Duplication of the artery to the cystic duct. A Case Report of a rare anatomical variation with surgical significance

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Abstract

Anatomical variations of the cystic artery are frequently documented, but variations of the artery to the cystic duct are extremely uncommon. We report an extremely rare duplication of the artery to the cystic duct, revealed during laparoscopic cholecystectomy on an 18-year-old Caucasian female treated for gallstone disease. Both arterial branches were meticulously and carefully retracted and cauterized, so that bleeding and subsequent postoperative complications could be avoided. To our knowledge, this is the first reported case of an artery to the cystic duct duplication. Presence of congenital variations of the artery to the cystic duct encumbers surgical maneuvers and increases the potentiality of intraoperative injury and haemorrhage.

Keywords: Cystic Duct; Anatomic Variation; Laparoscopic Cholecystectomy.

Introduction

Laparoscopic cholecystectomy constitutes the gold standard in the treatment of cholelithiasis[1-3]. Nevertheless, traumatic injury of the cystic artery and of its arterial branches remains a severe problem that may lead to morbidities or even mortality[4]. According to literature, anatomical variations of the cystic artery are frequently reported as risk factors of haemorrhage during laparoscopic cholecystectomy[1]. On the other hand, anatomic irregularity of the artery to the cystic duct has only been reported once, although posing a serious risk of accidental injury and potential bleeding during laparoscopic cholecystectomy[2]. The present manuscript aims to highlight an extremely rare duplication of the artery to the cystic duct and to showcase its surgical significance.

Case Report

An 18-year-old Caucasian female was referred to our institution, with a 2-month history of colicky abdominal pain at the right upper quadrant, which had progressively become worse. Patient's clinical examination was unremarkable, without positive Murphy's sign, tenderness, or jaundice. The patient's BMI was 27.3 kg/m2. Both patient's vital signs and laboratory data, including bilirubin, ALT and ASD were within the normal spectrum. Abdominal ultrasound detected multiple gallstones into the gallbladder. Following these, laparoscopic cholecystectomy was scheduled.

During the operation, surgeons carefully exposed the operating field, to detect the Calot's triangle. Then, the Calot's triangle was meticulously dissected and both the cystic artery and the cystic duct were revealed. When surgeons attained to detect the typical "H-configuration", which is formed by the cystic duct, the cystic artery, and the artery to the cystic duct, they incidentally identified an accessory branch of the artery supplying the cystic duct **(Figure 1)**. Both an inferior and a superior arterial branch of

the artery to the cystic duct were discovered, altering the typical “H-configuration”. To our knowledge, this is the first reported case of an artery to the cystic duct duplication. The presence of duplication of the artery to the cystic duct constitutes a potential risk of accidental injury and significant haemorrhage during the operation[2].

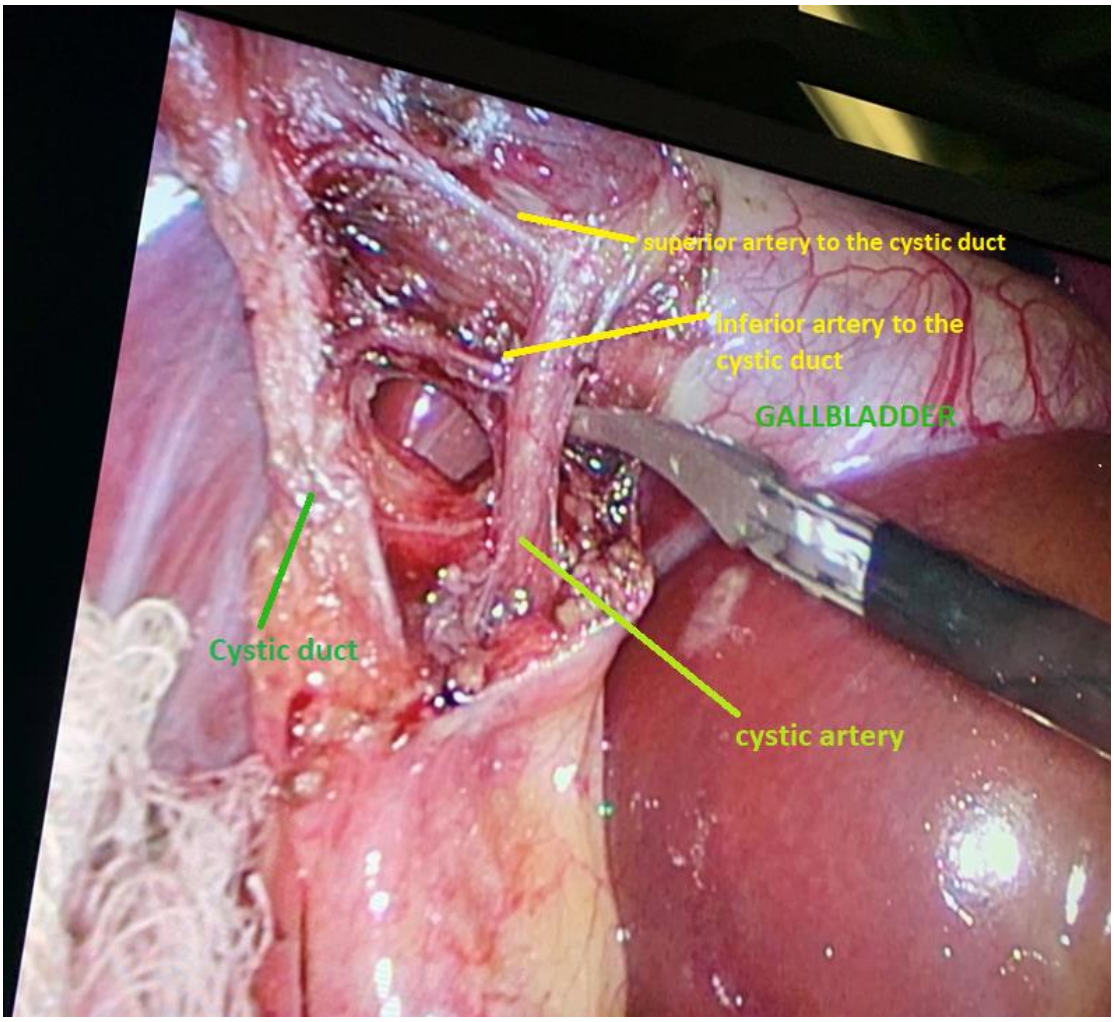

Figure 1: Duplication of the artery to the cystic duct. Presentation of both superior and inferior arterial branches in close relation to the cystic artery and the cystic duct. Alteration of the typical “H-configuration”.

Both arterial branches were retracted and cauterized, so that bleeding and subsequent postoperative complications could be avoided. The operation resumed in the usual fashion. Drainage was placed beneath the liver and removed on the second

postoperative day. The patient was discharged the third postoperative day with instructions. During the 3-month follow-up, the patient demonstrated no complications.

Discussion

The artery to the cystic duct constitutes a sole, inferior arterial branch, emerging from the cystic artery and supplying the cystic duct, with a prevalence of 91,47%[2]. The artery of the cystic duct typically originates at right angles from the cystic artery, and then traversing between the junction of the cystic and the common hepatic duct, and the junction of the cystic duct with the gallbladder, in order to enter the cystic duct while forming an "H-configuration"[2].

The artery to the cystic duct constitutes a significant risk-factor of accidental injury and haemorrhage in the hepatobiliary triangle during laparoscopic cholecystectomy[2]. Hereby, when surgeons detect the "H-configuration", the artery to the cystic duct must be carefully cauterized[2]. Such a surgical step is of paramount clinical significance, especially when encountering a short cystic duct in order to preserve its length, and to avoid accidental bleeding or extrahepatic biliary radical injuries[1,2], as performed in the presented case.

Rashid et al. have also reported that variant cystic arteries may not give the artery off to the cystic duct, in contrast to the typical cystic arteries[2]. Such anatomic variations, including the branches of the artery to the cystic duct, may be detected preoperatively with the utilization of arteriography[2]. However, arteriography is not included in the typical preoperative imaging of a patient with cholelithiasis. Hereby, surgeons' thorough knowledge of all probable arterial variations, gentle maneuvers, and meticulous exposure of the Calot's triangle are the cornerstones of a safe laparoscopic cholecystectomy.

Conclusions

Anatomical variations of the cystic artery are frequently documented, but variations of the artery to the cystic duct are extremely uncommon. Nevertheless, congenital variations of the artery to the cystic duct may not be as rare as considered, and their presence encumbers surgical maneuvers and increases the potentiality of intraoperative injury and haemorrhage[2]. Herein, further research is recommended so that anatomical variations of the artery to the cystic duct are documented.

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