International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 3; March 2018; Page No. 196-198

Assessment of the greater splanchnic nerves in cadavers from north Indian region

Dr. Vishwajeet Kumar
Assistant Professor, Department of Anatomy, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal, India

Abstract
Thoracic splanchnic nerves are splanchnic nerves that arise from the sympathetic trunk in the thorax and travel inferiorly to provide sympathetic innervation to the abdomen. The nerves contain preganglionic sympathetic fibers and general visceral afferent fibers. The present study was planned to assess the level of origin. Also to study the pattern of formation of the greater splancnic nerve in adult cadavers to overcome the failure rate in sympathectomy procedures.
The study was planned on 20 cadaveric subjects. During dissection of thorax after the removal of the lungs the sympathetic chain was cleaned and the ganglia were defined. The origin of the greater splanchnic nerve from different ganglia and its formation were noted. The approval of the Institutional ethical committee was taken for the present study.
From the present study the data gathered will be helpful for students as well as surgeons for a better outcome of the thoracic splanchnicectomy. Also in thoracolumbar sympathectomy the sympathetic chain has to be removed upto the highest point of origin of greater splanchnic nerve to overcome failure rate in sympathectomy.

Keywords: splanchnic nerves, splanchnicectomy, cadavers

1. Introduction
Thoracic splanchnic nerves are splanchnic nerves that arise from the sympathetic trunk in the thorax and travel inferiorly to provide sympathetic innervation to the abdomen. The nerves contain preganglionic sympathetic fibers and general visceral afferent fibers.

Table 1: There are three main thoracic splanchnic nerves

Name	Ganglia	Description
Greater [1]	T5-T9 or T5-T10 [2]	The nerve travels through the diaphragm and enters the abdominal cavity, where its fibers synapse at the celiac ganglia. The nerve contributes to the celiac plexus, a network of nerves located in the vicinity of where the celiac trunk branches from the abdominal aorta. The fibers in this nerve modulate the activity of the enteric nervous system of the foregut. They also provide the sympathetic innervation to the adrenal medulla, stimulating catecholamine release.
Lesser [3]	T9-T12, T9-T10,[3]T10-T12, or T10-T11 [2]	The nerve travels inferiorly, lateral to the greater splanchnic nerve. Its fibers synapse with their postganglionic counterparts in the superior mesenteric ganglia, or in the aortic renal ganglion. The nerve modulates the activity of the enteric nervous system of the midgut.
least or lowest [4]	T12-L2, or T11-T12	The nerve travels into the abdomen, where its fibers synapse in the renal ganglia.

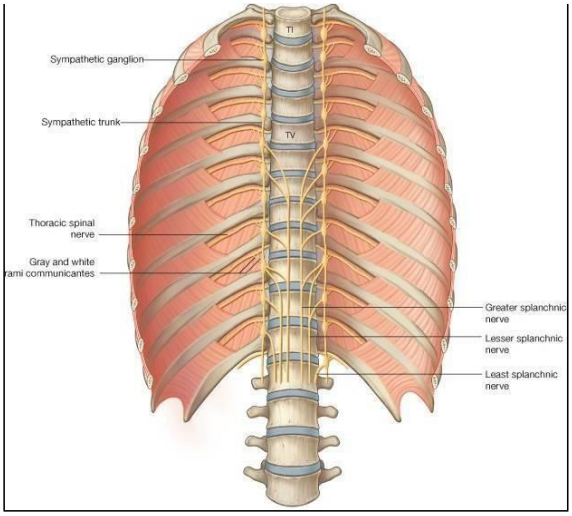

Fig 1

He anatomical disparity of the nerves is acquired from the medical twigs of the lower seven thoracic sympathetic ganglia. The lesser and the lower splanchnic nerves have less cranial assistance generally T11/T12, compared to the greater splanchnic nerves. The celiac plexus is a vital substitution for autonomic fibers and derives a number of thoracic splanchnic nerve fibers as it travels towards the abdominal cavity [1].

The greater splanchnic nerves are paired structures formed from preganglionic sympathetic nerve fibres which pass without synapsing through the paravertebral ganglia of segments five to nine on either side of the spinal column. The fibres from the ganglia converge to form a nerve which runs inferiorly through the thorax within the posterior mediastinum. It is closely apposed to the vertebral bodies of the spinal column. On the left, it is slightly lateral to the azygous vein. On the right, it is lateral to the hemiazygous system and the aorta.

The greater splanchnic nerves pierce the diaphragmatic crura on both sides at the level of L1. Then, the fibres pass to onto the surface of the aorta where they synapse with postganglionic fibres within the coeliac ganglia [2].

The thoracic splanchnic nerves are made of the medial branches of the lower 7-8 thoracic sympathetic ganglia. Their formation and course are highly variable along their intrathoracic and sub diaphragmatic portions. The greater splanchnic nerve (GSN) is the highest in position of the three nerves and it receives branches from T5-T8 thoracic sympathetic ganglia, the lesser splanchnic nerve (LSN) lies below the greater one and receives branches from T9 and T10 sympathetic ganglia, and the least splanchnic nerve (ISN) is the lowest nerve receiving branches from T11 and/or T12 ganglia.1 In a post-mortem study on human posterior thoracic walls, the GSN was formed by branches from T4-T11 ganglia and the commonest type was formed by contributions from T5-T9 ganglia. The LSN was formed by branches from T8-T12 ganglia and the commonest type by branches from T10 and T11 ganglia. The LSN was composed of branches from T10-L1 ganglia and the commonest type by branches from T11 and/or T12 ganglia.2 In embalmed South Indian cadavers, the stellate ganglion was bilaterally present in 4 and unilaterally in 15 out of 31 cadavers studied. The highest origin of the GSN was T4 ganglion while its lowest origin was T11 ganglion. The LSN commonly arose from T11 ganglion and the ISN commonly from T12 ganglion.3 Adequate information of the anatomical variability of the thoracic sympathetic chain and splanchnic nerves is important for the success of sub diaphragmatic neuroablative surgical procedures to relieve chronic abdominal pain [3-4].

The present study was planned to assess the level of origin. Also to study the pattern of formation of the greater splancnic nerve in adult cadavers to overcome the failure rate in sympathectomy procedures.

Methodology

The study was planned on 20 cadaveric subjects. During dissection of thorax after the removal of the lungs the sympathetic chain was cleaned and the ganglia were defined. The origin of the greater splanchnic nerve from different ganglia and its formation were noted. The approval of the Institutional ethical committee was taken for the present study.

Results & Discussion

The data from the 25 cadaveric subjects related to the origin of the greater splanchnic nerve from different ganglia and its formation were collected and presented as below. The table 1 indicates the total number of Cases and the number of ganglia involved in the formation.

Table 2

Total no. of ganglia involved in formation	No. of Cases
6 ganglia	1
5 ganglia	3
4 ganglia	8
3 ganglia	10
2 ganglia	1
Absent	1

The greater splanchnic nerve showed great variability both in the level of its origin and in the pattern of its formation. Reed (1951) found 58 patterns of the origin of the greater splanchnic nerve among 100cadavers [5]. In the present study 19 patterns of origin were seen in 50 specimens. Edward and Baker (1940) [6] found the greater splanchnic nerve arising from 3 ganglia in only 23% of the bodies as compared to the findings of the present study which shows44% (22 specimens). Moreover, the splanchnic nerves were rarely bilaterally symmetrical according to him. In the present observation, it was bilaterally symmetrical in three cadavers.

Table 3

Root	Right	Left	Total Cases observed
T4	2	1	3
T4/5	1	0	1
T5	5	7	12
T5/6	0	1	1
T6	9	12	21
T6/7	1	2	3
T7	16	21	27
T7/8	10	6	16
T8	12	15	27
T8/9	7	6	13
T9	13	19	32
T9/10	3	2	5
T10	6	3	9
T10/11	2	2	4
T11	1	1	2

The standard text books of Anatomy have described that the GSN is formed by T5 to T9 [1] or T10 ganglia [7]. In the present study, the GSN originated from two to six roots and the highest root of origin was T4 ganglia in 5.7% of the cases. In24.3%, the GSN originated from T5 ganglia. Edwards & Baker [6] have mentioned in their study that in 5%of the bodies the greater splanchnic nerve arose from only one ganglion and in a single instance GSN arose from seven ganglia. According to the number of ganglia from which splanchnic nerve arose, the pattern of formation of GSN could be classified into seven groups in the present study whereas Sway am Jothi *et al.* [8] have reported 19patterns of origin of GSN in 50 specimens and in one specimen the GSN was absent. Edwards &Baker [6] found marked lack of bilateral symmetry in origin of these

nerves. No bilateral symmetry was noticed in any of the specimens in the present study also.

Edward & Baker [6] found that the most frequent origin of the greater splanchnic nerve was from theT7, T8 and T9 ganglia whereas the most common arrangement was T6, T7 and T8 sympathetic ganglia in a study by Reed [5]. In the present study, the most frequent contribution for the GSN was from four ganglia: T6, T7, T8 and T9.

Conclusion

From the present study the data gathered will be helpful for students as well as surgeons for a better outcome of the thoracic splanchnic ec to my. Also in thoracolumbar sympathectomy the sympathetic chain has to be removed up to the highest point of origin of greater splanchnic nerve to overcome failure rate in sympathectomy

References

1. Greater splanchnic nerve. at Dorland's Medical Dictionary
2. http://www.gpnotebook.co.uk/simplepage.cfm?ID=-177 7991622&linkID=33098&cook=no
3. Loukas M, Klaassen Z, Merbs W, *et al*. A review of the thoracic splanchnic nerves and celiac ganglia. Clin Anat. 2010; 23(5):512-522.
4. Yang HJ, Gil YC, Lee WJ, *et al*. Anatomy of thoracic splanchnic nerves for surgical resection. Clin Anat. 2008; 21(2):171-177. 3. Kommuru H, Jothi S, Bapuji P, *et al*. Thoracic part of sympathetic chain and its branching pattern variations in South Indian cadavers. J Clin Diagn Res. 2014; 8(12):AC09-12.
5. Reed AF. The origins of the splanchnic nerves. Anat Rec. 1951; 109:341.
6. Edwards LF, Baker RC. Variation in the formation of the splanchnic nerves in the man. Anat Rec. 1940; 77:335.
7. Standring S. Autonomic Nervous System in Gray's Anatomy: The Anatomical Basis of Clinical Practice. Elsevier Limited, New York. 2016; 41:980-81.
8. Swayam Jothi S, Hemanth K, Ravi Kumar U, Rajeswara Rao N. Greater splanchnic nerve. IJAS. 2010; 1:17-20.