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CT Imaging Analysis on Variations of Gastrocolic Trunk of Henle

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ABSTRACT

Introduction: The Gastrocolic Trunk of Henle (GTH) is a crucial venous channel formed by right gastroepiploic vein, anterior superior pancreaticoduodenal vein and veins from the right colon. GTH variations are critical in surgeries involving colon, pancreas, stomach. Our study aims to describe the GTH variations using computed tomography.
Materials and Methods: 462 patients who had undergone CECT abdomen scans for 1 year from January 2025 were enrolled in the study. Images were analysed for GTH and its variations according to the Miyazawa classification, based on the number of colic drainage veins.
Results: In our study, GTH was detected in 92.9% patients with Type 1 being the most common type. The frequencies of different types of GTH in our study were as follows: Type 0 - 9%, Type 1 - 63.6%, Type 2 - 17.5%, Type 3 - 2.59%.
Conclusion: Variability in the anatomy and tributaries of GTH necessitates careful pre-operative assessment of the trunk by imaging so as to improve the surgical outcome.

Keywords: Gastrocolic Trunk of Henle (GTH), computed tomography (CT).

INTRODUCTION

Henle in 1868, first proposed the concept of Gastrocolic venous trunk which later became known as Gastrocolic Trunk of Henle (GTH). It is a venous trunk formed by the stomach draining right gastroepiploic vein (RGEV) and colon draining superior right colic vein (SRCV), and the trunk drains into the superior mesenteric vein (SMV). Later, Descomps et al renamed the trunk as gastropancreaticocolic trunk with the inclusion of anterior superior pancreaticoduodenal vein (ASPDV)[1,2,3].

The GTH is composed of many tributaries including RGEV, ASPDV, right colic vein (RCV), SRCV, middle colic vein (MCV), accessory middle colic vein, ileocolic vein. The confluence of any two or more of the mentioned veins is identified as GTH. GTH exhibits variations in its formation and various classification systems have been proposed to categorize the anatomical types and variations. Miyazawa classification is commonly used, as it balances both practicability and comprehensiveness. Based on it, GTH is categorized into Types 0, 1, 2,

3 depending upon number of colic vein tributaries like RCV, SRCV, MCV. RCV and MCV are tributaries arising from marginal veins of ascending and transverse colon respectively. When multiple RCV or MCV are present, the thicker vein is identified as the main vein and the smaller one is referred to as the accessory vein. SRCV is the tributary originating from the marginal vein of hepatic flexure of colon[1,2,4,5,6.]

GTH with its variations poses a significant challenge during the surgeries involving right colon, transverse colon, head of pancreas, duodenum and distal stomach. Obtaining precise preoperative information about the anatomical tributaries of the gastrocolic trunk is very important[7,8].

Many studies have been conducted on GTH variations across the world. However, there exists scarcity of data in the Indian context. The aim of this study is to describe the variations of the Gastrocolic trunk of Henle using computed tomography (CT) imaging among patients who underwent scans in a tertiary care centre in central Kerala (southernmost state in India).

METHODS

The study was conducted in the Department of Radiodiagnosis at Believer's Church Medical College Hospital (a tertiary care centre in Thiruvalla, Kerala), after getting clearance from Institutional Research and Ethical committees.

Patients who underwent CECT abdomen from January 2025 to December 2025 were enrolled in this study. CECT abdomen images of 462 patients were analysed.

Patients with history of abdominal surgeries and whom the gastrocolic trunk could not be adequately assessed due to SMV infiltration by the tumor or visualization difficulties were excluded from the study.

All the CT scans were performed in a Philips Ingenuity 128 slice CT scanner. The CT images were analysed using Philips Workstation having IntelliSpaceTH Portal Operating System. The Multidimensional (MDCT) raw data transferred to the workstation is processed using multiplanar reformation technique, curved planar reconstruction and volume rendering.

GTH variations were stratified as per Miyazawa classification which is actually based on the number of colic veins draining into it: Type 0 indicates no colic vein, Type 1 denotes single colic drainage, Type 2 indicates two colic drainage and Type 3 signifies three colic drainages.

RESULT

Among the 462 patients, there were 429 patients with gastrocolic trunk, with an occurrence rate (detection rate / prevalence) of 92.9 %. GTH was absent in 7.1 % patients.

Among all the colic tributaries, SRCV was the most common (identified in 61%, 282 patients) followed by RCV (described in 28.5%, 132 patients) and MCV (16.8%, in 78 patients).

The anatomical variations in tributaries of the GCT described by MD-CT were classified into four types based on the number of colic drainage veins

The frequencies of Type 0, Type 1, Type 2 and Type 3 were 9 % (n=42), 63.6 % (n=294), 17.5 % (n=81) and 2.59 % (n=12) respectively. Type 1 has the highest frequency of all types (63.6 %).

Among Type 1 GCH, where the venous trunk has tripod confluence consisting of RGEV, ASPDV and colic vein, superior right colic vein (SRCV) was the most frequent (42.8 %, n=198). On the other hand, Type 3, where the SRCV, RCV and MCV separately drained into the GCT was rare (2.59 %).

There was no case where ileocolic vein drained into the GTH. But ileocolic vein is a constant component of colic venous anatomy and drains exclusively to SMV.

Table 1: Showing different GTH variations in our study

Absent	Type 0	Type 1			Type 2			Type 3	Total
		SRCV	RCV	MCV	SRCV + RCV	SRCV + MCV	RCV + MCV		
33 (7.1 %)	42 (9 %)	198 (42.8 %)	75 (16.2 %)	21 (4.5 %)	36 (7.79 %)	36 (7.79 %)	9 (1.9 %)	12 (2.59 %)	462
		294 (63.6 %)			81 (17.5 %)				

Table 2: Showing prevalence of GTH in different studies.

Study	Prevalence / Detection rate (%)
Our study	92.9
Miyazawa et al[4]	83.3
Gu et al[7]	81.25
Sakaguchi et al[13]	77.5
Ogino et al[14]	87.7
Yamaguchi et al[9]	69
Jin et al[10]	88.9
He et al[6]	97.3
Lange et al[11]	45.9
Lee et al[12]	79.3

Table 3: Showing frequency of different types of GTH in various studies in comparison with our study.

Study	Type 0	Type 1	Type 2	Type 3
Our study	9 %	63.6 %	17.5 %	2.59 %
Miyazawa et al[4]	7 %	71 %	20 %	2 %
Jin et al[10]	11 %	33 %	40 %	11 %
He et al[6]	14.1 %	53.3 %	27 %	5.6 %

DISCUSSION

Studies have been conducted on GTH variations across the world using various approaches like autopsy, vascular casting, intraoperative anatomy and imaging techniques. Nowadays, imaging methods such as computed tomography (CT) angiography, magnetic resonance imaging (MRI) and Doppler ultrasound are widely utilised to assess vascular anatomy. Among these, MDCT stand out as a non-invasive, cost effective, accurate approach which provide new insights into the anatomy and variations of Henle's trunk, but there have been only few studies[1,7.]

Many of the studies on GTH were by using autopsy/ vascular casting (Yamaguchi et al[9], Jin et al[10]) and intra-operative anatomy (He et al[2, 6], Lange et al[11], Lee et al[12] etc). Few studies which used MDCT for the evaluation of GTH variations were by Miyazawa et al[4], Gu et al[7], Sakaguchi et al[13], Ogino et al[14]. Most of the studies were of small sample size.

High GTH detection rate was seen in our study similar to most of world wide studies. In our study, GTH was detected in 92.9% of patients. Detection rate / prevalence of GTH in various other studies is shown in Table 2.

Type 1 GTH with one draining colic vein was the commonest type of GTH in our study, similar to most of the other studies. Table 3 shows the comparison of different studies against ours based on GTH types. Many of the studies were using other classification systems; hence, not comparable.

Many of the studies showed RCV as the most common colic vein tributary. But, in our study, SRCV was the most frequent colic tributary in Type 1 GCH followed by RCV.

Thorough preoperative assessment of GTH anatomy and its variations is clinically important for two main reasons. Firstly, to avoid unexpected bleeding during surgeries. The complex and diverse branching patterns of GTH make it a common source of intra-operative bleeding and the risk is heightened during laparoscopic surgery with no tactile feedback increasing the likelihood of

torrential hemorrhage. To add, choosing an appropriate surgical dissection approach like medial /cephalic /paging approaches and meticulous intra-operative techniques like ligating GTH by branches rather than root, careful dissection along fascial planes also further help to reduce intra-operative bleeding complications.

Secondly, GTH due to its strategic anatomical position, plays a pivotal role in lymphatic dissection during surgeries for right sided colon cancer, particularly in Complete Mesocolic Excision (CME) and Central Vascular Ligation (CVL) procedures. It is said to be associated with lower local recurrence and improved survival as it facilitates central lymph node dissection with high ligation of the supplying vessels[2,5,6,7,15].

CONCLUSION

There exists marked variability in the anatomy and tributaries of GTH among the population. Hence, careful pre-operative assessment of the trunk by imaging is necessary before right colic/ pancreatic/ gastric surgeries so as to improve the surgical safety, outcome and prognosis of the patients.

Declaration by Authors

Ethical Approval: Approved

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