CONSTANTA "OVIDIUS"UNIVERSITY
MEDICINE FACULTY

HEPATIC ARTERY MORPHOLOGY

- THE PhD THESIS ABSTRACT -

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INTRODUCTION

At the level of the organs vascularised by the celiac trunk branches, as with other regions of the human body, the anatomical research is guided by the rich hepatic, gastric and splenic pathology, by the new medical needs for imaging exploration and by the the needs of our modern surgery. The coherent and systematic study of the collateral and terminal branches of the celiac trunk found a new, growing impulse together with the hepatic segmentation knowledge,the newly introduced and improved partial hepatectomy techniques and the various therapeutic techniques of vascular anastomoses or hepatic transplant procedures.Even the most common colecistectomy raises issues to a surgen due to the arterial vascular variants existence and it is not possible without a solid knowledge of the vascularisation sources.

All of these facts pinpoint towards the necessity of knowing very well the multiple aspects exhibited by the celiac trunk branches which have been described and researched for a long time but are still sparkling interest and are keeping on being investigated under various aspects.A great deal of specialist books edited within this field are proving this constant interest which is also justified by the new modern investigation methods for vascularisation (common angiography and CTangio, RMN). Even so, at the end of this study there will be plenty of room for discussions, mentions and clarifications.

At an international level the studies done by Rosi and Cova, Rio Branco, Descomps are standing out and in the second half of the 20th century there are prominent authors like Huu, Vandamme şi Bonte, Lippert & Pabst and a great number of works about the celiac trunk and its branches, all done by Bergmann. I also had a variable number of cases, part of them being my own cases and some of them gathered from the specialty literature and I was able to compare my personal results at the end of my study with the data collected by the scientists mentioned before.

My study concerning the hepatic artery started about five years ago with a good amount of resources , which allowed me to collect an impressive number of personal cases, sometimes more than those of some well known authors.The amount of cases allowed

me to describe multiple variations of the hepatic artery which is hard to find all in once at the same author as usually a single author described just one particular anatomical aspect of this arterial trunk. I have tried to value my personal scientific results trough some lectures or making posters as an author or co –author, participating at different national or international congresses and anatomy conferences. Let me remind just a few : The Annual Meetings of Scientific Communications from the Medicine Faculty in Constanta, National Anatomy Congresses from Cluj and Constanţa and The International Anatomy Congress, Anatomische Gesellschaft, from Hamburg Frankfurt auf Main.

This work about a vast domain such as morphology, even if it takes into consideration just a single arterial segment, less extensive than other arterial vessels, wouldn`t have been possible without a serious scientific background to which I`m indebted to my Proffessors whom I would like to thank you very much and I will always be gratefull.

I would also like to express many thanks to Mr. Baz Radu, Lecturer, and Mrs. Bărdaş Mariana, MD, who provided me with the angiographies used for my research, helping me this way to indicate the origin and dimentions of the collateral and terminal branches of the hepatic artery as well as the connections determined between this artery and the other branches of the celiac trunk and abdominal aorta.

I could not forget all my colleagues within the Anatomy Department who were so warm and supportive all along the process of writing and researching for my PhD thesis.Many thanks to all of them.

Finally, I would like to say thank you to my scientific advisor, Professor *Bordei Petru*, who guided my steps all the way towards the goal of elaborating this study.

RESOURCES AND WORKING METHODS

To be able to emphasize the morphological characteristics of both the celiac trunk and hepatic arteries we had to take into consideration for the purpose of our study a number of 313 particular cases as follows: 128 dissections on fresh liver organs prepared through formalin fixation;28 plastic injection method preparations followed by corrosion, 29 Doppler examinations, 62 common Angyography tests, 56 CTangio. Each morphological feature was studied through a variable number of cases so we could trace each individual characteristics.

As our study method we currently used dissections, both on corpses or anathomical preparations .The eviscerated anatomical preparations were fresh or preserved through formalin fixation, derived from adults and fetuses, made on subdiaphragmatic organic blocks or on plastic injection method preparations.All of these were carried out in our practical laboratory rooms and inside of our Anatomy Laboratory from Constanta,Faculty of Medicine.We also used the plastic injection room on the same location.

The plastic injection method which was very often performed, entailed the use of corpses and fresh liver organs.The injected substance was Technovit 7143 and NN Dimethiltoluidine 3% as solvent.Corrosion process was achieved through sodium hidroxyde accelerated by a 80-90^0 temperature. Our ecograohies were performed in Medical Clinic I by a Logiq^{TM} 700 scanner produced by General Electric Medical System.

The common angyographies I have studied were borrowed from the Anatomy Laboratoryand the CTAs which I had the opportunity to examine came from Emergency Clinic Hospital Constanta (Medimar Investigations Center and Euromedic Imaging Diagnostic Center from Constanta) all of them being processed by a tomography computer GE LightSpeed 16 Slice CT. We also used angyographies from Pozimed Diagnostic Center, processed by a tomography computer GE LightSpeed VCT64 Slice CT.The morphological landmarks for our research were : the origin place and level of the celiac trunk from the abdominal aorta in relation to the vertebral column and the other aortic collateral branches, especially the superior mesenteric artery and the renal arteries.As regards the

hepatic artery,we have followed it from its origin point to its ending within the hepatic hill(the extrahepatic path) with the aim to study how the hepatic artery originates from the celiac trunk or other possible arterial sources, from the poin of view of both place and level of insertion and in relationship with the vertebral column and the other two branches of the celiac trunk. We also took into consideration the path and direction of the artery ,the insertion level for its collateral branches and the level and ways of ending for the hepatic artery.

MORPHOLOGICAL FINDINGS ON THE CELIAC TRUNK AND HEPATIC ARTERY

THE CELIAC TRUNK ORIGIN

TABLE NR. 5 – LENGTH BETWEEN THE CELIAC TRUNK POINT OF ORIGIN AND THE SUPERIOR MESENTERIC ARTERY

LENGTH IN CM	NUMBER OF CASES	PERCENTAGE %
0,2-0,5	11	7,86
0,6-0,9	26	18,57
1-1,5	91	65
1,6-2	12	8,57

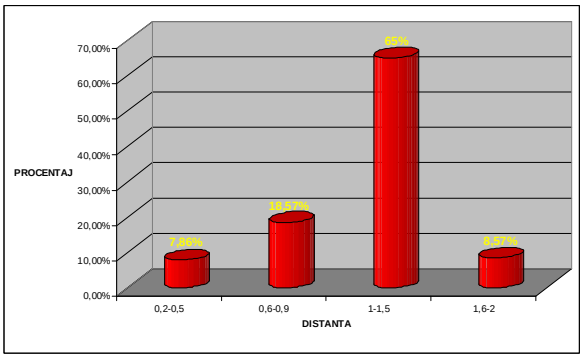

CHART NR. 3 -CELIAC TRUNK POINT OF ORIGIN IN RELATION TO THE SUPERIOR MESENTERIC ARTERY(LENGTH BETWEEN THEM)

We have followed the origin point of the celiac trunk from aorta using 74 cases.From the point of view of the skeleton the emergence point of the celiac trunk from aorta is placed within the interval between the superior third of the T12 vertebra and the inferior half of the L1 vertebra.

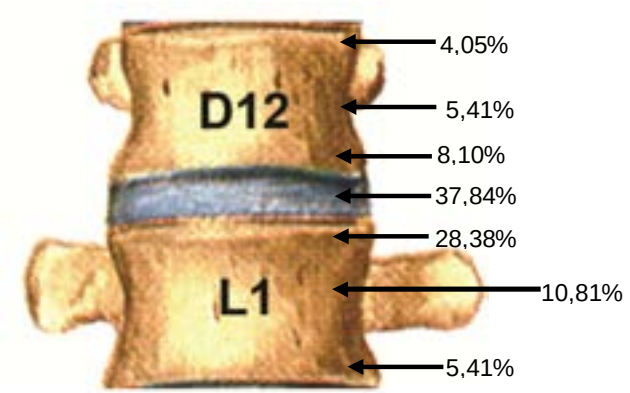

Fig. 41 – The celiac trunk origin in relation to the vertebral column

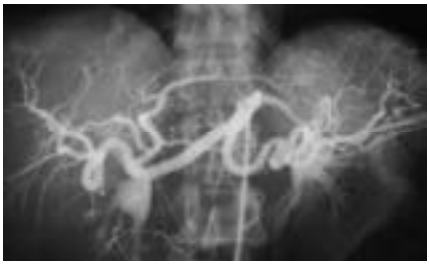

Fig. 43 –Celiac trunk origin at the level of L_1,superior third. The gastro-duodenal artery arises on the lateral wing of L1 vertebra (superior half) and right gastric artery emerges from the proper hepatic artery,close to its origin.

The most frequent origin point of the celiac trunk from aorta was found within the interval between T12-L1 i.v.disc and the superior third L1 , in 48 cases out of the 74 cases investigated (68,86% cases).These results agree with the findings of Paturet, Nguyen Huu, Bordei and Chiriloaie, but differ fromTestut's results who is placing the origin point most usual at the inferior edge level of the vertebral body T12 and T12-L1i.v.disc.According to Chevrel, the most frequent origin of the celiac trunk is placed between the interval T12-L1.

Fig. 44 – Celiac trunk origin at the level of L1 medial part and a common hepatic artery with a straight transverse direction to the right.The gastroduodenal artery originating on the lateral right wing of T12-L1 I.v disc,at the 12th rib superior border. Right gastric artery emerging from the proper hepatic artery at the inferior half of T12 vertebra.

Fig. 51 – Celiac trunk origin on the median line , anterior aortic side, at the level of T12-L1 I.v. disc with an oblique ascending direction towards right. Between the hepatic and splenic arteries there is an 180^{o} angle.The gastroduodenal artery originates on the lateral wing of T12 vertebra, above the 12^{th} rib. The right gastric artery originates from the proper hepatic artery at the level of T11 vertebra.

THE ENDING PATTERNS OF THE CELIAC TRUNK AND THE SINGLE HEPATIC ARTERY ORIGIN

I have studied the hepatic arteries origin on a number of 236 cases and found the single hepatic artery in 194 cases (82,20% percentage), in the other 42 remaining cases (17,80%) I could find either multiple,double or triple hepatic arteries.

The ending pattern of the celiac trunk helps to appreciate the common hepatic artery origin when this one emerges from the celiac trunk. Out of the 194 cases showing a single hepatic artery,in135 cases (65,59%) the hepatic artery had its origin from the celiac trunk with its various ending patterns.

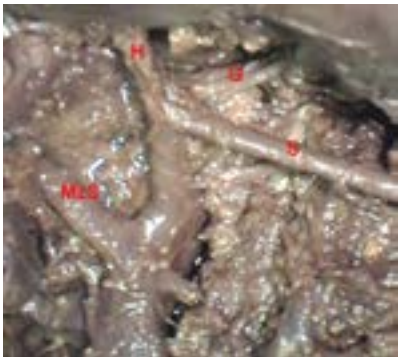

Fig. 55 – Trifurcated celiac trunk.An obtuse angle is created between the hepatic artery and splenic artery with the left gastric artery as its bisectrix.

The hepatic artery origin from a complete hepatogastrolienal celiac truk out of which are emerging all of the three big arteries , at the same level or at different levels was found in a 69,59% percentage which is close to the results achieved by Lipschutz in 72%, but smaller than Piquand`s 82%, and Rossi & Cova 84,5% and much smaller than Adachi 87,7%, Poynter 89%, Descomps 88%, Rio Branco & Eaton 90%. My percentage is higher that the one provided by Lippert & Pabst, 49% cases.

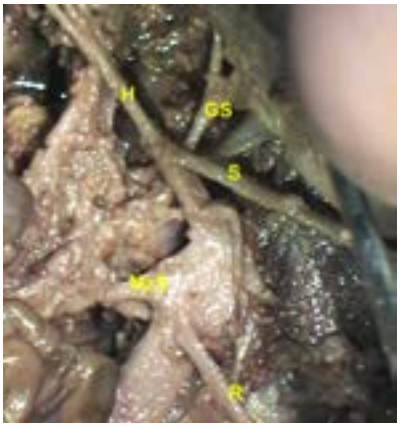

Fig. 124 – Celiac trunk with 3 branches ; left gastric artery origin is pleced below the terminal ramification(hepatosplenic trunk).

TABEL NR. 14 – COMPLETE CELIAC TRUNK - HEPATOGASTROLIENAL

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	87,7
DESCOMPS	50	88
EATON	206	90
LERICHE & VILLEMIN	55	89,1
LIPPERT & PABST	-	49
LIPSCHUTZ	83	72
PIQUAND	50	82
POYNTER	160	89
RIO BRANCO	50	90
ROSSI & COVA	102	84,3
VANDAMME & BONTE	156	86
PERSONAL CASES	236	69,59

The hepatic artery origin from a true trifurcated celiac trunk, "*ad modum tridentis*", where all of the three main branches are araising from the same level as terminal branches is less frequently met and I could find it just in 23,61% cases, a percentage similar to Lippert & Pabst, who are providing a 25% percentage.

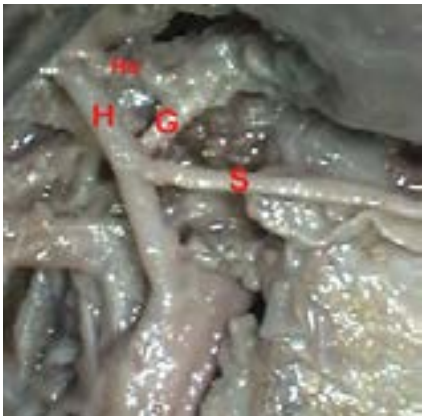

Fig. 125 - True trifurcation of the celiac trunk.

TABLE NR. 15 - TRUE TRIFURCATION : "AD MODUM TRIDENTIS"

AUTHOR	NR. STUDIED CASES	PERCENTAGE
LIPPERT& PABST	156	25%
PIQUAND	50	10%
PERSONAL CASES	236	23,61%

The hepatic artery origin from an incomplete celiac trunkriginea arterei hepatice dintr-un trunchi celiac incomplet, where one of the three main branches are emerging outside the celiac trunk I found it in a much higher percentage (25% cases), than in the specialist literature statistics , excepting Lipschutz who is finding it in the same percentage.

Fig. 126 – Incomplete celiac trunk (hepatosplenic) with a left gastric artery from aorta

TABELE NR. 16 – INCOMPLETE CELIAC TRUNK

AUTHOR	NR. STUDIED CASES	FREQUENCY %
DESCOMPS	50	12
EATON	206	9
LERICHE & VILLEMIN	55	9
LIPPERT & PABST	156	9
LIPSCHUTZ	83	25
NGUYEN HUU	400	3,5-4
PATURET	-	10
PIQUAND	50	14
POYNTER	160	9
RIO BRANCO	50	8
ROSSI & COVA	102	11
PERSONAL CASES	236	25

The most often the hepatic artery had its origin from a ***hepatosplenic celiac trunk***, 82 cases (42,27% out of all cases and

60,74% out of all celiac trunks), a trunk which has four possible variants in connection to the left gastric artery origin :

1. ***the left gastric artery origin is placed under the terminal ramification of the trunk***, an aspect found in 44 cases (22,68% out of all cases and 32,59% out of all celiac trunks);

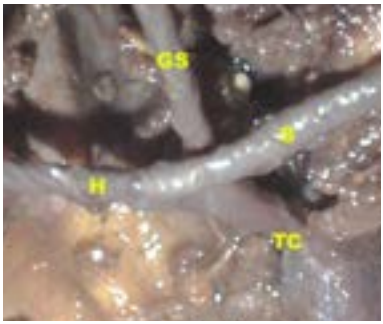

Fig. 56 - Hepatosplenic trunk with the left gastric artery originate under bifurcation.

2. ***the left gastric artery originate from the abdominal aorta***, a variation seen in 26 cases (13,40% out of all cases and 19,26% out of all celiac trunks), where the left gastric artery is usually placed above the trunk origin from aorta; in 19 cases (14,07% out of celiac trunks) the left gastric artery had its origin individually from aorta, in 4 cases (2,96% out of all celiac trunks) the origin from aorta it had the shape of a trunk ramificated with the left gastric and posterior gastric arteries , ***a bigastric trunk***, and in 3 cases (2,22% out of all celiac trunks) as a trunk ramificated into a left gastric artery and a second hepatic artery (***gastrohepatic trunk***). In both these situations there were two arterial trunks coexisting with the hepatosplenic trunk.

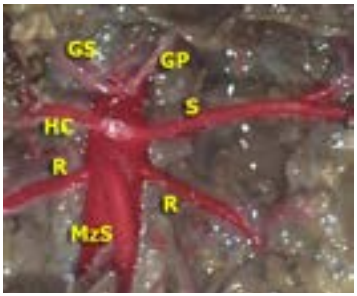

Fig. 58 - 2 arterial trunks, one is branching into the common hepatic and splenic arteries and the other one into the posterior gastric and left gastric arteries

3. ***the left gastric artery originate from common hepatic artery***, an aspect seen in 7 cases (3,61% out of all cases and 5,18% out of all celiac trunks);

4.

Fig. 59 - Hepatosplenic trunk with a left gastric artery originating from the common hepatic artery.

5. ***the left gastric artery originate from the splenic artery***, 5 cases (2,96% out of all celiac trunks).

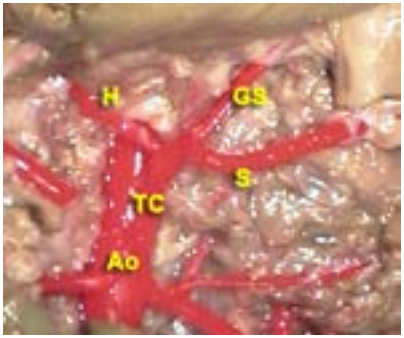

Fig. 60 - Hepatosplenic trunk with a left gastric artery originating from the splenic artery.

TABLE NR. 17 – HEPATOSPLENIC TRUNK

AUTHOR	**NR. STUDIED CASES**	**FREQUENCY** %
ADACHI	252	6,4
DESCOMPS	50	10
EATON	206	4,4
LIPPERT & PABST	-	5
LIPSCHUTZ	83	13,3
NGUYEN HUU	400	0,5
PIQUAND	50	8
VANDAMME & BONTE	156	6
PERSONAL CASES	236	42,27

Within the specialty literature ther is just Lipschutz with a percentage higher than 10% cases (13,3%), Nguyen finding it below 1% cases (0,5%), the other studied authors reporting it in a percentage between 5-10% cases.

The hepatic artery originate from a hepatogastric trunk it was encountered in 27 cases (13,92 out of all cases and 20% out of all celiac trunks), with two described variations in connection to the splenic artery origin:

1. ***the splenic artery originate under the terminal trifurcation of the gastrohepatic trunk***, 15 cases (7,73% out of all cases and 11,11% out of all celiac trunks).
2. ***the splenic artery originate from aorta***, 12 cases (6,19%out of all cases and 8,89% out of all celiac trunks).

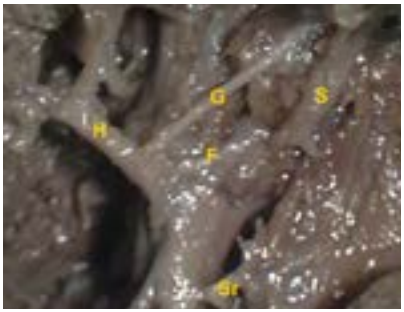

Fig. 61 - Hepatogastric trunk with a splenic artery originating from aorta

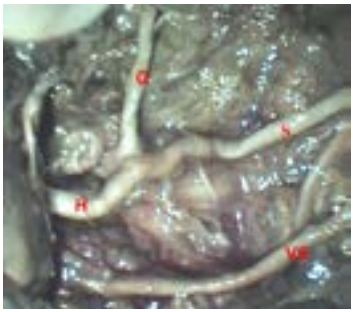

Fig. 62 – Hepatogastric trunk with splenic artery originating below the bifurcation

TABLE NR. 19 - HEPATOGASTRIC TRUNK

AUTHOR	NR. STUDIED CASES	FREQUENCY %
DESCOMPS	50	10
EATON	206	4,5
LERICHE & VILLEMIN	55	1,5
LIPPERT & PABST	-	1
NGUYEN HUN	400	0,5
PIQUAND	50	8
RIO BRANCO	50	2
ROSSI & COVA	102	6
PERSONAL CASES	236	13,92

In 5 cases (2,58% out of all cases and 3,70% out of all celiac trunks) I have seen ***the hepatic artery origin from a four branches***

terminated celiac trunk (two cases with the common hepatic artery, a left gastric , splenic and middle suprarenal arteries, in two cases branching into common hepatic, a left gastric, splenic and left inferior frenic arteries, just one case where the celiac trunk was branching out into common hepatic, left gastric, splenic and a suprarenalian trunk bifurcated in turn into middle and inferior suprarenal arteries.

Fig. 63 – Hepatic artery emerging from a 4 branches celiac trunk: common hepatic, left gastric, left inferior frenic and splenic arteries.

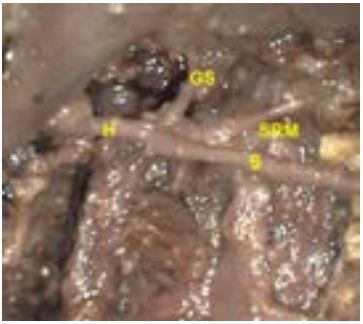

Fig. 64 – Hepatic artery emerging from a 4 branches celiac trunk:common hepatic,left gastric,left inferior frenic and splenic arteries.

Fig. 65 - Hepatic artery originating from a celiac trunk with 4 branches: common hepatic a., left gastric a., splenic a., and bifurcated suprarenal trunk with middle and inferior suprarenal arteries.

The hepatic artery originating from a celiac trunk ending in four branches comes out in a 2,58% percentage from all our cases and 3,70% from the celiac trunks,a morphological type found by Lippert in 10% cases and Michels in 5% cases, Nguyen Huu finding it in a 2-2,5% cases and Kosinski in 1,8% cases.

TABLE NR. 21 – CELIAC TRUNK WITH 4 BRANCHES

AUTHOR	NR. STUDIED CASES	FREQUENCY %
KOSINSKI	-	1,8
LIPPERT & PABST	-	10
MICHELS	257	5
NGUYEN HUU	400	2-2,5
PERSONAL CASES	236	2,58

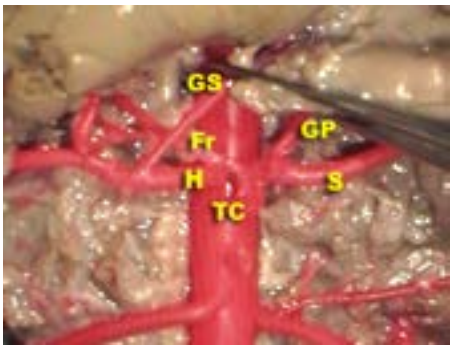

Fig. 132 - Celiac trunk ending with 4 branches: common hepatic artery,right frenic a., posterior gastric a. and splenic a.

In 4 cases (2,06% out of all cases and 2,96% out of all celiac trunks) I came across the ***the hepatic artery origin from a celiac trunk ending in five branches*** ,"***in a bouquet*** ", in 2 cases branching out into common hepatic , splenic, left gastric,right inferior frenic and superior suprarenal arteries; in another two cases the superior suprarenal artery was replaced by the middle suprarenal and posterior gastric arteries. Therefore I encountered two situations: one where the branches detached from the same level ,being true terminal branches and another one where one or two of the arterial branches detached at different levels but very close from each other. I found this variant mentioned only by Serebrov, in 1958.

Fig. 66 – Common hepatic artery originating from a terminal celiac trunk with 5 branches: common hepatic a., splenic a.,left gastric a., superior suprarenal a.and right inferior frenic a.

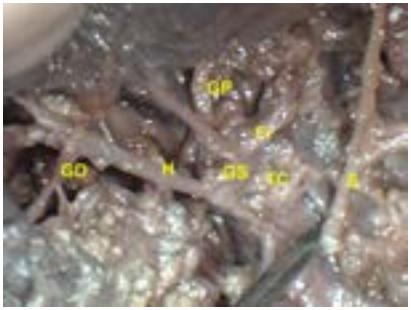

Fig. 133 - Celiac trunk with five branches spread out among them: common hepatic a.,splenic a., left gastric a., posterior gastric a.,left frenic a.

From all of our data collected and presented by now it comes out that **a single hepatic artery originating from the celiac trunk** was found in 57,20% cases, a smaller percentage than the other results from the scientific literature with differences scoring between 18-25 percentage. *Descomps* gives a precise 100% out of his cases.

TABLE NR. 22 - SINGLE HEPATIC ARTERY ORIGINATING FROM THE CELIAC TRUNK

AUTHOR	NR. STUDIED CASES	FREQUENCY %
DASELER	-	83,7
DESCOMPS	50	100
LIPPERT & PABST	-	76
NGUYEN HUU	400	80
PERSONAL CASES	236	57,20

These diffrences are probably due to the fact that I did not take into consideration in my statistics the multiple hepatic arteries in which case one or two arteries with their origins from the celiac trunk might exist.

I have also found 59 cases with the hepatic artery emerging from other arterial sources than the celiac trunk which describes 25% out of cases the hepatic artery originating from aorta, from a celioliomesenteric or mesentericohepatic trunk.

The most often I have seen **the single hepatic artery originating from aorta** , in 24,74% cases a higher percentage than the one found within the specialty literature (0,5-3% cases).

TABLE NR. 23 – SINGLE HEPATIC ARTERY ORIGINATING FROM AORTA

AUTHOR	NR. STUDIED CASES	FREQUENCY %
LIPPERT & PABST	-	3
NGUYEN HUU	400	0,5
VANDAMME & BONTE	156	1
PUTZ & PABST	-	3
PERSONAL CASES	216	24,74

Among these cases we found in 16,49% cases **the absence of the celiac trunk,** a situation where the three arteries will emerge straight from the aorta. It is obviously a higher percentage than in the scientific literature as shown in the table below, this aspect being quoted in 0,4-3% cases.

TABLE NR. 24 – MISSING CELIAC TRUNK

AUTORUL	NR. STUDIED CASES	FREQUENCY%
LIPPERT & PABST	-	<1
NGUYEN HUU	400	0,5
PIQUAND	50	2
POYNTER	160	0,4
ROSSI & COVA	102	3
VANDAMME & BONTE	156	1,07
PERSONAL CASESE	236	16,49

It seems incredible that very well known authors in this field are not mentioning at all the case of a missing celiac trunk (Rio Branco, Lipschutz, Descomps, Eaton).

The origin of the single hepatic artery from a celiomesenteric trunk. I have encountered it in a higher percentage than the one quoted by the literature (between 1-2% out of the cases) ,apart from Lipschutz, who is finding it in a similar percentage (3% cases), a closer percentage from Rossi & Cova in 2,5% din cases, Adachi finding it in a higher percentage (4% cases).

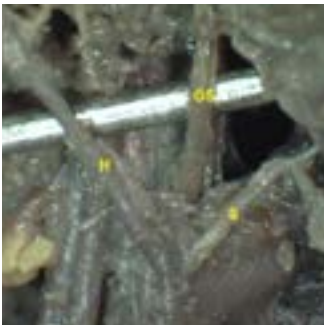

Fig. 135 – Missing celiac trunk,the three arteries emerging straight from aorta.

TABEL NR. 25 - CELIOMESENTERIC TRUNK

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	4
EATON	206	1
LERICHE & VILLEMIN	55	1,9
LIPSCHUTZ	83	3
NGUYEN HUU	400	1,25
PIQUAND	50	2
POYNTER	160	2
RIO BRANCO	50	2
ROSSI & COVA	102	2,5
VANDAMME & BONTE	156	-
PERSONAL CASES	236	3,09

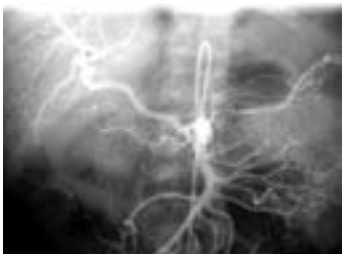

Fig. 67 – Celiomesenteric trunk.

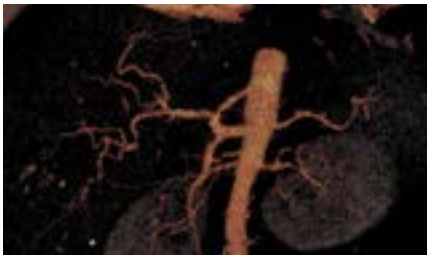

Fig. 69 - Celiomesenteric trunk.

A single hepatic artery originating from the superior mesenteric artery (mesentericohepatic trunk) it was found in 2,58% cases. According to Testut, the hepatic artery can accidentally

originate from the superior mesenteric artery and in these circumstances the celiac trunk will frecquently supply the right gastroepiplooic artery. Di Marino and Kamina claim that the common hepatic artery can emerge from the superior mesenteric artery and the hepatic artery gives off as branches : the gastroduodenal a, pyloric a, right hepatic a. (right branch gives off the cystic a.) and left hepatic (left branch);

Fig.72 – Common hepatic artery originating from the superior hepatomesenteric artery(hepatomesenteric trunk), the splenic artery originating from aorta. The gastroduodenal artery has its origin at the level of the D12-L1 I.v. disc, and the right gastric artery at the level of D12 vertebra.

Putz & Pabst found that the common hepatic artery emerges from the superior mesenteric artery in 3% cases. Michels describes 19 cases where the common hepatc artery originates from the superior mesenteric artery,a variant which he considers as type 9 as regards the hepatic arteries origin(the common hepatic trunk being replaced by the superior mesenteric artery). By Chevrel, when the hepatic artery originating from the superior mesenteric artery is also accessory, it will have a course posterior to the portal vein ; when it shows as a single artery its course will go anterior to the portal vein.

We found ***a double hepatic artery in*** 16,10% cases, a percentage which varies within the specialist books.

TABELE NR. 26 – DOUBLE HEPATIC ARTERY FREQUENCY

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	19,7
BERGMAN	-	10-19
RIO BRANCO	250	20
CARLES	-	1,6
DASELER	-	12,2
DOUARD	300	2
GODLEWSKI	56 (fetuses)	55
LIPPERT & PABST	-	31

LAMARQUE	1000 (angio)	21,5
LAUDE	50 (angio)	47
MELLIÈRE	-	40
MICHELS	257	21
NGUYEN HUU	400	14-25
PEDROSO	-	12
RIGAUX	120	29,2
SOHIER	19	80.6
PERSONAL CASES	236	16,10

Except for Charles and Douard, who found a double hepatic artery just in 1,6%, respectively 2% cases, there are higher differences of 14,1, respectively 14,5 percentage in my own study. On some occasions my own percentage has extra variations of 3,9-4,1 percentage: Daseler, Pedroso or a minus of 3,6-5,4 percentage: Adachi, Lamarque, Michels). Even so ,these diffrences are not as significant as one can find with other authors who are describing higher percentage compared to mine: between 13,1-38,9 percentage(Lippert, Godlewski, Laude, Mellière, Rigaux),except for i Sohier ,who has a diffrence of 64,5 percentage. These diffrences, sometimes significant are due to the unrepresentateve number of cases used and the subjective interpretations of the angiographies, far from reality in some circumstances.

Testut found that independently from the hepatic artery of the celiac trunk the liver receives supply from some other arteries, less important, described on the whole as *accessory hepatic arteries*. The most frequently these arteries are just common arterioles emerging from three sources: 1.left gastric or from pyloric arteries; 2. Internal thoracic a.; 3. Inferior diaphragmatics a.

Netter states that a right or left hepatic artery originating usually from the proper hepatic artery can be partially or totally replaced by an aberrant artery(accessory or replacement a.) having a different origin. The left gastric artery is the most common origin place of a left hepatic artery and the superior mesenteric artery is the most frequently the origin place to an accessory right hepatic artery. He describes 8 origin variations of an additional hepatic artery.

Moore found that a right or left hepatic artery, commonly originating from the proper hepatic artery could be partially or totally replaced by an aberrant artery (accessory or replacement) having a different origin.

Kamina describes 10 origin variants of an additional hepatic artery, the most common cases having 2 arteries, less often with cu 3 arteries and very rare with 4 additional hepatic arteries.

Hentati & colab., discovered through dissection a case with u 2 hepatic arteries both of them emerging from the superior mesenteric artery, creating this way a ***bihepatomesenteric trunk***. According to them, there was never described this particular variant in the specialty literature.

Out of my own cases,in 12 situations (5,08% out of the studied hepatic arteries and 28,57% out of the cases with multiple hepatic arteries) both hepatic arteries had their origin from the celiac trunk and in all of the cases the second artery was a left hepatic artery. In 8 cases (3,39% out of the studied hepatic arteries and 19,05%out of the multiple hepatic arteries cases) the left hepatic artery emerged from the celiac trunk under its terminal ramification, being a hepatosplenic trunk (6 cases), when the left gastric artery emerged also under the terminal ramification , in 2 cases the celiac trunk ending through a classical trifurcation. In other 2 cases (0,85% out of the studied hepatic arteries and 4,76% out of the multiple hepatic arteries cases) the left hepatic artery originates from a celiac trunk ending with four or five branches.

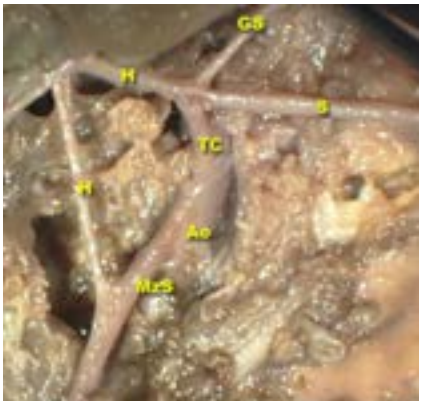

Fig. 137 – The second hepatic artery originating from the superior mesenteric artery.

The second hepatic artery had its origin from the superior mesenteric artery in 8 cases (3,39% out of the studied hepatic arteries and 19,05% out of the multiple hepatic arteries cases), the other artery arising from the celiac trunk as its terminal branch. This variant describes 4type from his classification (24). In 6 cases

(2,54% out of the studied hepatic arteries and 14,29% out of the multiple hepatic arteries) the artery originating from the superior mesenteric artery proves to be a right hepatic artery(6 type from Michels` classification), and in 2 cases (10,53% out of all cases) it was a left hepatic artery ( 8t type from Kamina`s classification). Ace Bergmann found this variant in 10-19% cases Nguyen Huu in 0,5% out of all cases and Lippert in 12% cases.

TABLE NR. 27 – A SECOND HEPATIC ARTERY OUT OF THE SUPERIOR MESENTERIC ARTERY

AUTHOR	NR. STUDIED CASES	FREQUENCY %
BERGMANN	**-**	**10-19**
CARLES	-	1,6
LIPPERT & PABST	-	15
NGUYEN HUU	400	4,25
PERSONAL CASES	236	3,39

In 4 cases (1,69% out of the studied hepatic arteries and 9,52% out of the multiple hepatic arteries cases), the two hepatic arteries(one left, the other one, right) were emerging from aorta, a situation where the celiac trunk was missing and the three branches of the celiac trunk had also their origins from aorta .This variation is mentioned by a few authors :Lippert found it in less than 1% cases, Nguyen Huu, on 400 cases, found it in 0,5% cases, Piquand, on 50 cases,found it in 2% cases, Poynter, with 160 cases, in 0,4% out of his cases, Rossi & Cova,with 102 cases,discovered it in 3% cases and Vandamme, on 156 cases, in 1,07% out of his cases.

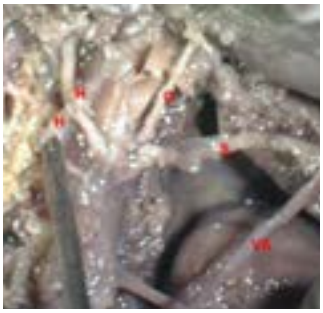

Fig. 138 – Two hepatic arteries originating from aorta.

This variant it is a 4 type after Michels` classification. In 6 cases (15,79% percentage) the artery emerging from the superior

mesenteric artery it is a right hepatic artery (6 type after Michels), and in 2 cases (10,53%) it was a left hepatic artery (8 type after Kamina`s classification).

TABLE NR. 28 – TWO HEPATIC ARTERIES ORIGINATING FROM AORTA

AUTORUL	NR. STUDIED CASES	FREQUENCY%
LIPPERT & PABST	-	below 1
NGUYEN HUU	400	0,5
PIQUAND	50	2
POINTER	160	0,4
ROSSI & COVA	102	3
VANDAMME	156	1,07
PERSONAL CASES	236	1,69

One can notice that my own percentage it is close enough to the data found in the specialty literature, the biggest diffrences show up in comparison with Rossi &Cova, who found more often a second hepatic artery originating from aorta (in 3% cases), Nguyen Huu and Lippert finding a lower percentage (below 1% cases).

The two arteries originating from aorta displayed on different levels,superior and inferiorior,are taking birth horizontally at some distance from each other and usually the left one has a more anterior origin point. Sometimes the inferior artery can be a left hepatic artery passing anteriorly or posteriorly than the right hepatic artery, following her course towards liver.

In 4 cases also (1,69% out of the studied hepatic arteries and 9,52% out of the multiple hepatic arteries) the right hepatic artery(common) had its originfrom the celiac trunk (the most often hepatosplenic trunk), the left hepatic originating from the left gastric artery (5 type after Michels` classification) .

In 6 cases (2,28% out of the studied hepatic arteries and 14,29% out of the multiple hepatic arteries cases) one of the two hepatic arteries derived from a hepatosplenic trunk and the other one from a hepatogastric trunk, both trunks having a common origin from aorta with the hepatogastric trunk placed in a higher position.

In other 4 cases (1,69% out of the studied hepatic arteries and 9,52% out of the multiple hepatic arteries cases) a hepatic artery arised from the celiac trunk (hepatosplenic trunk),and the other hepatic artery derived from aorta as a left hepatic artery originating above the celiac trunk origin. Bergmann found this variant in 10-19%

out of all cases ,Nguyen Huu in 0,5% out of cases and Lippert in 12% out of cases.

TABLE NR. 29 – A SECOND HEPATIC ARTERY ORIGINATING FROM AORTA

AUTHOR	NR. STUDIED CASES	FREQUENCY %
BERGMAN	-	10-19
LIPPERT & PABST	-	12
NGUYEN HUU	400	0,5
PERSONAL CASES	236	1,69

Note the high percentage findings given by Bergmann in 10-19% cases and Lippert, 12% cases.

TABLE NR. 30 – TRIPLE HEPATIC ARTERY FREQUENCY

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	3,9
RIO BRANCO	250	2
DOUARD	300	-
GODLEWSKI	56 (fetuses)	12,5
LAMARQUE	1000 (angio)	4,39
LAUDE	50 (angio)	2
MICHELS	257	-
RIGAUX	120	4,2
SOHIER	19	1.6
PERSONAL CASES	236	1,69

Compared to the data of the specialty literature my percentage is slightly higher than Rigaud and Sohier, with just 0,09 and respectively 0,49 percentage, lower with1,31 percentage than Rio Branco and Laude,with 2,28 and 2,70 percentage than Adachi and Lamarque. It is smaller but the difference is higher compared to Godlewski(10,81 percentage).As a matter of fact, Michels and Douard did not encounter such cases with three hepatic arteries.

These significant diffrences are due partly to the fact that some statistical data were built upon an insignificant number od cases and partly to the fact that nowadays the angiographies are exposed to personal interpretations, sometimes too far from reality.Hentati, opposite to the existing differences one can find through the specialty books is saying that there are often cases with three hepatic arteries, providing also a list with their origins.

Caty, following a dissection of a 46 years old corps,comes up with a description for 3 hepatic arteries:the first one (common hepatic artery) originating from the celiac trunk, a second one (left hepatic artery) with its origin from the left gastric artery and a third (right hepatic) ,emerging from the superior mesenteric artery.

Kamina describes a case with 4 hepatic arteries (6 type, his classification), two are right and two left; between the right ones ,one of them is a terminal branch of the celiac trunk (hepatosplenic trunk),giving off pyloric, gastroduodenal and cystic arteries; the second right hepatic artery originate from the celiac trunk , below the terminal bifurcation, being a collateral branch of it and entering the liver through the hilum;between the two left hepatic arteries,one of them originate from the left gastric artery (collateral branchof the celiac trunk, emerging below the terminal ramification and above the point of origin to the second right hepatic artery,between the origins of the two right hepatic arteries), and the second left hepatic arteries originate from the splenic artery; both left hepatic arteries are entering the hepatic hilum to the left.

Another problem which comes out is connected to the terminology used to name these additional hepatic arteries. To many authors the common hepatic and middle hepatic arteries are normal, regardless their origins but the other liver supplying arteries are seen as abnormalities : Testut, Godlewski, Couinaud, Duval. To the others the common hepatic artery it is the main artery and the small arteries are just accesssory (Rigaud, Couinaud). As opposed to the above cases there are other authors claiming that all the arteries involved in liver vascularisation should be considered hepatic arteries with various functional roles. (Rigaud, Duval and Taviaux, quoted by Hentati)). These confflicting opinions are revealing the diversity of the concepts in embryology upon the origins of the hepatic arteries and they are also explaining the large interval range of the statistical data. There are other authors thinking that the arteries with origins either from the common hepatic or gastoduodenal are accessory hepatic arteries (Laude, Rigaud), while others are considering them as collaterals of a main artery (Couinaud). I personally belive that the terminology of double or triple hepatic arteries would be more appropriate in cases of multiple hepatic arteries. One should take into consideration the caliber(diameter) of the artery to be able to create a definition for the main hepatic artery as it seems to have the biggest caliber and has the ability to supply the larger hepatic territory.

Out of the things exposed before it comes out that the single hepatic artery was found in 82,20% cases and in 17,80 % cases we found multiple,double and triple arteries.

TABLE NR. 31 – SINGLE HEPATIC ARTERY FREQUENCY

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	70
RIO BRANCO	250	55
DOUARD	300	98
GODLEWSKI	56 (fetuses)	25
LAMARQUE	1000 (angio)	74,2
LAUDE	50 (angio)	51
MICHELS	257	55
RIGAUX	120	66,6
SOHIER	19	17,7
PERSONAL CASES	236	82,20

My own percentage is higher than others - Godlewski, Laude and Sohier, with differences between 31,2-63,6 percentage (they worked with a reduced number of cases) .The percentage is also smaller to Rio Branco and Michels, who had a good number of cases (250, respectively 257 cases), the differences scoring 27,2 percentages.

TABLE NR. 32 – MULTIPLE HEPATIC ARTERY FREQUENCY

AUTHOR	NR. STUDIED CASES	FREQUENCY %
ADACHI	252	23,6
RIO BRANCO	250	22
DOUARD	300	2
GODLEWSKI	56 (fetuses)	67,5
LAMARQUE	1000 (angio)	26,4
LAUDE	50 (angio)	49
MICHELS	257	55
RIGAUX	120	33,4
SOHIER	19	82,2
PERSONAL CASES	236	82,20

My personal percentage is identical to the one found by Sohier, but there are significant differences as regards single and double hepatic arteries.Apart from Douard, who found double

arteries in a percentage of 2% cases,my percentage differences are higher with 14,7-60%.

Fig. 139 – Gastroduodenal and right gastric arteries with the origin from the left hepatic artery which is a celiac trunk branch;the right hepatic artery also originate from the celiac trunk.

The gastroduodenal artery is the biggest collateral branch of the hepatic artery, some authors (Papilian and Descomps, quoted by Paturet) even consider it a bifurcation branch of the hepatic artery.Although Paturet states that it is on the anterior side of the portal vein to the left from the common bile duct ,I did not find too often this origin ,the most frequently the gastroduodenal artery originating from the right lateral wing of the portal vein, being laterally placed to the right in relationship to the vertebral column. In cases of double or triple hepatic arteries, the gastroduodenal artery arises only from a hepatic artery originating from the celiac trunk or aorta, as I have never encountered a case where to emerge from a hepatic artery originating itself from a superior mesenteric artery because out of this a cystic artery could arise. In cases with multiple hepatic arteries, the gastroduodenal artery will arise from the right hepatic artery (lateral), or less often will arise from the left hepatic artery with a celiac or aortic origin.When there is a single hepatic artery originating from the superior mesenteric artery this artery will give birth to a gastroduodenale artery. All of these aspects were described by Kamina, who mentioned that the left hepatic artery originating from the celiac trunk it is the one providing the gastroduodenal a., with its origin in aorta and having a posterior traject to the bile duct.According to Kamina these cases are rare as the right hepatic artery(even when originates from aorta) is the one giving birth to the gastoduodenal a.

Nguyen Huu found cases where the gastroduodenal artery originates from the superior mesenteric artery, a variant I have never met.

Gray mentions a possibility for the gastroduodenal artery to have its point of origin from a celiac trunk, apart from having the point of origin from the superior mesenteric artery or from an aberrant hepatic artery.

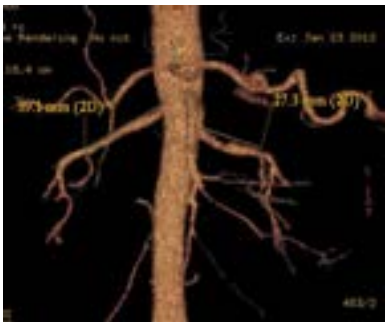

Fig. 86 – Common hepatic artery with a descendind oblique course ,has a trifurcated ending with right gastric, proper hepatic and gastoduodenal arteries.

The right gastric artery or pyloric artery (according to the french authors), by Rouvière & Paturet-arises from the proper hepatic artery , an aspect which I found myself in a majority of cases. Sometimes the proper hepatic artery can deliver a right gastric accessory artery, thiner than the previous one , a variant I did not meet at all but which appears at Descomps in 25% cases This aspect is documented also by Chevrel, who states that the origin point of the right gastric artery it could be also from the left terminal branch of the proper hepatic artery, from the common hepatic or gastroduodenal arterie. I found the origin from the common hepatic artery in 16,67% cases but I could not find any quotations about its origin as a result of the common hepatic artery trifurcation where the right gastric a. is the medial branch.After Chevrel the right gastric a. is ending either in a bouquet (not very often), or through a bifurcation with the anterior and posterior branches creating an anastomosis at the level of the lesser curvature of the stomach together with the left gastric a. branches ,an anastomosis which is present according to Borelly (quoted by Chevrel) in almost 26,67% cases (8 cases out of 30). If there are multiple hepatic arteries the right gastric a. emerges usually from the left hepatic a. or from the right medialhepatic artery , in case there are two right hepatic arteries .

Fig. 140 - Gastroduodenal artery with origin from the right hepatic artery (hepatosplenic trunk);its terminal branch is the right gastroepiploic artery.The left hepatic artery originating from the hepatogastric trunk gives rise to the right gastric artery.

The terminal ramification of the proper hepatic artery s takes place usually inferiot to the hepatic hilum and inferior to the terminal ramification of the hepatic portal vein. The proper hepatic artery is ending with two branches, right and left(Rouvière şi Chevrel), Paturet adding to these a third branch , called **accesory branch** or a **medium hepatic artery**, known also as **aHaller `s medium hepatic artery**. I was able to find this branch till nowadays in13,24% out of cases. I have also described some cases where the terminal ramification of the hepatic artery emerged inferiorly from the portal bifurcation. (most often, in 44,44% cases) or antero- lateral to its left (in 33,33% cases).

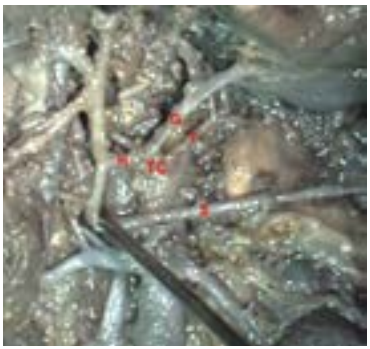

Fig. 78 – Hepatosplenic trunk with a proper hepatic artery ending in trifurcation.

I discovered the right branch is thicker than the left branch , an aspect reported also by Chevrel, Rouvière, Paturet. The arterial branches are like satellites to the venous portal branch but their situation in connection to it has many variations,therefore one cannot talk about a specific type as Paturet also noticed.Their placement is different between the two terminal branches as well as within the same hepatic lobe.There is also a different level of terminal ramification for the two branches ,as well as their traject and the ramification pattern. The right branch is usually ending through ramification and the left branch is more frequently ending with three branches than the right one. The hepatic posterior lobe is always supplied by the two terminal ranches even if sometimes one of them is bulkier than the other.The quadrate lobe may be vascularised only by the right branch. Sometimes,the proper hepatic artery is ending through trifurcation with a right branch,left branch and cystic arteries.

Fig. 141 – Cystic artery emerging from the terminal ramification of the proper hepatic artery.

THE SEGMENTAL HEPATIC ARTERIAL VASCULARISATION.

At the level of the hepatic hilum the hepatic artery is ending in a bifurcation, giving rise to the right and left branches.After passing the hepatic hilum, the right branch is ending through a bifurcation into a an anterior biger branch called ***the anterior segment arteryr*** (A. segmenti anterioris) and a posterior branch named ***the posterior segment artery*** (A. segmenti posterioris). Out

of the right branch, closer to its origin point , arises a branch for the quadrate lobe .It can happen also after the artery crosses the anterior side of its homologous portal vein.One or even two branches are detaching from the anterior bifurcation branch of the right branch of the hepatic artery, going to the quadrate lobe. There is also a posterior branch for the caudate lobe which emerges out of the right branch of the hepatic artery, closer to its origin and this artery is named ***the caudate lobe artery*** (A. lobi caudati). This artery gives birth ,sometimes, to a descending branch supplying the antero lateral part of the caudate lobe.

Fig. 113 – Right branch of the hepatic artery is longer and thicker. It gives off an intermediate branch to the quadrate lobe and 2 other branches to the caudate lobe springing from the posterior side of the right portal branch. One can easily identify the segmental branch to the right hepatic lobe.The left branch is not involved into the quadrate lobe vascularisation.The branch to the hepatic segment II is bigger than the branch to the hepatic segment III.

The left branch of the hepatic artery is related, most frequently to the right branch, within a superficial, anterior plane.This branch is also connected to its homologous portal vein and in most cases passes anterior and less often, posterior to it. In some cases when the terminal bifurcation of the left branch appears early,one of the two branches is allowed to pass prior to the other one and the other branch will go posterior in relation the left portal venous branch. It has an ondulated or straight course with a transverse direction or descending oblique to the left.Sometimes it can have initially, along 1-1,5 cm,a vertical course. At the level of the left portal venous branch or anterior to this it will end through a bifurcation with an anterior and a posterior branch.The posterior branch gives off ,in turn,1-2 branches destined to the caudate lobe, supplying its left lateral side and the middle part. The two branches,anterior and posterior, will spread out to the hepatic segments II and III, the vascular territories being very clearly separated from each other; in

very rare situations the anterior branch gives off a thin posterior branch which will enter the hepatic segment II.

The caudate lobe of the liver receives arterial branches from both terminal branches of the hepatic artery and each of them supplies the corresponding half of the lobe. It is not so uncommon though the case when one of the hepatic artery branches, right or left, will supply more than than the corresponding half of the caudate lobe.The caudate lobe has a rich vascularisation, as from each terminal branch of the hepatic artery can emerge 2 or 3 arteries.If there is just one branch, it will give off a very rich ramification.

The left branch of the hepatic artery will take part less often to the quadrate lobe vascularisation.In over 80% cases the caudate lobe vascularisation is provided only by the right branch of the hepatic artery. The arteries of the quadrate lobe are derived from the intermediate branch which can have its origin either from a left and right branch or from the celiac trunk. It can also originate from the hepatic artery trunk either as a collateral or a terminal branch and in the last case the proper hepatic artery will end through trifurcation. In cases where the quadrate lobe arteries are coming from both terminal branches of the hepatic arteries, the right branch usually supplies , as a rule, more than the right half of the lobe. It is true that sometimes one of the quadrate lobe branches can take part to the hepatic segment III vascularisation, even if its origin point is from the right hepatic branch. The hepatic segment III branch can pass anteriorly to the left branch of the portal vein , describes a curve with its concavity across the lobe,passes posteriorly to the posterior terminal vein of the left portal branch , arriving on the posterior wing of its portal homologous. Out of this arterial branch comes out an arterial branch to the caudate lobe,emerging at a point anterior to the left portal branch cross.The artery of the hepatic segment III passes posteriorly to the left portal branch.

Fig. 114 – Intermediate branch originating from the the proper hepatic artery right terminal branch,helps vascularize the 3th hepatic segment.

SUMMARY CONCLUSIONS

Considered from all of their aspects, the celiac trunk and hepatic artery exhibit a great morphological variability , their collateral and terminal branches being by far the most interesting and having the most clinical value.

I found out there is a link between the celiac trunk lenght and his terminal branches caliber as much as that when the hepatic artery caliber is equal to that of the splenic artery, the terminal ramification is either high up placed or at the center.

Paturet`s conclusions are not validated by my own research .He states that when there is a longer celiac trunk its branches are not emerging from the same radial level but will emerge individually at diffrent levels.Among the cases I have personally studied I was able to find very often situations where medium and long celiac trunks had a terminal ramification “ad modum tridentis”.

Vandamme says that the celiac trunk direction is influenced both by the pancreatic neck topogaphy and common hepatic artery origin. In case the hepatic artery does not arise from the celiac trunk, the trunk itself will take a direction towards left , not right , which means that the hapatic artery is the one pulling the celiac trunk towards the right side.

The presence of a right hepatic artery originating from the superior mesenteric artery will require to preserve the superior

mesenteric artery together with the hepatic graft while the pancreas will be taken together with the celiac trunk and its branches. The existence of a left hepatic artery originating from the celiac trunk will involve preserving it together with the hepatic graft, the pancreas being collected together with both the superior mesenteric artery and splenic artery. Bersani states that in some cases one could see,lokking at serial arteriographies an arterial vascularisation of the liver which actually goes against the main stream.The gastroduodenal artery streaming from the superior mesenteric artery will blur the heapatic artery before the blood stream of the celiac trunk could reach to this point, a phenomenon supported by a longitudinal morphotype.Some disputed surgical interventions are based on such objective facts because it is difficult to work around a celiac trunk having a possible inferior frenic artery and being surounded by a rich mass of nervous fibres. Vandamme says that a celiaco- mesenterico deturnation of the blood whose cause could vary (cirrhosis, hepatic tumors) would be frequently met in case of a celiac trunk stenosis.

The multitude of hepatic arteries variations is a well known but despite this knowledge the side effects and implications are also extremely variable (Vandamme). This study not only brings up questions upon thecauses of variations but underlines the technical difficulties which one can face during abdominal surgery or emergency interventions imaging.Knowing the variations described above it is of vital importance due to their clinical implications. Making a ligation on the right gastroepiploic artery in case of a total or distal gastrectomy could be threatening to the pancreatic vascularisation.Both a vascular dissection and a ligation during the cefalic duodenopancreatectomy could seriously damage the pancreatic vascularisation especially when there is no preop knowledge about the existing variations.Because of the close connections between the ducts and hepatic arteries the surgical approach of this region could be difficult and potentially dangerous. For example, during a hepatic transplant the donor may have an anatomical variation which could cause a problem to the recipient from the point of view of the arterial reconstruction or vice versa.

Having very diffrent origins, the multiple hepatic arteries are one of the most challenging situations a surgeon could face during the surgical interventions upon liver or cholecyst, especially during the laparoscopic technique, any damage to the liver involving a quick hemostasis and in most situations solving the case through classical

surgery. We should not forget that the ligation of the damaged artery could cause further complications within the visceral teritory irrigated by it. It is obvious that before any surgery an angiography should be a must.

In interventional radiology the selective catheterisation of the right hepatic artery might pose technical difficulties,especially if the catheter is supposed to move along the right branch for chemical embolization. In case the embolization agent is released downstream the anastomosis it can concern the duodenal territory of the right hepatic artery causing pain, perforations or ischemia. The same thing could happen in case of the anastomosis between the middle hepatic and right hepatic arteries.

Out of our investigated cases we noticed that very often when one of the arteries has a celiac origin this artery gives birth to the cystic and gastroduodenal arteries even if it is a left hepatic artery or a medial right hepatic artery.

Another problem coming out is that connected with the denomination of the *multiple* or *additional* hepatic arteries. All of these conflicting opinions are showing off the diverse concepts in embryology as regards the liver`s arteries origins and they are also explaining the large interval range of the statistical data. I do belive that in case of multiple hepatic arteries the name of ***double or triple hepatic arteries*** would be more appropriate. When giving a definition to the main hepatic artery one should take into account the artery caliber as it is considered the main artery with the biggest caliber, the artery which irrigates the widest territory. The importance of the celiac trunk branches was also described by Bersani who studied the arterial distribution on 120 hepatic grefts collected from patients in a brain death state.He values the possibilities of vascular partition in case of a double combined prelevation of liver-pancreas organs. The available right hepatic artery with its origin from the superior mesenteric artery will assume preserving the superior mesenteric artery toghether with the hepatic greft and removing the pancreas with the celiac trunk and its branches.

Regarding the statistical diffrences within the specialist books , I belive they are a consequence of the number of cases taken into consideration and also to some racial features, geographic area and the period of time the study was elaborated.Nowadays a series of statistical diffrences are linked with the new methods used to study the vascular variants (Eco, common or CT angyographies), techniques which are exposed to errors and are by far less perfect

than dissections (Lamarque, Ralls), these researchers using different denominations to make things even more complicated.
The different percentage within the anatomical literature are clarly linked to the diffrent human races and the geographic area of life and these aspects, the various morphologycal aspects of the celiac trunk and its branches in connection to the factors mentioned above have been demonstrated by Nguyen Huu. He came to these conclusions following a research which involved 400 corpses and was able to describe significant diffrences between the celiac trunks derived from europeans and americans(white race) and the ones coming from vietnamese people(yellow race). I entirely agree with this writer and I think the vascular-nervous variability might vary within the same areal according to some factors from the surrounding environment which could influence the organogenesis period.That`s what explains the morphological variations encountered to a population living in the same geographical area during different periods of time.The total number of personal cases and different criteria in considering the level of separation for the celiac trunk branches are also playing a role in a diversity of statistical diffrences.

I do belive that when you are studying an important arterial trunk it is almost impossible to face and describe all the morphological variants displayed within the specialist literature.Without being entirely on J.L. Faure`s side, who used to say that a vascular brunch has potentially an infinite number of variants,I do agree that there are many potential ways of growing out branches into an artery.I would rather say that one can identify a certain dominant pattern which comes among the existing variants.One more time we could sense that " The exception proves the rule."

Even if it does not take into consideration the exhaustive morphological aspects of the celiac trunk and hepatic artery together with both their collateral and terminal branches, my study has some very distinctive features which are of a special medical relevance :

- compared to other authors in the same field it has a relatively high number of clinical cases ;
- my statistic is not based on results gathered from other authors; it is an original study built on my own clinical cases ;
- I have used in my study various research methods, combining both clasical methods and the most advanced possibilities given by the modern imaging systems.

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