



Couinaud's corrosion casts of the liver

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Submitted Mar 16, 2022. Accepted for publication Mar 27, 2022.

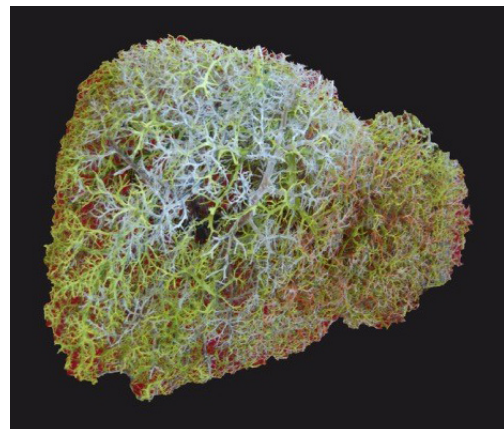
doi: 10.21037/hbsn-2022-09

View this article at: <https://dx.doi.org/10.21037/hbsn-2022-09>

Claude Couinaud [1922–2008], a French surgeon-anatomist, became famous for his classification of the segmental division of the liver. He defined each segment by its distinct portal venous anatomy and its intersegmental, watershed boundaries. Each segment would function as an independent functional unit with its own biliary ductal system draining into the central bile ducts. Blood from all segments is collected into the three main hepatic veins that drain into the caval vein.

Whatever terminology is applied in hepatic surgery, the basis is provided by the segmental morphology of the liver delineated by Couinaud. He numbered the segments 1 to 8, a reference consistently used to indicate the type and extent of a planned resection, and any additional liver augmenting procedure deemed necessary to increase volume and function of the anticipated liver remnant. Techniques to enhance the segments of the future liver remnant like portal vein embolization or associating liver partition and portal vein ligation for staged hepatectomy (ALPPS), entail deportalization of segments to be resected and fall back on the portal venous segmental distribution initially described by Couinaud. His first studies on liver anatomy comprised corrosion casts of the portal venous system which revealed to him the perfectly ordered portal ramifications and led the way to the concept of segmentation of the liver. Couinaud's segmental classification in combination with improved imaging techniques laid the foundation for modern hepatic surgery.

Claude Couinaud lived and worked as a surgeon in Paris (1). He undertook numerous anatomical studies on post-mortem livers, meticulously dissecting the intrahepatic structures and defining the segmental system in a way that was directly applicable to hepatic resections (2). To examine the territories of portal perfusion, he prepared corrosion casts of the liver by injecting vinyl chloride



acetate resins dissolved in acetone into the portal trunk (3). After hardening of the resin, the liver was dissolved in hydrochloric acid and the resulting cast was washed and dried. By injecting different colors into the portal and hepatic veins as well as into the hepatic artery and bile duct, these structures were preserved in their three-dimensional, morphological framework.

The corrosion cast technique was at that time also used by E. Rapp [1930–2010], another remarkable surgeon-anatomist who worked at the medical faculty of Montpellier in the south of France (3). His detailed studies on corrosion casts of 134 livers showed the multiple vascular variations and venous anastomoses that can occur in the liver. Couinaud left his collection of corrosion casts to the Faculty of Medicine of the University of Paris, as part of the Delmas-Orfila-Rouvière museum. André Delmas [1910–1999] was a professor of anatomy in Paris, with whom Couinaud undertook his first corrosion cast studies of the portal vein. The collection at the museum in Paris containing 116 corrosion casts of Couinaud, was moved

to the medical faculty of the University of Montpellier in 2015, and is presently exhibited in the “Conservatory of Anatomy” in the old premises of the medical school and anatomy theater adjacent to the Saint Peter cathedral in Montpellier (4). The whole set of 250 corrosion casts of livers prepared by the surgeon-anatomists Couinaud and Rapp create a unique collection, that makes a visit to the “Conservatory of Anatomy” at the Ecole de Médecine in Montpellier—one of the oldest medical schools in Europe—very much worthwhile.

Acknowledgments

The corrosion cast shown was prepared by Claude Couinaud and is on display in the “Conservatory of Anatomy” at the old Ecole de Médecine in Montpellier (modified photograph).

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Hepatobiliary Surgery and Nutrition*. The article did not undergo external peer review.

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at <https://hbsn.amegroups.com/article/view/10.21037/hbsn-2022-09/coif>). TMvG serves as the unpaid Deputy Editor-in-Chief of

Hepatobiliary Surgery and Nutrition. The author has no other conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Cite this article as: van Gulik TM. Couinaud’s corrosion casts of the liver. *HepatoBiliary Surg Nutr* 2022;11(2):174-175. doi: 10.21037/hbsn-2022-09