



Hepatic Arterial Variant Anatomy and Predisposition to Hepatocellular Carcinoma

Hayley Moss¹, Ayana Wilson¹, Melissa Potts²

¹University of Louisville School of Medicine, Louisville, KY, 40202, USA

²Department of Radiology, University of Louisville, Louisville, KY, 40202, USA

Abstract

Background: Blood supply to the liver can vary drastically from patient to patient. In order to classify these differences, hepatic arterial variants are categorized according to Michel's Classification (Types I-X). Characterizing the hepatic anatomy is critical for the success of procedures such as liver transplants and radioembolization and chemoembolization of arteries supplying hepatic tumors. Although a classification system exists, the frequency of each hepatic variant type has not been well-documented. These variations in anatomy could possibly predispose individuals to hepatic malignancies.

Hypothesis and Objective: Frequency of each type of hepatic arterial variant could be different from that noted in previous papers, notably Michels 1966 and Hiatt 1994. The goal of this project was to determine these frequencies and compare them to the values reported in the Michels and Hiatt papers to determine if certain hepatic arterial variants predispose individuals to hepatocellular carcinomas.

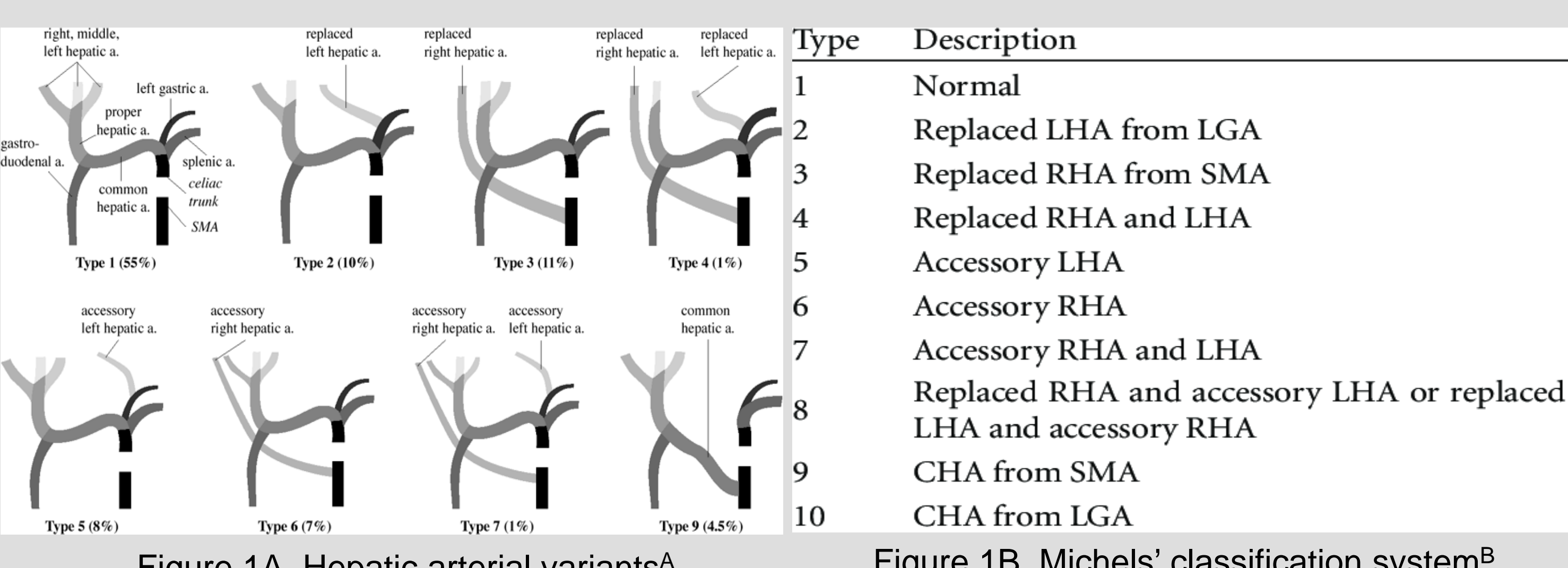
Methods: Mesenteric angiograms from 281 patients whose procedural dates ranged 2009-2019 were interpreted and recorded in accordance with Michel's Classification. The angiograms obtained were from records of patients diagnosed with primary or metastatic liver cancer who were undergoing radiologic workup before radioembolization of arteries supplying the tumor(s). The frequencies of each type were then recorded and compared to the data in the Hiatt and Michels papers.

Results: Type I anatomy comprised 75.8% of patients, Type II 8.5%, Type III 8.2%, Type IV 1.8%, Type V 1.1%, Type VI 2.8%, Type IX 1.8%, and no cases were reported with Types VII, VIII, or X.

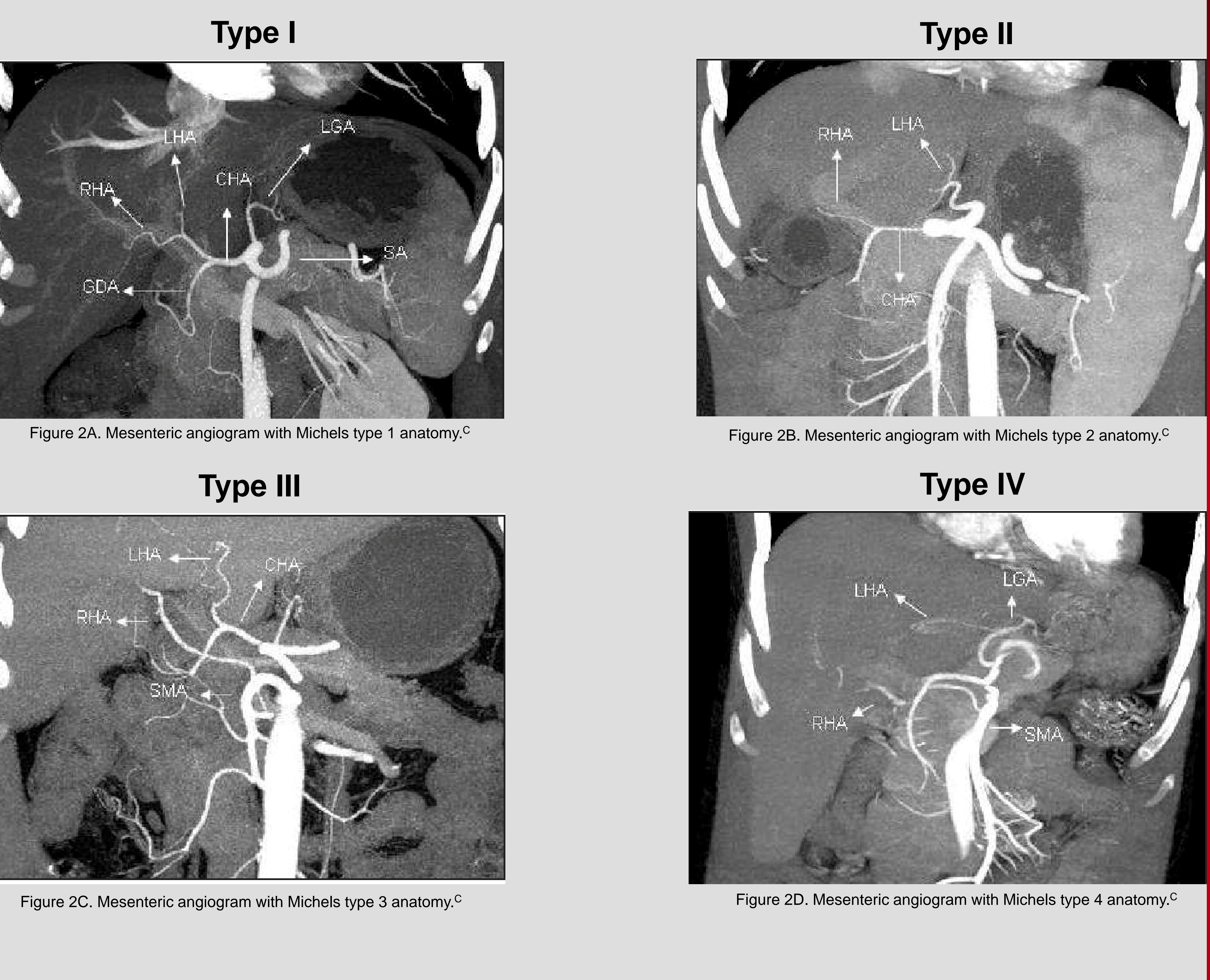
Conclusions: The data from this project aligned closely with that reported in the Hiatt paper. Type I anatomy was reported as 75.8% and 75.7% from this project and the Hiatt paper respectively, whereas the Michels paper reported Type I comprising 55% of patients. Types II, III, IV, V, and VI frequencies from the Hiatt paper also closely matched recorded data from this project. The similarities between this project's data and that from the Hiatt paper indicates that hepatic arterial variant anatomy does not predispose individuals to hepatocellular carcinoma.

Background: Classification of Hepatic Anatomy

- Hepatic anatomy varies widely from individual to individual.
- The right, left, or common hepatic arteries can arise from vessels such as the superior mesenteric artery and the left gastric artery [Fig 1A].
- These variations can then be categorized according to Michels' classification system [Fig 1B].



Background: Mesenteric Angiograms



Hypothesis and Objectives

Variant hepatic anatomy occurs more frequently in patients with hepatocellular carcinoma.

- Objectives:
- To determine frequency of each type of hepatic anatomical classification in patients with hepatocellular carcinoma.
 - To compare this data with that previously reported in the Hiatt and Michels papers.
 - To establish correlation of variant hepatic anatomy with predisposition to hepatocellular carcinoma.

Methods

- 281 records were obtained from patients diagnosed with hepatocellular carcinoma.
- Mesenteric angiograms obtained during radiologic catheterization work up were interpreted and the hepatic anatomy classified in accordance with the Michels classification system.
- Frequency of each variation was recorded and compared with values previously reported in the Hiatt and Michels papers.
- Differences in rates of hepatocellular carcinoma based on anatomical classification were noted.

Results: Frequency of Hepatic Arterial Variants

TYPE	Number of Patients	% with Variant Type	TYPE	Number of Patients	% with Variant Type
I	213	75.8	I	757	75.7
II	24	8.5	II	97	9.7
III	23	8.2	III	106	10.6
IV	5	1.8	IV	23	2.3
V	3	1.1	V	15	1.5
VI	2	2.8	VI	2	0.2
VII	0	0.0	VII	0	0.0
VIII	0	0.0	VIII	0	0.0
IX	5	1.8	IX	0	0.0
X	0	0.0	X	0	0.0
Total	281		Total	1000	

Figure 3A. Percentage of patients with each anatomic classification. Figure 3B. Hiatt study of 1000 patients categorized by type.

TYPE	Number of Patients	% with Variant Type
I	110	55
II	20	10
III	22	11
IV	2	1
V	16	8
VI	14	7
VII	2	1
VIII	4	2
IX	5	2.5
X	1	0.5
Total	196	

Figure 3C. Michels study of 196 patients.

Conclusions

- Data from this project agreed with data reported in the Hiatt paper.
- Data from this project did not agree with data report in the Michels paper.
- Specific hepatic anatomic classifications did not correlate with higher likelihood of hepatocellular carcinoma.

References

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