EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Coden USA: EJBPBO
Volume: 13
Issue: 9
Year: 2026

MOYNIHAN'S CATERPILLAR HUMP OF THE RIGHT HEPATIC ARTERY MIMICKING THE CYSTIC ARTERY ASSOCIATED WITH A LONG LOW ANTERIORLY INSERTING CYSTIC DUCT DURING LAPAROSCOPIC CHOLECYSTECTOMY: A POTENTIAL DOUBLE PITFALL CASE REPORT

Mallika Singha[1]*, Rituparna Bhowmick[1]

Department of General Surgery, Gauhati Medical College and Hospital, Guwahati, Assam, India.

***Corresponding Author: Mallika Singha**

Department of General Surgery, Gauhati Medical College and Hospital, Guwahati, Assam, India.

DOI: https://doi.org/10.5281/zenodo.22159426

How to cite this Article: Mallika Singha[1]*, Rituparna Bhowmick[1]. (2026). Moynihan's Caterpillar Hump Of The Right Hepatic Artery Mimicking The Cystic Artery Associated With A Long Low Anteriorly Inserting Cystic Duct During Laparoscopic Cholecystectomy: A Potential Double Pitfall Case Report. European Journal of Biomedical and Pharmaceutical Sciences, 13(9), 186–190.

Article Received on 01/08/2026 **Article Revised on 21/08/2026** **Article Published on 01/09/2026**

ABSTRACT

Moynihan's caterpillar hump refers to a redundant tortuous loop of the right hepatic artery (RHA) that descends into the hepatocystic triangle, closely simulating the cystic artery in both calibre and position. We report a 35-year-old female who underwent elective laparoscopic cholecystectomy for symptomatic cholelithiasis. Intraoperatively, the RHA was found to make a tortuous anterior loop across the Hartmann's pouch before passing posterior to the cystic duct —a course highly deceptive of the cystic artery. Meticulous dissection guided by strict adherence to the Critical View of Safety (CVS) revealed a separate smaller branch arising from this looping vessel and entering the gallbladder neck as the true cystic artery. A concurrent biliary anomaly was present: the cystic duct followed a long anterior course and inserted unusually low into the common bile duct, further distorting the normal triangular anatomy. Once both structures were conclusively identified, the cystic artery and cystic duct were individually clipped and divided, and cholecystectomy was completed uneventfully. The patient was discharged on postoperative day two. This case highlights the hazard of misidentifying a caterpillar hump RHA as the cystic artery and emphasises that the co-existence of a low-inserting cystic duct multiplies the risk of inadvertent biliary or vascular injury. Strict adherence to the CVS remains the cornerstone of safe laparoscopic cholecystectomy.

KEYWORDS: Caterpillar hump; Moynihan's hump; Right hepatic artery; Laparoscopic cholecystectomy; Cystic duct variation; Critical view of safety; Biliary anatomy.

INTRODUCTION

Laparoscopic cholecystectomy has become the gold standard operative intervention for symptomatic gallstone disease worldwide, owing to its well-established advantages of reduced postoperative pain, shorter hospital stay, and earlier return to functional activity. Despite its ubiquity, the procedure carries a finite risk of vascular and biliary injury, much of which is attributable to the remarkable variability in the anatomy of the hepatocystic triangle. Misidentification of the right hepatic artery (RHA) as the cystic artery represents one of the most consequential intraoperative errors in biliary surgery, capable of resulting in catastrophic haemorrhage, inadvertent ligation, or hepatic ischaemia.

Moynihan's caterpillar hump, first described by Sir Berkeley Moynihan in the early twentieth century, refers to a redundant, sinuous loop of the RHA that protrudes into Calot's triangle in close proximity to the gallbladder neck.[2] In this configuration, the vessel closely resembles the cystic artery in both position and calibre. The reported incidence of this anatomical variant ranges from approximately 1% to 13% across autopsy and operative series, rendering it uncommon but not rare.[1 3] The simultaneous presence of a variant cystic duct insertion further⁻ distorts the normal landmarks of the hepatocystic triangle and compounding operative risk.[10]

We report a case in which a caterpillar hump of the RHA was encountered during laparoscopic cholecystectomy,

with the added complexity of a long, low anteriorly-inserting cystic duct. Safe completion of the procedure was achieved through strict adherence to the Critical View of Safety (CVS) as described by Strasberg and Brunt.[4] We discuss the anatomical basis, recognition, and operative management of this potentially dangerous combination of anomalies.

CASE

A 35-year-old female presented with a history of recurrent right hypochondrial pain and dyspepsia. Abdominal ultrasonography confirmed multiple calculi within the gallbladder, with no biliary ductal dilatation and an otherwise normal hepatobiliary system. Liver function tests and haematological parameters were within normal limits. Elective laparoscopic cholecystectomy was planned following informed consent.

The procedure was performed under general anaesthesia using the standard four-port technique in the supine position with reverse Trendelenburg tilt. The gallbladder was moderately distended without evidence of acute inflammation or pericholecystic adhesions. Retraction of the gallbladder fundus in a cranial and lateral direction was performed, and dissection of the hepatocystic triangle was commenced.

As peritoneal attachments were carefully divided, a large, prominently pulsatile vessel was encountered within Calot's triangle (Fig. 1). The vessel's calibre and vigorous pulsatility were immediately disproportionate to what would be expected of a cystic artery. Crucially, the vessel was observed to follow a tortuous anterior course directly across the front of Hartmann's pouch before coursing posteriorly behind the cystic duct—a configuration entirely distinct from the usual short, direct trajectory of the cystic artery. This recognition immediately raised suspicion of a Moynihan's caterpillar hump of the RHA.

Dissection was deliberately slowed, and the vessel was carefully traced in both directions. Its proximal extent was confirmed to continue superiorly towards the hepatic hilum, and its distal extent formed a dependent loop before ascending again—consistent with the classical caterpillar hump configuration.

Continued meticulous dissection identified a distinct, smaller branch arising from this looped vessel and coursing directly into the neck of the gallbladder: the true cystic artery (Fig. 2). Throughout this dissection, strict adherence to the CVS was maintained; dissection was continued until the hepatocystic triangle was entirely cleared of fat and fibrous tissue and only two structures—the cystic artery and cystic duct—were confirmed to enter the gallbladder.

An additional anomaly was simultaneously appreciated: the cystic duct pursued an unusually long anterior course before inserting into the common bile duct (CBD) at a considerably lower and more anterior level than the standard insertion point (Fig. 3). This low anterior insertion caused the distal cystic duct to run in close parallel apposition to the CBD for a substantial length, creating potential for misidentification and inadvertent injury to the CBD. Extended dissection was required to clearly delineate the cystic duct from the CBD along its entire anterior aspect before the CVS could be confidently declared.

Once both the cystic artery and the cystic duct were individually and unambiguously identified, two titanium clips were applied to each structure and they were divided between the clips. The gallbladder was dissected from the liver bed in the standard retrograde fashion and extracted through the epigastric port. Operative time was approximately 65 minutes. Haemostasis was confirmed and the abdomen was closed. Histopathological examination of the excised gallbladder confirmed chronic calculous cholecystitis. The postoperative course was entirely uneventful and the patient was discharged in satisfactory condition on postoperative day two.

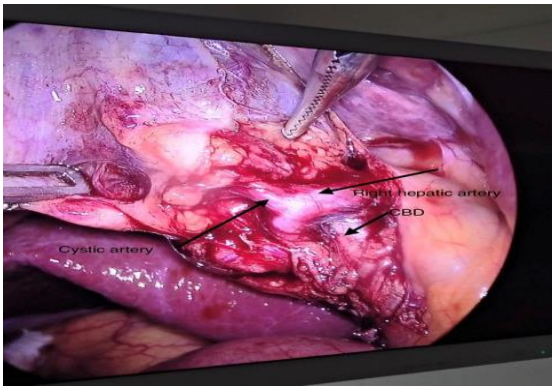

Fig. 1: Laparoscopic video still demonstrating a large, pulsatile tortuous vessel (asterisk) encountered within Calot's triangle. The right hepatic artery (RHA) makes an anterior loop across the front of Hartmann's pouch before passing posteriorly behind the cystic duct—the classical caterpillar hump configuration. Note the calibre and vigorous pulsatility inconsistent with a cystic artery. GB, gallbladder; HP, Hartmann's pouch; RHA, right hepatic artery.

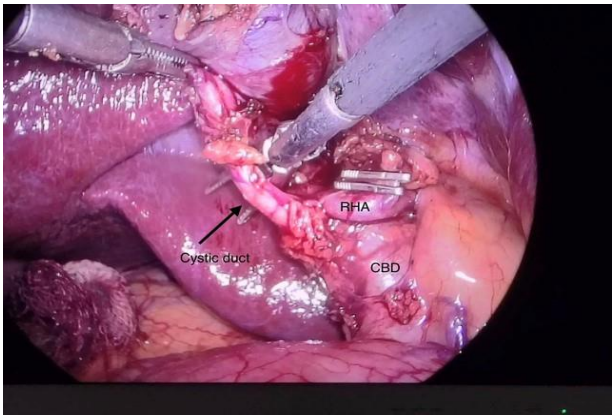

Fig. 2: Intraoperative video still after further dissection, demonstrating the true cystic artery (arrow) as a separate, substantially smaller branch arising from the caterpillar loop of the right hepatic artery (asterisk) and coursing directly into the neck of the gallbladder.Positive identification of this distinct branch was essential to confirm the Critical View of Safety prior to clip application. CA, cystic artery; RHA, right hepatic artery.

Fig. 3: Operative video still after clipping and division of the cystic artery, showing the long, anteriorly positioned cystic duct (arrowhead) with a low insertion into the common bile duct. The cystic duct follows an extended anterior course in close apposition to the CBD before their junction, constituting an additional surgical pitfall requiring careful dissection before clip application. CBD, common bile duct; CD, cystic duct.

DISCUSSION

The hepatocystic triangle is among the most anatomically variable regions in the human abdomen, with reported anomalies of the biliary and arterial systems exceeding 40%.[5] In this context, Moynihan's caterpillar hump of the RHA occupies a position of particular clinical significance because its misidentification carries the risk of inadvertent arterial ligation and consequent right lobe hepatic ischaemia—a complication associated with significant morbidity and mortality.[12,13]

The term 'caterpillar hump' describes the visual appearance of the RHA as it forms a redundant, undulating loop within Calot's triangle before ascending to the hepatic hilum.[2] In our case, the loop assumed a particularly deceptive configuration: the artery passed anterior to the Hartmann's pouch before curving posteriorly behind the cystic duct. This anterior-thenposterior course placed the vessel in a position that closely simulated the expected course of a cystic artery both in proximity to the gallbladder neck and in the plane of dissection. Reported incidence of this variant ranges from 1% to 13%, and several authors note that the hump is more pronounced when surrounding fatty tissue displaces the RHA inferiorly into the triangle.[6,7]

The pivotal intraoperative clue, as in previously reported cases, was the identification of a separate, substantially smaller cystic artery arising from the looped RHA.[8] A vessel that is unusually large, persistently pulsatile, or follows a tortuous course within Calot's triangle should never be clipped without first confirming the presence of a separate branch entering the gallbladder wall.[9] The distinction between the RHA and the cystic artery may be further aided by tactile cues—appreciation of vigorous pulsation and the springy tension of a large elastic vessel under gentle traction—even through laparoscopic instruments.

The co-existing biliary anomaly in our case—a long cystic duct with low anterior insertion into the CBD—introduced a second, independent layer of risk. Cystic duct variations are reported in up to 20% of patients and

include low insertion, high insertion, medial insertion, spiral or posterior insertion, and parallel (adherent) courses alongside the CBD.[1,11] A low-inserting[0] cystic duct that travels anteriorly along the CBD for an extended distance is particularly hazardous: the surgeon must resist the temptation to identify the point at which the two structures first appear to separate as a safe clipping point, as the actual confluence may lie considerably lower. In our case, this necessitated extended dissection along the anterior aspect of the cystic duct-CBD junction before the CVS could be safely and confidently achieved.

The CVS, as defined by Strasberg and Brunt, requires that the hepatocystic triangle be cleared of all fat and fibrous tissue, that the lower third of the gallbladder be separated from the liver bed, and that only two structures—the cystic duct and cystic artery—be seen entering the gallbladder.[4] It is now well established that the CVS, rather than the traditional infundibular technique, is the most reliable safeguard against biliary and vascular injury during laparoscopic cholecystectomy.[14] The present case is a compelling illustration of how the CVS prevents disaster: it was only because the surgeon refused to clip any structure until two and only two structures were seen entering the gallbladder that the caterpillar hump was recognised and the true cystic artery was found. When doubt persists despite a technically satisfactory CVS, intraoperative cholangiography, laparoscopic ultrasonography, or planned conversion to open surgery should be considered without hesitation.[15,16]

The educational value of this case is threefold. First, it demonstrates that a large, pulsatile artery traversing the front of Hartmann's pouch and then passing posterior to the cystic duct is almost certainly the RHA making a caterpillar loop—and not the cystic artery. Second, it illustrates how a concurrent low- inserting cystic duct multiplies the anatomical hazard by simultaneously distorting the biliary landmarks.

Third, it reaffirms that the CVS is the single most reliable operative safeguard irrespective of the complexity of intraoperative anatomy encountered.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to disclose.

INFORMED CONSENT

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

AUTHOR CONTRIBUTIONS

Conceptualization: MS. Data curation: MS, RB. Writing – original draft: MS, RB. Writing – review C editing: MS. All authors read and approved the final manuscript.

REFERENCES

1. Michels NA. Cystic artery and its variants: their anatomical importance. Arch Surg., 1953; 66(2): 216-222.
2. Moynihan BGA. On gall-stones and their surgery. 2nd ed. London: Baillière, Tindall and Cox, 1905.
3. Hugh TB, Kelly MD, Mekisic A. Rouvière's sulcus: a useful landmark in laparoscopic cholecystectomy. Br J Surg, 1997; 84(9): 1253-1254.
4. Strasberg SM, Brunt LM. Rationale and use of the critical view of safety in laparoscopic cholecystectomy. J Am Coll Surg. 2010; 211(1): 132-138.
5. Nagral S. Anatomy relevant to cholecystectomy. J Minim Access Surg, 2005; 1(2): 53-58.
6. Balija M, Huis M, Nikolic V, Stulhofer M. Laparoscopic visualization of the cystic artery anatomy. World J Surg, 1999; 23(7): 703-707.
7. Gur S, Yildirim C, Ozyuvaci E, Alimoglu O. Caterpillar hump deformity of the right hepatic artery: a report of two cases and review of the literature. Surg Laparosc Endosc Percutan Tech., 2008; 18(4): 402-405.
8. Hiatt JR, Gabbay J, Busuttil RW. Surgical anatomy of the hepatic arteries in 1000 cases. Ann Surg, 1994; 220(1): 50-52.
9. Sarawagi R, Sundar S, Gupta SK, Raghuwanshi S. Anatomic variations of cystic arteries during laparoscopic cholecystectomy and its clinical relevance. Anat Res Int., 2016; 2016: 2374347.
10. Lamah M, Karanjia ND, Dickson GH. Anatomical variations of the extrahepatic biliary tree: review of the world literature. Clin Anat., 2001; 14(3): 167-172.
11. Flament JB, Delattre JF, Palot JP. The cystic artery: a new systematic description and its application to surgery. Ann Chir., 1988; 42(7): 483-488.
12. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg, 1995; 180(1): 101-125.
13. Way LW, Stewart L, Gantert W, Liu K, Lee CM, Whang K, et al. Causes and prevention of laparoscopic bile duct injuries: analysis of 252 cases from a human factors and cognitive science perspective. Ann Surg, 2003; 237(4): 460-469.
14. Buddingh KT, Niekel MC, van Dam GM, Nagengast FM, Mahieu HF, Nieuwenhuijs VB. Intraoperative assessment of biliary anatomy for prevention of bile duct injury: a review of current and future patient safety interventions. Surg Endosc., 2011; 25(8): 2449-2461.
15. Dili A, Bertrand C. Laparoscopic ultrasonography as an alternative to intraoperative cholangiography during laparoscopic cholecystectomy. World J Gastroenterol., 2017; 23(29): 54385450.
16. Singh K, Ohri A. Anatomic landmarks: their usefulness in safe laparoscopic cholecystectomy. Surg Laparosc Endosc Percutan Tech, 2006; 16(5): 322-324.

17. Kama NA, Doganay M, Dolapci M, Reis E, Atli M, Kologlu M. Risk factors resulting in conversion of laparoscopic cholecystectomy to open surgery. Surg Endosc., 2001; 15(9): 965-968.
18. Schnelldorfer T, Sarr MG, Adams DB. What is the duct of Luschka? A systematic review. J Gastrointest Surg, 2012; 16(3): 656-662.
19. Petrescu I, Bratu AM, Petrescu S, Popa BV, Cristian D, Burcos T. CT vs. MRCP in choledocholithiasis jaundice. J Med Life, 2015; 8(2): 226-231.
20. Blumgart LH. Surgery of the Liver, Biliary Tract and Pancreas. 4th ed. Philadelphia: Saunders Elsevier; 2007.