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Surgery

CALOT'S TRIANGLE IS NOT CYSTOHEPATIC TRIANGLE. A REVIEW OF LITERATURE

KEY WORDS: Calot's Triangle, Cystohepatic Triangle, Misnomer

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ABSTRACT

Calot's triangle is an anatomical landmark of paramount value in cholecystectomy. Jean-François Calot (1861-1944) was a French Surgeon who in 1891 described an isosceles triangle in his doctoral thesis which continues to be of great utility during surgery to avoid damage to biliary tree and vasculature till date. The modern definition of the boundaries of Calot's triangle varies from Calot's original description, although the exact timing of this change is not entirely clear. According to the original description of Calot, the boundaries of the triangle were formed by cystic duct, common hepatic duct and cystic artery. A minor translation error from French to English somehow made inferior surface of the liver as one of the border. Although rectified in subsequent translations, the erroneous description of boundaries found its way in many of the publications that lead to a confusion in original description of Calot's triangle. Despite being recognized, few literatures still continue to follow the initial translation to this day. This review of literatures was made in an effort to recognize the confusion behind the boundaries of Calot's triangle.

AIM:

This study aimed to review the widely used anatomical textbook literature on the description of boundaries of Calot's triangle and its accuracy with the original description.

METHODS:

Calot's original description of the triangle was as follows: *"Le triangle n'est pas exactement équilateral, mais plutôt isocèle, les deux côtés supérieur et inférieur, représentés par l'artère et le conduit cystique, étant seuls égaux, et un peu plus longs que la partie du canal hépatique qui entre dans la constitution du triangle"*.

It was initially translated as "The triangle is not exactly equilateral; the superior and inferior sides, represented by the cystic duct, are equal and slightly longer than the side of the triangle made up by the hepatic duct". This translation was widely accepted although it remained inaccurate.

Later it was accurately translated to "The triangle is not exactly equilateral, but rather isosceles, the two superior and inferior sides represented by the cystic artery and the cystic duct, being equal and a little longer than the part of hepatic duct."

The former translation was followed in many of the publications that lead to a confusion in Calot's description. Despite being recognized, few literatures still continue to follow the initial translation to this day. A systematic search undertaken to thoroughly evaluate the description of Calot's Triangle in widely used anatomy textbooks, surgical textbooks. 10 widely used textbooks were reviewed regarding the boundaries of the Calot's triangle and their accuracy to the original description.

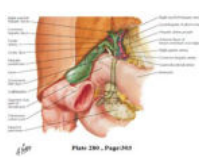

RESULTS:

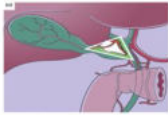
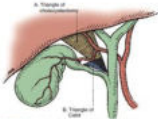
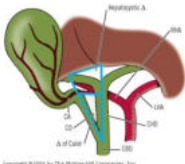
Commonly used anatomy and surgical textbooks were reviewed. 6 out of 10 textbooks have 'Sabiston's textbook of surgery', 'Schwartz principles of Surgery', 'Fischer's mastery of surgery', 'Farquharsan's Book of Operative Surgery' 'Netter's Atlas of Human Body and 'Oxford handbook of clinical surgery' have inaccurately described the inferior border of the liver as one boundary of Calot's Triangle instead of the cystic artery. Other widely used textbooks (Bailey & Love, Maingot's, Blumgart's and Skandalakis) have rightly mentioned cystic artery as one of the boundary of Calot's Triangle. Blumgart and Skandalakis even described the difference between Calot's triangle and cystohepatic triangle with illustrations.

CONCLUSION:

The Calot's Triangle has been confused with cystohepatic triangle in 6 of the 10 published literature. This could be attributed to the error in initial translation of Calot's description. The boundaries of Calot's triangle are Cystic duct, Cystic Artery and Hepatic Duct with content as **cystic lymph node of Iund** or **Mascagni's lymph node** whereas the boundaries of Cystohepatic triangle are cystic duct, hepatic duct and inferior surface of the liver with Calot's triangle as its content. This error has to be rectified and recognized while teaching and imparting knowledge to the younger generation.

Chart 1: Accuracy of Boundaries of Calot's Triangle in different published literatures.

TEXTBOOK	EDITION	DESCRIPTION	ACCURACY
Netter's Atlas of Human Body	Edition: 6 Plate 280, Page number: 303		Inaccurate
Sabiston Textbook of Surgery	Edition 20	<p>FIG. 15-1 The left hepatic artery usually also gives off a middle hepatic artery branch that heads toward the right side of the umbilical fovea and supplies segment IV. The right hepatic artery usually runs posterior to the common hepatic duct and enters Calot's triangle, bounded by the cystic duct, common hepatic duct, and liver edge, where it gives off the cystic artery to supply the gallbladder and then continues into the substance of the right liver.</p>	Inaccurate
Oxford Handbook of Clinical Surgery	Edition: 4		Inaccurate
Fischer's Mastery of Surgery	Edition: 6	<p>usually divides into the anterior and posterior sectional arteries before entering the liver parenchyma. The cystic artery crosses the common hepatic duct posteriorly or anteriorly. As it runs toward the gallbladder, it courses through the hepatocystic triangle (Calot's triangle), which is bounded by the common hepatic duct on the left, the cystic duct on the right, and the inferior surface of segment 4 above. The cystic artery runs to the upper border of the gallbladder superior to the site of the cystic duct and divides into an anterior and a posterior branch that ramify on the gallbladder surface.</p>	Inaccurate

<p>Bailey & Love's Short Practice of Surgery</p>	<p>Edition: 26, Page : 1098</p>  <p>Calot's triangle or the hepatobiliary triangle is the space bounded by the cystic duct inferiorly, the common hepatic artery medially and the superior border of the cystic artery. This area is often used to ligate the cystic duct. It is an important anatomical landmark and should be identified by surgeons performing a cholecystectomy to avoid damage to the extrahepatic biliary system (Figure 87.2A).</p>	<p>Accurate</p>
<p>Blumgarts Surgery of the Liver, Pancreas and Biliary Tree.</p>	<p>Edition: 6</p>  <p>FIGURE 87.2A A, Triangle of hepatobiliary system bounded by the common hepatic duct, cystic duct, and cystic artery. B, The gallbladder and its associated structures.</p>	<p>Accurate</p>
<p>Maingot's Abdominal Operations</p>	<p>Edition: 12</p> <p>998 Part VII: Gallbladder and Bile Ducts</p> <p>It is important to clearly identify the structures within the hepatobiliary triangle, which is the ventral aspect of the area bounded by the gallbladder wall and cystic duct, the liver edge, and the common hepatic duct. Contained within the hepatobiliary triangle is the superior Calot's triangle. The boundaries of Calot's triangle include the cystic duct, cystic artery, and the gallbladder wall. Absence of anatomy is a well-recognized risk factor for biliary injury. The absence of right hepatic duct (RHED) is the most common anomaly causing problems during laparoscopic cholecystectomy. The most dangerous variant is where the cystic duct joins a low-lying, otherwise right normal duct. Injury to these ducts can produce regional acute occlusion of an otherwise duct may be asymptomatic, and even unrecognized (Fig. 48.13).</p>	<p>Accurate</p>
<p>Skandalakis – Surgical Anatomy</p>	<p>International Students Edition (2004)</p>  <p>Copyright © 2004 by The McGraw-Hill Companies, Inc. All rights reserved.</p>	<p>Accurate</p>
<p>Farquharsan's Book of Operative Surgery</p>	<p>Edition: 10</p> <p>draw it gently forwards and to the right (Fig. 18.4a). Calot's triangle is dissected: this is a triangle bounded by the inferior surface of the right lobe of liver, the common hepatic duct, and the cystic duct and superior border of the gallbladder. The junction of the cystic duct and common duct is displayed by dividing the overlying peritoneum, and by gentle stripping. This dissection may take time, as the ducts are often obscured by fat or oedematous connective tissue. The cystic artery is found within Calot's triangle, and ligated and divided. An absorbable ligature is then passed loosely around the cystic duct close to its junction with the common bile duct. Any stones in the cystic duct should be milked towards the gallbladder and the cystic duct clamped or ligated (Fig.</p>	<p>Innaccurate</p>
<p>Schwartz Principle of Surgery</p>	<p>Edition: 10</p> <p>Figure 87.16. Laparoscopic cholecystectomy. A, The liver is elevated. B, The ducts to be ligated are exposed and secured with clips. C, The gallbladder is dissected from the common hepatic duct. D, The gallbladder is removed. E, The gallbladder is placed in a bag and removed from the patient. F, The gallbladder is placed in a bag and removed from the patient. G, The gallbladder is placed in a bag and removed from the patient. H, The gallbladder is placed in a bag and removed from the patient. I, The gallbladder is placed in a bag and removed from the patient. J, The gallbladder is placed in a bag and removed from the patient. K, The gallbladder is placed in a bag and removed from the patient. L, The gallbladder is placed in a bag and removed from the patient. M, The gallbladder is placed in a bag and removed from the patient. N, The gallbladder is placed in a bag and removed from the patient. O, The gallbladder is placed in a bag and removed from the patient. P, The gallbladder is placed in a bag and removed from the patient. Q, The gallbladder is placed in a bag and removed from the patient. R, The gallbladder is placed in a bag and removed from the patient. S, The gallbladder is placed in a bag and removed from the patient. T, The gallbladder is placed in a bag and removed from the patient. U, The gallbladder is placed in a bag and removed from the patient. V, The gallbladder is placed in a bag and removed from the patient. W, The gallbladder is placed in a bag and removed from the patient. X, The gallbladder is placed in a bag and removed from the patient. Y, The gallbladder is placed in a bag and removed from the patient. Z, The gallbladder is placed in a bag and removed from the patient.</p>	<p>Innaccurate</p>

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