



A Suggestive Case of “Phrygian Cap” Gallbladder at MSCT and Review of the Literature

Francesco MESSINA^{1*}, Annamaria NUCERA¹, Maria Giovanna FAVA²

¹Unit of Radiology, Great Metropolitan Hospital (G.O.M.) Reggio Calabria, Italy

²Department of Surgery, University Hospital “Renato Dulbecco” Catanzaro, Italy

*Corresponding author: Francesco Messina, Unit of Radiology, Azienda Ospedaliera Grande Ospedale Metropolitano Via Giuseppe Melacrino n.21, 89124 Reggio Calabria, Italy.

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Abstract

Gallbladder anomalies are rare congenital defects or deformities with an incidence rate of approximately 2% - 4% in the general population. “Phrygian Cap” Gallbladder (PCG) is an anatomical anomaly, in which the gallbladder length is longer than normal in all cases and the fundus of the gallbladder folds on itself and is diverted laterally by the abdominal wall, miming a pathological condition on hepatobiliary imaging. These radiological aspects might complicate the diagnosis, especially in clinical cases of non-specific symptoms. In our case report, we describe a male patient with recurrent abdominal pain on the right side, with the presence of biliary sludge and cholecystitis, diagnosed at multislices Computed Tomography (CT).

Keywords: Gallbladder, Phrygian cap, Computed tomography, Abdominal pain

Abbreviations: PCG = Phrygian cap gallbladder; CT = Computed Tomography; MRI = Magnetic Resonance Imaging; WBC = White Blood Cell; PCR = C-Reactive Protein; US = Ultrasonography; MPR = Multi Planar Reconstructions

Background

A “Phrygian cap” Gallbladder can be the result of the folding of the fundus during the embryological evolution [1] because of the excessive length. A PCG has no pathological significance and often causes no symptoms, but this anatomical anomaly can however complicate the exact diagnosis in symptomatic patients, such as in the case presented.

Imaging can be difficult, as the PCG can result in shadowing or artefact; this may obscure gallstones or polyps, as well as mimic gallstones, sludge, mass, polyps, or obstruction leading to potential mismatch of diagnosis [2-4]. Therefore, in presence of symptoms concerning acute cholecystitis, such as nausea, vomiting, and/or localized or diffuse epigastric pain, further imaging with multiphase CT scan (or multiphase Magnetic Resonance Imaging,

MRI) is crucial in ruling out obstructions and masses. Moreover, CT is better for anatomically viewing the gallbladder with a higher sensitivity and specificity for acute, and the use of CT imaging in the differential diagnosis and follow-up examination is very important for monitoring the hepatobiliary clinical conditions of patients.

Case Presentation

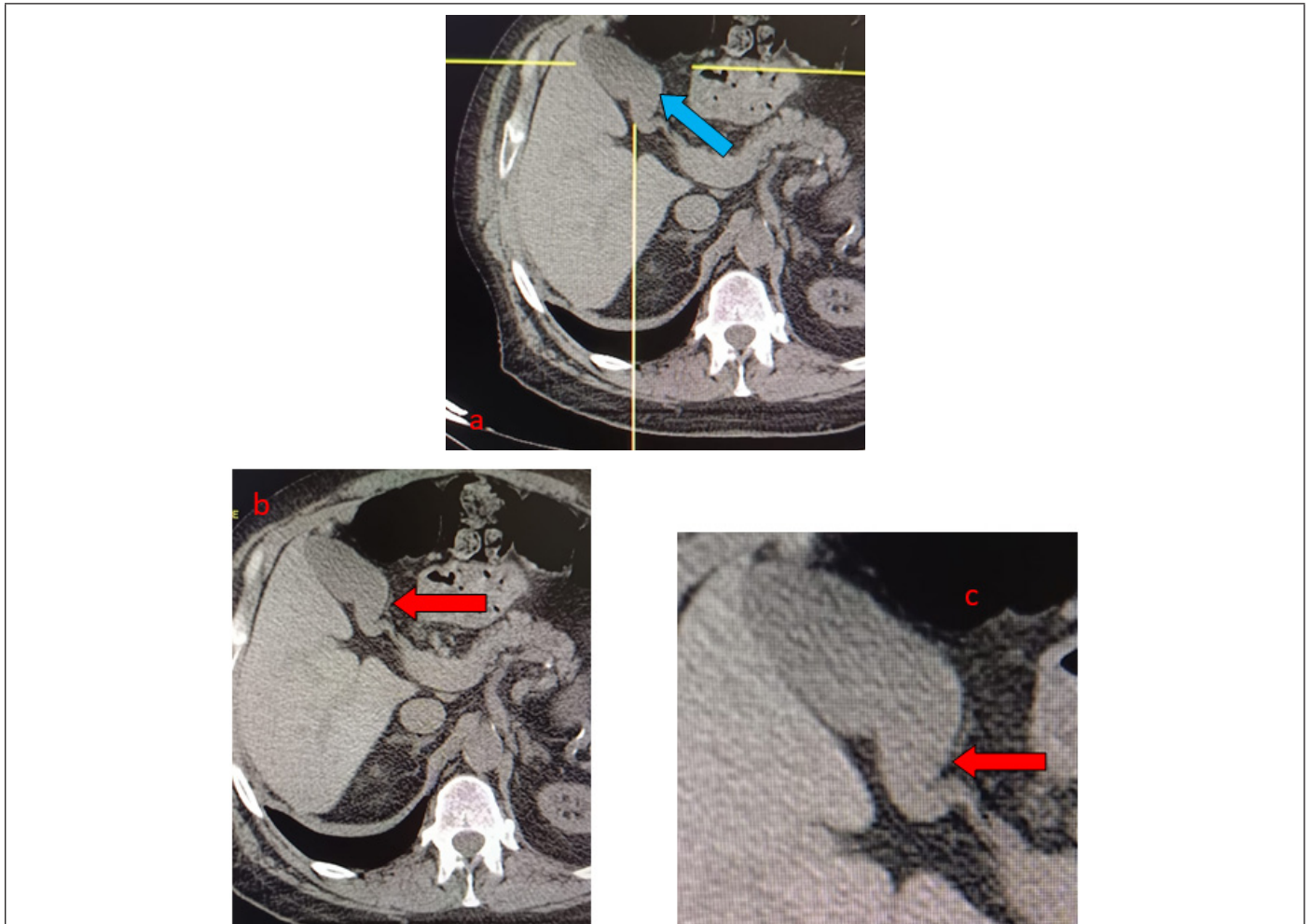
We report the case of a 52-years-old man (resident in another city, and on holiday in our city) presented to the Emergency Department of our Hospital with an history of recurrent abdominal pain. In another Hospital of our Region, two months ago, he was treated for an acute biliary pancreatitis.

On clinical examination, the abdomen was tender in the right hypochondrium, abdominal pain on the upper right size, with

fever (37.5°C). Blood tests revealed White Blood Cell (WBC) count $14.65 \times 10^3 / \mu\text{L}$; C-reactive protein (CRP) 0.65 mg/dl.

An Abdominal Ultrasound (US) scan was inconclusive because he was affected by the presence of excessive intestinal gas. An emergency abdominal contrast enhancement Computed Tomography (CT) was made, and the images so obtained were

analyzed with a slice-thickness of 1.2 mm and MPR reconstructions (axial, sagittal, and coronal). CT revealed the presence of biliary sludge in the gallbladder and biliary tract with an initial thickened walls. CT images also raised the suspicion of an abnormal gallbladder; and a PCG was seen, with its typical twisted anatomical form (Figure 1).



Figures 1 (a, b, c): CT has shown the presence of biliary sludge (blue arrow) in the gallbladder and biliary tract with an initial thickened walls. CT also revealed the presence of an abnormal gallbladder, and there was a "Phrygian cap" gallbladder (red arrows), with its typical twisted appearance.

The patient was unable to make a Magnetic Resonance-Cholangiography because he was claustrophobic. In fact, Multiphase MRI is the first choice of hepatobiliary imaging, but CT scan can help in narrowing the exact diagnosis in case of MRI contraindications.

Following three days of clinical observation and specific drug therapy at Emergency Room, the patient showed the recovery of normal vital signs with decreasing epigastric pain and gas and fecal material emission. Lipase and amylase had normal levels.

The patient was discharged home on day 4 with instructions and dietary and therapeutic prescriptions, with periodic clinical check-ups, in order to prevent complications and the advice to undergo deferrable cholecystectomy.

Discussion

The gallbladder is a pear-shaped organ and stores bile. Normally, the gallbladder is about 7 cm long and 3 cm wide and is located on the under-surface of the liver. Since the introduction of cholecystectomy [5], many gallbladder variations are known.

These variations include anomalies of form, location or number of gallbladders. Gallbladder anomalies arise from changes in embryological development. During the fourth week of gestation, the liver, gallbladder and biliary tree arise as a ventral bud from the most caudal part of the foregut. The original hepatic diverticulum differentiates caudally into the gallbladder [6,7]. A folding of the fundus during embryological development causes a so-called "Phrygian cap". A "Phrygian cap" is a congenital abnormality of the gallbladder and has an incidence of about 4% [8-10]. It is the most common congenital anomaly of the gallbladder and can simulate a mass in the liver during hepatobiliary imaging, which may also suggest a tumor. It can also simulate a duplication of the gall-bladder [11]. While typically considered a benign incidental

finding, this anatomical variation can present diagnostic challenges, particularly in the context of acute or complicated cholecystitis with choledocholithiasis. A "Phrygian cap", however, has no pathological significance. It is therefore important to use proper imaging techniques to differentiate between a "Phrygian cap" and other diagnoses.

We report the case of a man with pain in the right upper abdominal quadrant, and discuss the imaging aspects of a "Phrygian cap". PCG was first described by Boyden in 1935: he named the deformity after the "Phrygian Cap", an ancient conical cap with the top pulled forward. This cap is associated in antiquity with the inhabitants of Phrygia, a region that is now called central Turkey (Figure 2).



Figure 2: This statue wears a conical head-dress which fits closely around the head and is characterized by the top pulled forward. This cap is associated in antiquity with the inhabitants of former Phrygia. A marble head of Attis child II sec.d.C. exhibited at Musée des Monnaies Médailles et Antiques, Bibliothèque Nationale de France, Paris.

A PCG is a benign anatomical abnormality. Sometimes patients complain of pain in the right upper quadrant of the abdomen. The "Phrygian cap" is of no clinical importance other than to not mistake it for pathology.

A "Phrygian cap" can be identified with ultrasonography, CT scan, oral cholecystography, cholescintigraphy, and nowadays also by multiphase-MRI. CT and US are important to identify the "Phrygian cap" because it can show delayed filling of a portion of the gallbladder during hepatobiliary imaging.

Nowadays, multiphase MRI, or multiphase CT (in case of MRI contraindication), is the first choice of hepatobiliary imaging and is important for differential diagnosis. The multiphase images obtained by MRI or CT can usually differentiate between a mass lesion in the liver or gallbladder and a gallbladder's anomaly.

In our case report, this deformity was, in retrospective, detected

on the CT. Since a "Phrygian cap" has no pathological significance, prophylactic cholecystectomy is not necessary. Laparoscopic cholecystectomy is indicated in case of symptoms, or for other pathologies [12], to confirm the diagnosis or as surgical second look for abdominal exploration purposes.

In conclusion, when the gallbladder appears smaller than the gallbladder fossa or a mass is seen in the fundus on hepatobiliary imaging, a "Phrygian cap" gallbladder should be in the differential diagnosis. Multiphase images by MRI or CT scan should be obtained to exclude a tumor [1].

Conclusions

This patient presented complaints of right upper quadrant pain because of an acute biliary pathological condition associated with a "Phrygian cap" gallbladder anomaly, emphasizing the importance of recognizing these anomaly in case of suspected acute

cholecystitis. The presence of a folded gallbladder can complicate the radiological interpretation, potentially delaying diagnosis and therapeutic management. Recognition of such anomalies pre-operatively, particularly using as imaging test the Computed Tomography is important to choose the right surgical approaches avoiding surgical complications. It is crucial for surgeons to be aware of these abnormalities and to approach a laparoscopic cholecystectomy after proper pre-operative imaging study.

This gallbladder anomaly PCG and anatomical biliary defects underscore the importance of a multidisciplinary approach (between Radiologist and Surgeon) for a major precision in the management of complex cases of biliary tract's abnormalities.

Continuous reporting of anatomical variations improves clinical knowledge, contributing to safety during operations. Avoiding serious complications during laparoscopic cholecystectomy is crucial, and studying these anomalies can help achieve this objective ensuring favorable clinical outcomes in complex surgical scenarios.

Acknowledgement

None.

Conflicts of Interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Patient Consent Statement

The patient confirmed the consense for publication of our case report.

Ethical Statement/Human and Animal Rights

The authors declare that in this case report there aren't any experiments on animals.

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