Conclusive Identification and Division of the Cystic Artery: A Forgotten Trick to Optimize Exposure of the Critical View of Safety in Laparoscopic Cholecystectomy

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The value of the critical view of safety (CVS) in preventing bile duct injuries (BDIs) during laparoscopic cholecystectomies (LCs) partially resides in its extensive dissection requirements. Despite careful dissection, short cystic structures and high entering cystic arteries can at times impede full appreciation of the CVS. In such situations, the operator conclusively identifies the cystic artery by following it from its origin up into the gallbladder and by pulsation, and then divides it to better expose the hepatocystic triangle. Strasberg and colleagues[1] described this event in their first paper on the critical view, however, subsequent publication overlooked this technical trick. We generate the hypothesis that taking into consideration this often performed but under-described technical trick could increase the CVS achievement rate and consequently help prevent BDIs.

VALUE OF THE CRITICAL VIEW OF SAFETY

Bile duct injuries still complicate 0.32% to 0.66% of LCs.[2] The consequences of this dreaded complication are well known by both patients and health professionals.

In an attempt to prevent misidentification of cystic structures leading to BDI, Strasberg and colleagues[1] proposed a strategy for conclusive anatomic identification. This consists of clearing the hepatocystic triangle of fat or connective tissue and freeing the lowest part of the gallbladder from the cystic plate. If the dissection demonstrates 2, and only 2, tubular structures entering the gallbladder, then the CVS is achieved.

Even though obtaining level I evidences is not feasible, CVS has proven to be effective for preventing BDIs[3,4] and is endorsed by all surgical societies fostering safe cholecystectomies.[5-7] When CVS cannot be achieved safely, the operator should opt for adjunctive intraoperative imaging or other bailout strategies. Not achieving CVS is equally informative to the surgeon. However, this is only true when the operator safely but systematically tries to obtain the dissection described here.[8] Nonetheless, it should be pointed out that being systematic does not mean being stubborn, and the line between a safe dissection and a potentially dangerous one is subtle.

TECHNICAL NOTES

At our institution, we are committed to developing a culture of safe cholecystectomy through continuous education, research, and performance evaluation. In fact, every patient is asked to consent to endoscopic videorecording for postoperative assessment. Having reviewed more than 500 LC videos, we found that occasionally, even if the operator dissects the hepatocystic triangle and divides the lower part of the gallbladder from the cystic plate, the cystic artery length or position can impede clear visualization of the 3 criteria composing the CVS. This is the case when cystic structures are short or when the cystic artery enters high in the gallbladder, physically blocking a complete view of the hepatocystic triangle, especially that of the angle between the cystic plate and the divided inferior margin of the gallbladder. Only in such cases, and only after having conclusively identified the cystic artery by tracing its course from the origin to its termination into the gallbladder—by pulsation and size—the surgeon could divide the cystic artery before achieving the critical view. This allows the surgeon to obtain a clear view of the hepatocystic triangle and cystic plate, with only one tubular structure connected to the gallbladder, unequivocally the cystic duct.

The associated video of a delayed LC demonstrates the case well (Video 1). Using a combination of monopolar

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cautery and blunt dissection, the surgeon carefully dissects the adhesions hindering the hepatocystic triangle. Two tubular structures entering the gallbladder became clearly visible, but cystic plate visualization remains impeded. Exposure of the cystic plate by freeing the lower part of the gallbladder from its liver bed is fundamental to achieving the CVS because it allows excluding the presence of other vascular or biliary structures. In Video 1, a short cystic artery arising from the extraparenchymal right branch of the hepatic artery prevents achieving a clear critical view (Fig. 1).

By tracing its origin, course, and termination in the gallbladder, the surgeon conclusively identifies the cystic artery as such and is safe to clip and cut it before and to achieve a critical view. Indeed, this maneuver allows an unimpeded view of the hepatocystic triangle and the cystic plate to be obtained. Only then is the cystic duct unequivocally identified as the only structure connected to the gallbladder and the surgeon clips and cuts it to successfully complete the LC.

DISCUSSION

To foster patient safety, scientific communication, and quality assessment, CVS criteria have been defined unequivocally. Accordingly, CVS is considered achieved only if, after clearance of the hepatocystic triangle and division of lower part of the gallbladder from the cystic plate, 2 and only 2 tubular structures (ie the cystic duct and the artery) are seen entering the gallbladder.[9]

However, in the original article proposing the technique for conclusive anatomic identification, the authors allowed one exception to this principle. They clearly stated that, at times, the cystic artery length (ie short) or position (ie entering high in the gallbladder) prevent a safe view, no matter the dissection. Only in such cases, once conclusively identified by observation of pulsation and appropriate size, can the cystic artery be divided safely before the critical view.[2] By doing so, a clear view of CVS criteria is obtained and the only tubular structure connected to the gallbladder can be identified safely as the cystic duct.

To the best of our knowledge, this point was overlooked by successive clinical publications, with only 1 very recent article mentioning it.[10] However, in 2007, Wijsmuller and colleagues[11] proved on 10 embalmed human bodies that dividing the cystic artery significantly increases the exposed area of the hepatocystic triangle, optimizing CVS. Surgeons familiar with LC can confirm this point empirically.

Potential drawbacks could be misidentification with other vascular structures, such as right hepatic branches or with the cystic duct itself. To prevent this, besides pulsation and size, the cystic artery should be cleaned of connective and fat tissues and followed to its origin up into the gallbladder.

Far from proposing to modify CVS criteria, we generate the hypothesis that, in selected cases, taking into consideration this well known but overlooked technical trick could increase CVS achievement rate and consequently help prevent BDI.

CONCLUSIONS

Despite the large consensus on achieving CVS to prevent BDI, we are still far from the 0.1% to 0.2% incidence rates commonly reported in open cholecystectomy.[1] As described initially and later overlooked, in selected cases

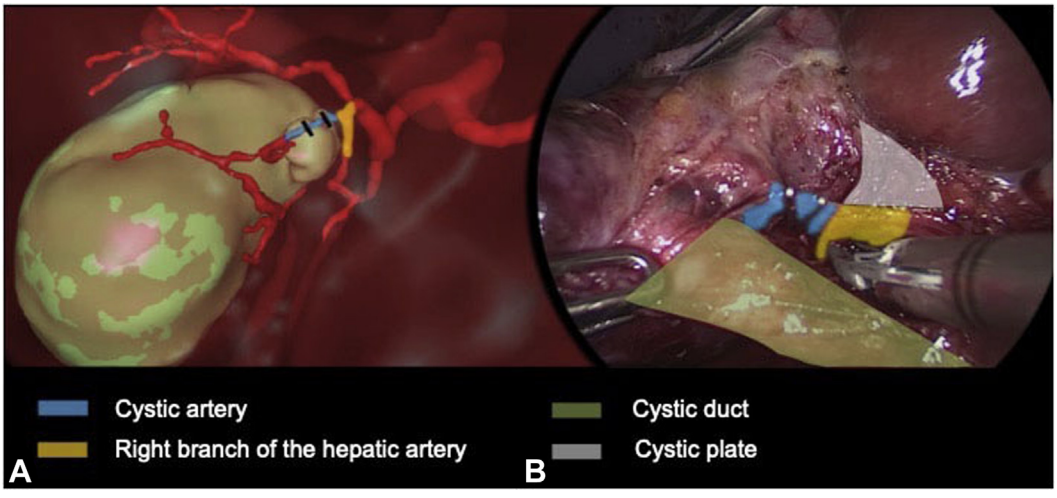

Figure 1. A 3-dimensional reconstruction (A) and endoscopic view (B) of the patient's hepatocystic anatomy. A short cystic artery arising from the extraparenchymal right branch of the hepatic artery impedes clear visualization of the cystic plate.

surgeons could clip and divide the conclusively identified cystic artery before CVS to better expose the cystic plate. Noteworthy, this exception to CVS principles should only be taken into consideration when the length or position of the artery impedes the critical view and once the artery is identified conclusively. Ongoing studies are assessing frequency, precise indications, and potential effect of this technical trick to promote a universally accepted but rarely achieved safety maneuver.

Author Contributions

Study conception and design: Mascagni, Felli, Pessaux, Dallemagne, Mutter
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