

Moynihan's Hump: A Rare Anatomical Variation of the Right Hepatic Artery Encountered During Laparoscopic Cholecystectomy

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Abstract

Background: Laparoscopic cholecystectomy is a commonly performed surgical procedure in current medical practice. During this procedure, surgeons often encounter variations in the vascular and biliary anatomy. One such variation is the "Moynihan's hump" or "caterpillar configuration" of the right hepatic artery, where the tortuous right hepatic artery runs proximally or in parallel to the cystic duct, occupying a significant portion of Callout's triangle. "Moynihan's hump" commonly gives the origin to thin and short cystic artery. Identification of "Moynihan's hump" are crucial for preventing potentially life-threatening intraoperative vascular or biliary injuries during cholecystectomy.

Case presentation: This report presents two cases of Moynihan's hump identified during laparoscopic cholecystectomies, one in a 19-year-old woman with chronic cholecystitis and the other in a 62-year-old woman with acute cholecystitis. In both cases, the humps of the right hepatic arteries were successfully identified and secured during the operation. (TCM-GMJ March 2023; 8 (1):P87-P89)

Keywords: Moynihan's Hump; Caterpillar Configuration; Tortuous Right Hepatic Artery; Callot's Triangle; Laparoscopic cholecystectomy;

Introduction

Cholelithiasis is a common indication for cholecystectomy, with laparoscopic cholecystectomy being the recommended treatment when gallstones become symptomatic or acute cholecystitis is diagnosed. The gallbladder is typically supplied by the cystic artery (CA), which branches off the right hepatic artery (RHA) and enters a triangular space known as the "Hepato-cystic triangle" or "Triangle of Callout" below the liver. This area serves as a critical surgical landmark during cholecystectomy (1).

During laparoscopic cholecystectomy, the initial step involves ligating and dividing the CA, followed by identifying the cystic duct and its junction with the common bile duct. The RHA is the most commonly at risk during surgery and must be carefully identified before ligating the CA. In certain cases, the RHA may be tortuous and closely located to the gallbladder and cystic duct, forming a structure referred to as a "caterpillar hump" or "Moynihan's hump" (2,3,4,5). This situation can make the CA shorter, and there is a risk of mistakenly identifying the RHA as the CA or injuring the RHA while attempting to ligate the CA. Damage to the RHA can result in ischemic necrosis of the right functional lobe of the liver. Therefore, the presence of a Moynihan's hump should be suspected when an un-

sually large CA is observed through the laparoscope.

This report describes two cases of patients with cholecystitis who underwent laparoscopic cholecystectomy. During surgery, a variant of the RHA passing in front of the cystic duct formed a Moynihan's hump, extending parallel to the gallbladder axis and giving rise to a very short CA.

Case Description

Case 1: A 19-year-old female was admitted to the hospital with recurrent attacks of pain in the right hypochondrium over the last four months. Each attack was accompanied by fever, fatigue, nausea, vomiting, and pain in the right upper quadrant (RUQ) after consuming fatty meals. The physical examination revealed a positive Murphy's sign. Abdominal ultrasound showed thickening of the gallbladder wall with multiple small stones, leading to a diagnosis of chronic calculous cholecystitis. Bilirubin and alkaline phosphatase levels were within the normal range, and the patient underwent elective laparoscopic cholecystectomy.

The surgery began with the establishment of a pneumoperitoneum using a Verres needle, followed by the insertion of four ports using a four-port technique. Initial exploration revealed mild gallbladder wall thickening with no adhesions. Callout's triangle was explored by upward traction of the gallbladder fundus, lateral retraction of the Hartmann's pouch, and medial dissection of the peritoneum at the level of the infundibulum. During gallbladder retraction, a thick tissue band in front of the common bile duct and lower part of the gallbladder was encountered.

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Initially, it was assumed to be a cystic duct at a lower position. To ensure a "critical view of safety," the dissection extended by opening the lateral aspect of the peritoneum. The hepatobiliary triangle was dissected free from areolar tissue, and the gallbladder bottom was separated from the lower part of the liver bed. During careful dissection of Callout's triangle, a tube-like structure passing behind the cystic duct was discovered. It was initially believed to be the RHA forming a Moynihan's hump. The dissection continued cautiously while gently pulling the gallbladder, revealing a short CA arising from the tubular structure and entering the gallbladder near its fundus. The cystic duct was ligated first, followed by gentle clipping of the short CA and its separation from the RHA. The retrograde cholecystectomy was completed safely, and the patient was discharged after 24 hours without any complications (Figure 1).

Case 2: A 62-year-old female presented to the emergency department with a one-day history of fever, nausea, vomiting, and severe pain in the right hypochondrium. She had a history of hypothyroidism for the past 5 years and arterial hypertension for the past 10 years. The physical examination revealed a positive Murphy's sign. Abdominal ultrasound showed thickening of the gallbladder wall with multiple small stones and a large stone obstructing the neck of the gallbladder. Conservative management did not yield positive results, and laparoscopic cholecystectomy was decided as the course of action.

Initial exploration revealed gallbladder wall thickening with adherence of the omentum. Exploration of Callout's triangle was performed as described in the previous case. Gentle dissections were conducted to achieve a "critical view of safety." During the dissection of Callout's triangle, a thick tubular structure located behind the cystic duct was discovered. Despite its position, it was considered to be the RHA due to its larger size, forming a Moynihan's hump (Figure 2 a). The dissection was extended by opening the lateral aspect of the peritoneum. The tubular structure was identified as the RHA but without giving rise to the CA (Figure 2 b). All attachments between the gallbladder and the RHA were gently coagulated, followed by ligation of the cystic duct and separation of the gallbladder from its bed. The procedure was completed successfully, and the patient was discharged after 48 hours. Postoperative follow-ups showed complete recovery.

Discussion

Laparoscopic cholecystectomy is a commonly performed surgical procedure. However, the biliary system, particularly Callout's triangle, may exhibit anatomical variations in 20% to 50% of patients, which are not always identified before surgery. Ultrasound is typically the first imaging modality used for patients suspected of having gallbladder disease, but it does not provide precise imaging of the biliary and vascular systems like computed tomography or magnetic resonance imaging (2,6,7,8,9). This can pose challenges, especially in cases of significant inflammation of the gallbladder combined with anatomical varia-

tions.

The presented cases describe an anatomical variant known as Moynihan's hump or caterpillar configuration, characterized by a tortuous RHA occupying a significant portion of Calot's triangle. Moynihan's hump is a rare anomaly, with an incidence reported between 1.3% and 13.3%. The RHA can form a single or double loop, passing either posteriorly or anteriorly to the common hepatic duct. In the cases described, the RHA entered Callout's triangle behind the cystic duct, creating a Moynihan's hump. The larger size of the artery raised suspicion that it was the RHA rather than the CA. The "critical view of safety" technique was crucial in preventing the ligation of the RHA (2,6,10).

Ligation of the RHA instead of the CA can result in serious complications (11, 12, 13). Complete ligation of the RHA can lead to ischemic necrosis of the right lobe of the liver, while partial injury may cause hepatic artery pseudoaneurysm and excessive bleeding. Vascular injury during laparoscopic surgery can also obstruct the surgeon's field of vision, leading to blind coagulation or clipping and injury to the bile duct (14, 15). Therefore, it is crucial to adhere to the safety rules described and emphasized by Strasberg as the "critical view of safety." This approach states that no clipping or cutting should be performed until Callout's triangle is cleared of all fat, allowing for the visualization of only two structures: the CA and duct (15, 16, 17, 18). Failure to identify the correct anatomy of Calot's triangle may result in intraoperative bleeding, a challenging complication that increases the likelihood of converting to open surgery (17). The reported incidence of conversion to open surgery due to blood vessel injuries during laparoscopic cholecystectomy is approximately 0% to 1.9%, with a mortality rate of about 0.2% (2, 3, 5, 6).

In conclusion, the presence of Moynihan's hump or caterpillar configuration of the RHA is an anatomical variation that may be encountered during laparoscopic cholecystectomy. Suspecting the presence of a caterpillar hump of the RHA is important when an unusually large CA is observed through the laparoscope. Although this abnormality is rare, a comprehensive understanding of the anatomy of the biliary tract and gallbladder is crucial to ensure safe surgery, prevent arterial damage, and avoid operative complications.

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Figure 1: RHA Moynihan's hump with short CA

Red lines indicate the borders of RHA Moynihan's hump; yellow line indicate CA; green dashed line shows Cystic duct stump.

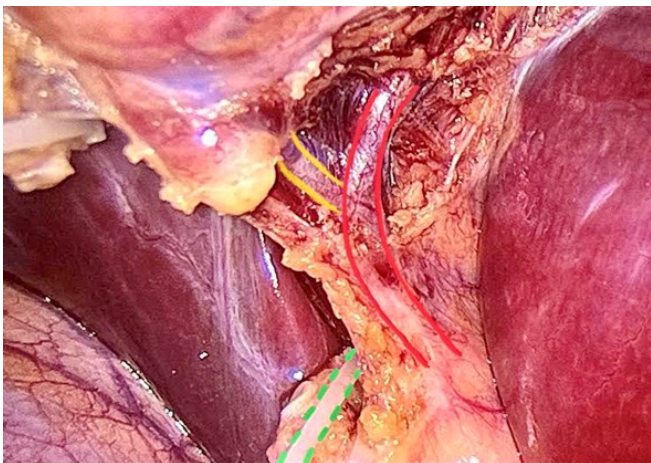


Figure 2: a,b. RHA Moynihan's hump without CA.

Red lines indicate the borders of RHA Moynihan's hump; green line indicates the borders of Cystic duct; white arrow shows the dissected lateral peritoneal aspect.

