ulcers, post vagotomy diarrhoea and the dumping syndrome. The knowledge about the normal and abnormal patterns of the anterior and posterior gastric nerves is an imperative to the surgeons who perform highly selective vagotomy. Most of the studies in this region have been done on the western population

and the perspective of truncal and highly selective vagotomy is based on the western literature only. However, Indian studies regarding this topic, are only few and far inbetween. This nature of study on the Indian population in this part of the country was an initiative. 55 stomach specimens were utilized for the study. The anterior gastric nerve was dissected out from the level of commencement to the level of termination by the dissection method. The branching pattern, plexus formation and crow's foot appearance at the level of the termination of the anterior gastric nerve were studied. The results which were obtained are analyzed and discussed in detail.

Key Words: Ulcers, Truncal vagotomy, Highly selective vagotomy, Anterior nerve of Latarjet

KEY MESSAGE

- To give an idea about the various branching patterns of the anterior nerve of Latarjet in the anterior surface of the stomach, to the surgeons during a highly selective vagotomy procedure.

INTRODUCTION

The surgical therapy for peptic ulcer began as an empiric extension of the procedures which were first used in the nineteenth century for gastric cancer. The technique of highly selective vagotomy represents the culmination of decades of surgical research and appears to have greatly improved the functional outcome of ulcer surgery. Currently, there is no pharmacological agent that permanently controls the peptic ulcer diathesis.

Highly selective vagotomy is the newest addition to the armamentarium of definitive ulcer operations. This procedure limits the vagotomy to the fundus of the stomach and preserves the antral innervations, thereby avoiding the need for a drainage or resectional procedure. According to JC Thomson et al [1] and Petropoulos [2], the sparing of the antropyloric innervation results in near normal gastric emptying and with the preservation of the extragastric vagal innervations, the incidence of post vagotomy diarrhoea and dumping minimal. The recurrence of the ulcers was observed to be minimal. The incidence of wound infection, anastomotic leakage and afferent or efferent limb obstruction were greatly reduced. The success which was reported in the early European series and the duplication of these promising results in the prospective trials was reported by Jordan [3]. The major issue concerning highly selective vagotomy is ulcer recurrence. There is compelling evidence that the success of the procedure in terms of ulcer recurrence depends primarily on the experience of the surgeon and the knowledge of the anatomy of the gastric branches of the vagus nerve in the

abdomen. The present study was done to identify the anterior gastric nerve pattern in our population and to compare the results with the western literature.

MATERIALS AND METHODS

This study was conducted on 55 specimens including 12 cadaveric, 40 autopsy and 3 foetal specimens. This study was conducted during the period from 2006 to 2008 in the Department of Anatomy, Government Stanley Medical College, Chennai. The specimens were acquired from hospital resources after obtaining the necessary permissions from the concerned departments.

The stomach was dissected out by the routine dissection method [4]. The abdomen was opened by a midline incision which extended from the xiphisternum to the pubic symphysis. A transverse incision was made at the lower end of the midline incision and at the sub costal plane, upto the midaxillary line. The peritoneal cavity was opened. The lesser omentum was cut closer to the liver and the gastro phrenic and the gastrosplenic ligaments were cut to release the stomach. The greater omentum was cut along the greater curvature of the stomach. The stomach was then eviscerated.

The collected cadaveric stomach specimens were washed thoroughly and were dissected to visualize the anterior gastric nerve, which is otherwise known as the nerve of Latarjet. The serous layers of the stomach were dissected carefully to trace the nerve and care was taken not to injure the nerve and its branches. At the

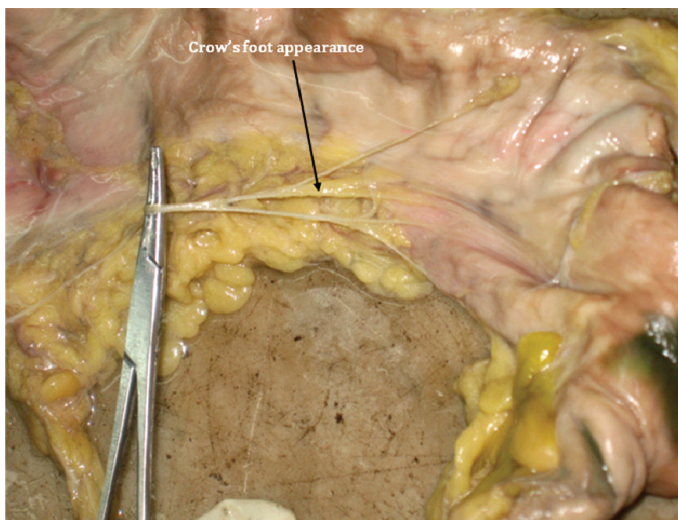
cardio oesophageal junction, the lower end of the left vagus and its cardiac branches were visualized.

The autopsy specimens were washed thoroughly in running water to remove the contents within it and to clean the surface. The collected specimens were immersed in a 10% formalin solution for the fixation of the tissue. The fat over the surface of the stomach and along the lesser curvature were removed piece meal by taking care to avoid damage to all the neurovascular structures. The serosal layer of the stomach was dissected carefully to trace the anterior gastric nerve of Latarjet.

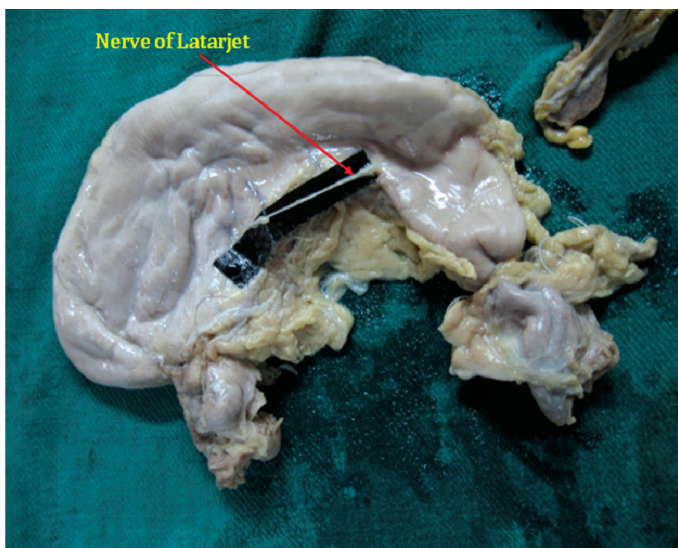
The foetuses were embalmed by injecting a 10% formalin solution by using an 18 gauge needle for their preservation and fixation. The stomach was dissected out by a routine method as is mentioned above. Then, the specimen was dissected carefully and the course of the anterior nerve of Latarjet and its branches were studied.

OBSERVATIONS

11 of the 12 cadaveric specimens showed branching of the nerve of Latarjet, with plexus formation over the anterior surface of the stomach. The nerve terminated at the level of the incisura angularis, forming a crow's foot appearance in those cases [Table/Fig-1]. In one specimen, the anterior nerve of Latarjet alone was observed without branches and in its termination, the usual crow's foot appearance was not observed [Table/Fig-2].



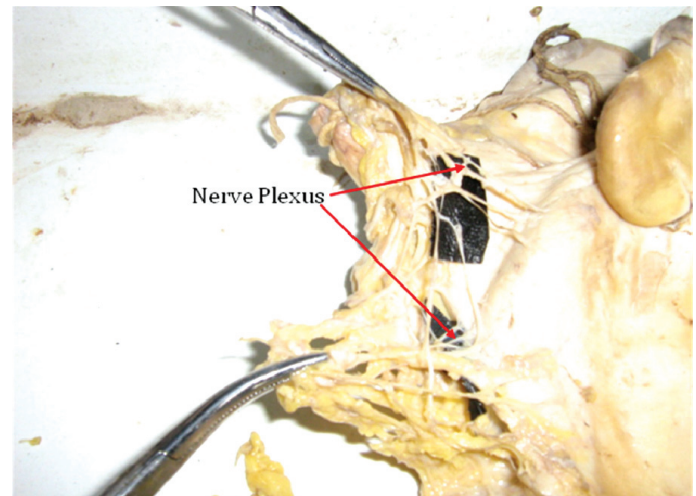
[Table/Fig-1]: The Crow's Foot Appearances at the level of termination



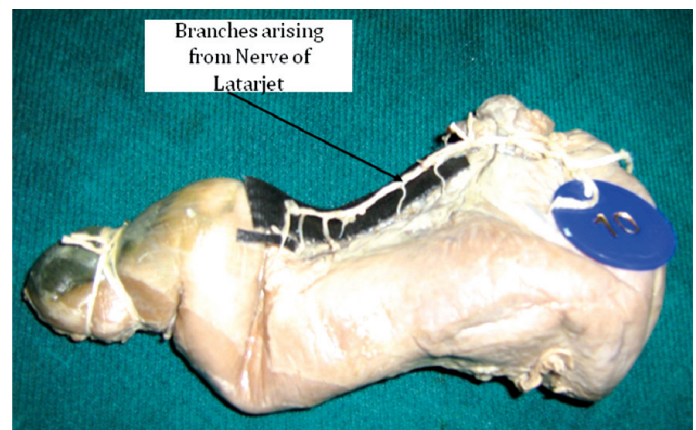
[Table/Fig-2]: The Anterior Nerve of Latarjet without branches

In 35 of the 40 autopsy specimens, the anterior nerve of Latarjet showed branching and plexus formation over the anterior surface of the stomach [Table/Fig-3]. In the remaining 5 specimens, the branching alone was observed without the plexus formation and the crow's foot appearance [Table/Fig-4]. The level of termination of the nerve in all the specimens were observed at the level of the incisura angularis.

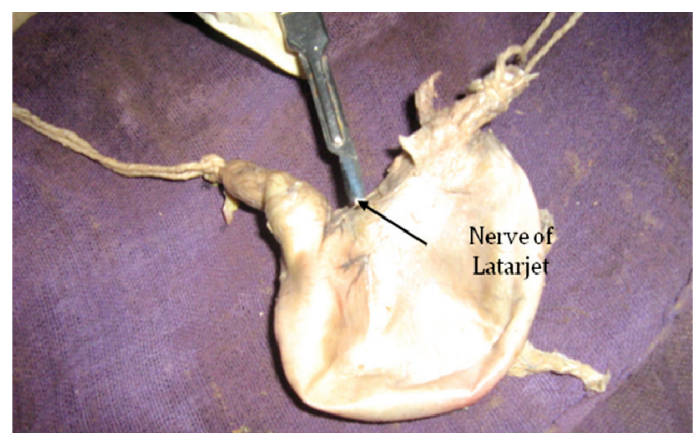
All the foetal specimens which were studied were full term babies. The observations in the foetal specimens were unique. The anterior nerve of Latarjet alone was observed with its usual course, without branching and plexus formation and the crow's foot appearance was not seen at the level of the termination [Table/Fig-5].



[Table/Fig-3]: Plexuses formation at the Cardiac End and Middle of the Body of the stomach



[Table/Fig-4]: Branches Arising from Anterior Nerve of Latarjet without any plexus formation



[Table/Fig-5]: Foetal Specimen showing Anterior Nerve of Latarjet

At the end of this study, the anterior nerve of Latarjet was observed in all the 55 specimens (100%). The level of termination of the anterior nerve of Latarjet was at the level of the incisura angularis in all the specimens which were studied (n = 55). 83.6% of the specimens (i.e 46 out of 55) showed plexus formation over the anterior surface of the stomach. In 9.1% of the specimens (5 out of 55), the branching alone was observed without a plexus or crow's foot appearance. In 7.3% (4 out of 55) of the specimens, only the anterior nerve of Latarjet was observed. The crow's foot formation was found in 46 out of the 55 specimens (83.6%).

DISCUSSION

The stomach is supplied by sympathetic fibres from the celiac plexus and the para sympathetic fibres from the vagus nerves.

The sympathetic innervations of the stomach are through the greater and lesser splanchnic nerves (T5–T12) and the coeliac plexus. The parasympathetic supply is derived from the anterior and posterior vagus nerves. The right and left vagus nerves enter the abdomen through the oesophageal opening. The left and right vagi are now called as the anterior and posterior vagus nerves. This change in terminology is due to the clockwise rotation of the stomach which it undergoes during its development [5].

The anterior vagus nerve supplies the cardiac orifice and then divides near the upper end of the lesser curvature into gastric branches, pyloric branches and hepatic branches. The gastric branches, about four to ten in number, run towards the anterior surface of the body and the fundus and supplies them. The anterior gastric nerve is the major gastric branch that lies along the lesser curvature of the stomach. This nerve is also called as the anterior gastric nerve of Latarjet. The anterior gastric nerve ends at the incisura angularis by forming a crow's foot appearance. The posterior vagus nerve divides into the gastric and celiac branches. The gastric branches supply the posterior surface of the stomach. The largest branch is called as the greater posterior gastric nerve or the posterior gastric nerve of Latarjet. This nerve also ends at the incisura angularis. The celiac branches run along the left gastric artery and join the celiac plexus of the nerves [6].

The results of our study demonstrated the presence of the anterior nerve of Latarjet in all the specimens (100%). This coincides with the findings of Latarjet [7], who also observed the presence of this nerve in all his specimens (100%). Skandalakis [8] reported the presence of the nerve in 96% of his specimens, Shuang Qui Yi [9] reported it in 70% and Jackson [10] reported it in 56% of the cases only.

Skandalakis⁸ reported that the level of termination of the anterior nerve of Latarjet was at the incisura angularis in 79% of his cases,

but Shuang Qin Yi⁹ observed the termination at this level in 40% cases only. In the present study, the anterior nerve of Latarjet was terminated at the level of the incisura angularis in all the specimens. This coincides with the observations of Latarjet⁷. In the present study, it became evident that the surgical anatomy of the anterior nerve of Latarjet conformed to a pattern which was similar to that of the western population.

McCrea [11], Loeweneck [12] and Brizzi et al [13] observed a plexus formation over the anterior surface of the stomach. Few other authors have reported the absence of such a plexus [14-17]. 83.6% of the specimens showed the formation of a plexus over the anterior surface of the stomach. Andrews and T.W. Mackay [18] observed the plexus formation in 58.6% of their cases. Brizzi et al [13] observed it in 20% of the cases, whereas Dia A et al [19] observed the same in 8% of the cases only.

The crow's foot appearance at the level of termination was noted in 83.6% of our cases, whereas Shuang Qin Yi [9] observed this appearance in all his cases (100%). In case of the crow's foot formation, the branches will also be given to the body of the stomach. In such cases, the failure to identify the branches and the division of this branch leads to the recurrence of the ulcers [2]. Therefore, the knowledge of the crow's foot formation and the distribution of its branches is important for surgeons.

In 9.1% of our cases, only the branches were observed to arise from the anterior nerve of Latarjet without any plexus formation. The same observation was also reported by Shuang Qin Yi [9] and Skandalakis et al [8] in their studies. However, the literature regarding the branches of the anterior nerve of Latarjet is scarce in the Indian population. The results of the present study were compared with those of previous studies [Table/Fig-6].

In highly selective vagotomy, the branches of the anterior and posterior gastric nerves are cut to reduce the gastric acid secretion. The branches are divided just before their level of termination, to retain the antral nerve supply. An incomplete and inadequate vagotomy results in ulcer recurrence. Therefore, the knowledge of the variants of the branching and disposition of the anterior gastric nerve decreases the risk of ulcer recurrence in highly selective vagotomy. In the present study, the pattern of the posterior gastric nerve of Latarjet has not been observed.

To our knowledge, all the studies which were done so far by various authors were done in cadaveric specimens only. The unique feature of the present study is that the authors have included foetal specimens also in it. The authors recommend further studies involving the innervation pattern of the posterior gastric nerve.

S. No.	Pattern Observed	Present Study	Previous Study
1.	Presence of Anterior nerve of Latarjet	100%	Latarjet et al 1921 100% Skandalakis et al 1986 96%
2.	Anterior nerve of Latarjet terminates at the level of incisura angularis	100%	Latarjet et al 1921 100 % Skandalakis et al 79% ShuangQinYi 40%
3.	Formation of plexus over the anterior surface of body of the stomach	83.6%	T.W.Mackay and P.L.R.Andrews 58.6%
4.	Branches arising from the anterior nerve of Latarjet without plexus formation	9.1%	Skandalakis et al 1986 ShuangQinYi 1990
5.	Formation of crow's foot	83.6%	Shuang QinYi 100%
6.	Anterior nerve of Latarjet without branches and plexus formation	7.3%	Variation hitherto not reported

[Table/Fig-6]: Specimens Studied in the Present Study was Compared with Previous Studies

CONCLUSION

The study of the pattern of the anterior nerve of Latarjet in the present study showed wide variations in terms of its branching pattern, plexus formation and crow's foot appearance. Such variations have also been reported in the western literature. The discussion part emphasises the most important anatomical details which are relevant to the achievement of adequate, highly selective vagotomy. The knowledge of these variations is of great importance for the surgeons who perform highly selective vagotomy, to achieve better results.

BIBLIOGRAPHY

- [1] Thompson JC et al. Effect of selective proximal vagotomy and truncal vagotomy on gastric acid and serum gastrin responses to a meal in duodenal ulcer patients. *Ann. Surg.* 1978 October; 188(4): 431-38.
- [2] Petropoulos PC. Highly selective transgastric vagotomy. *Arch Surg.* 1980; 115 (1) 33-39.
- [3] Jordon PH. Current states of parietal cell vagotomy. *Ann Surg* 1976; 184: 659.
- [4] Romanes GJ. Cunningham's manual of practical anatomy In: *Thorax and abdomen* 15th edn vol. 2 Oxford University Press; 1986: 133.
- [5] Langman's Medical Embryology 10th edn. Digestive system T.W. Sadler, 2006, Lippincott Williams and Wilkins, USA.
- [6] Gray's anatomy The anatomical basis of clinical practice In: *Gastro-intestinal tract* 39th edn Elsevier Churchill livingstone; 2005: 1150.
- [7] Latarjet et al Resection des nerfs del'estomach. Bulletin del academic de medicine 97: 681-91.
- [8] Skandalakis Surgical Anatomy; Paschalidis Medical Publication. In: *Stomach* chapter15, 740-44.
- [9] Shuang Qin Yi. *World Journal of Gastroenterology*, Japan 1990.
- [10] Jackson RG. Anatomy of the vagus nerves in the region of the lower esophagus and the stomach. *Anat. Rcc.* 1949; 103:1.
- [11] McCrea ED. The nerves of the stomach and their correlation to surgery. *Brit. J.Surgery* 1926;13:621.
- [12] Loeweneck et al Nervus vagus and cholinergische system ammagen des menchen Die vagal mage innervation.
- [13] Brizzi et al. The distribution of the vagus nerves in the stomach. *Chirurgica Gastroenterologica* 7: 17-34.
- [14] Sappey, Scheifer MPC. Symington Traite d' anatomic descriptive are figures intercalee's donsle texte ed 2. paris.
- [15] Mitchell, GAG. A macroscopic study of the nerve supply of the stomach *J. Anat* 1940; 75:50.
- [16] Ruckley, CV. A study of the variations of the abdominal vagi. *Br. J. Surgery* 1964 Aug; 51: 569-73.
- [17] Civalero LA. Selective proximal vagotomy and duodenal ulcer. *Acta Chirurgica Scandinavica Suppl.* 491.
- [18] Mackay TW. Andrews PLR, A comparative study of the vagal innervation of the stomach in man and the ferret. *J. Anat* 1983.
- [19] Dia A, Ouedraogo T, Zida M, Sow ML. An anatomic study of the vagus nerve at the base of the oesophagus and the stomach. Laboratoire d'anatomie et d' Organogenese, Universite Cherikh Anta Diop de Dakar, Senegal.

AUTHOR(S):

1. Dr. K.C. Shanthi
2. Dr. Sudhaseshayan

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor,
Department of Anatomy,
Vinayaka Mission Kirupananda Variyar Medical College,
Salem, Tamil Nadu, India.
2. Professor of Anatomy,
Director, Institute of Anatomy,
Madurai Medical College. Salem,
Tamil Nadu, India.

NAME, ADDRESS, TELEPHONE, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. K.C. Shanthi MS (Anatomy)
Department of Anatomy,
Vinayaka Mission's Kirupananda Variyar Medical College,
Salem, Tamil Nadu, India.
Phone: (0)9443370319
E-mail: drshan74@yahoo.com

DECLARATION ON COMPETING INTERESTS:

No competing Interests.

Date of Submission: Jun 25, 2011

Date of peer review: Jul 25, 2011

Date of acceptance: Aug 16, 2011

Date of Publishing: Oct 05, 2011