



Rouviere's Sulcus: A Useful Anatomical Landmark for Safe Laparoscopic Cholecystectomy

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ABSTRACT

Background: Laparoscopic cholecystectomy is accepted as the standard procedure for gallstone disease. Laparoscopic cholecystectomy is associated with more biliary, vascular, and visceral complications when compared with open cholecystectomy. The identification of Rouviere's sulcus is an additional strategy that can be used to prevent bile duct injuries. The aim of this study was to determine the frequency and the type of Rouviere's sulcus. **Materials & Methods:** This was a prospective descriptive study of 402 patients who presented with symptomatic gallstone disease and underwent laparoscopic cholecystectomy. Rouviere's sulcus was looked for before starting dissection. The frequency and the type of the sulcus were recorded. **Results:** Out 402 patients who underwent laparoscopic cholecystectomy, 284 (70.6%) patients were female and 118 (29.4%) patients were male, with a mean age of 48.4 (range 17-68 years), 221 patients (54.9%) were found to have open sulcus, fused type was found in 98 (24.4%) of patients, and not present in 83 (20.7%) of patients. **Conclusion:** The easy recognition of Rouviere's sulcus makes it a dependable landmark during severe acute inflammation. By dissecting ventral to Rouviere's sulcus, the surgeon ensures that they are operating away from the danger area.

Keywords: Rouviere's sulcus, Laparoscopic cholecystectomy, Bile duct injury

INTRODUCTION

Laparoscopic cholecystectomy is accepted as the standard procedure for gallstone disease. Laparoscopic cholecystectomy is associated with more biliary, vascular, and visceral complications when compared with open cholecystectomy [1].

The incidence of bile duct injuries in laparoscopic cholecystectomy approaches 0.5% [2-4]. Despite the advances in laparoscopic surgery, bile duct injuries continue to happen, and there has been no decline in the rates of injury [5].

Given the serious nature of this complication, the surgeon must make every effort to minimize the risk of bile duct injury. Accurate identification of the hepatobiliary anatomy is critical in laparoscopic cholecystectomy. Most bile duct injuries are thought to occur due to misidentification of biliary anatomy as a result of misinterpretation and/or lack of understanding the anatomy [2,6]. The identification of anatomical structures in laparoscopic surgery is complicated by the fact that these structures exist in a 3-D axis, yet the surgeon's view is fundamentally 2-D. Other factors that might increase the risk of bile duct injuries include inflammation/infection during acute cholecystitis, aberrant anatomy, hemorrhage, and surgeon inexperience [3,7]. Although a number of strategies have been described to limit iatrogenic biliary tract injuries, the only true safeguards are surgical vigilance, a thorough knowledge of the anatomy and its variants combined with meticulous dissection [2,7].

Internal anatomical landmarks and fixed extra biliary landmarks assist the surgeon, especially in difficult situations. Using well-described anatomical landmarks, combined with other well-documented strategies, such as the dissection of Calot's triangle to achieve the 'critical view of safety' [8], the surgeon will minimize the risk of injury to the biliary tract, particularly in the setting of acute inflammation. Another less well-recognized internal anatomical landmark in cholecystectomy is Rouviere's sulcus. The identification of Rouviere's sulcus is an additional strategy that can be used to prevent bile duct injuries [9].

In 1924, M.H. Rouviere, a French surgeon, described a fissure that now bears his name [10]. Rouviere's sulcus is a

2-5 cm sulcus running to the right of the liver hilum anterior to the caudate lobe. It contains the right portal toad or its branches. The sulcus identifies the plane of common bile duct accurately (a fact substantiated by cholangiographic studies) [11]. It can be identified in 80% of cases [10,11]. This sulcus is taken as the starting reference point for the commencement for a safe dissection. The plane of this sulcus should be always kept in mind during surgery. This extra-biliary reference point is a constant landmark on the live surface not distorted by any pathology [11].

In 1997, Hugh, et al. suggested that Rouviere's sulcus was a useful anatomic landmark in laparoscopic cholecystectomy [12]. The sulcus is a useful internal landmark that seems to get little recognition in major operative textbooks. For the correct identification of Rouviere's sulcus, anterosuperior and leftward traction of the gallbladder neck must be undertaken [13].

The aim of this study was to determine the frequency and the type of Rouviere's sulcus.

PATIENTS AND METHODS

This was a prospective descriptive study of 402 patients who presented with symptomatic gallstone disease and underwent laparoscopic cholecystectomy. The study conducted from January 2015 till November 2016 at Saint Raphael Hospital. All patients had a preoperative abdominal ultrasound, liver function tests, and complete blood count. The operation was done under general anesthesia with classical 3 ports, at the beginning of the operation. The same surgeon was performed all the operations. Rouviere's sulcus was observed for before starting dissection. The frequency and the type of the sulcus were recorded. The open type was defined as a right hepatic pedicle was identified and the sulcus was open throughout its length. Fused type was defined as one in which the pedicle was not visualized or if the sulcus was open only at its lateral end, and the absent type where the sulcus was not identified at the operation

RESULTS

Out of 402 patients who underwent laparoscopic cholecystectomy, 284 (70.6%) patients were female and 118 (29.4%) patients were male, with a mean age of 48.4 (range 17-68 years).

Open type was found in 221 patients (54.9%). Fused type was found in 98 (24.4%) of patients. The sulcus was not present in 83 (20.7%) of patients.

Out of the 221 patients with open type, 134 (60.7%) patients were complaining from chronic cholecystitis, 36 (16.2%) of them had empyema of the gallbladder, 28 (12.7%) patients had acute cholecystitis and 23 (10.4%) patients had mucocele of the gallbladder.

Out of the 98 patients with fused type, 47 (48%) patients had chronic cholecystitis, 27 (27.6%) patients had empyema of the gallbladder, 14 (14.2%) patients had mucocele of the gallbladder, and 10 (10.2%) patients had acute cholecystitis.

In the remaining 83 patients with absent type, 58 (70%) patients had chronic cholecystitis, 10 (12%) patients had acute cholecystitis, 8 (9.6%) of them had mucocele of the gallbladder, 6 (7.2%) of them had empyema of the gallbladder, and only one (1.2%) patient had gangrenous gallbladder.

DISCUSSION

Laparoscopic cholecystectomy is the gold standard procedure for gallstone disease. However, this operation has introduced complications which are either more complex or were not known in the era of open surgery. One of the most serious complication is major bile duct injury. The significant morbidity related to this operation seemed to be due to the lack of the laparoscopic anatomy of the gallbladder pedicle, two-dimensional vision, and lack of tactile feedback [14]. In this study Rouviere's sulcus was visualized in 319 (79.3%) of patients, comparing with other studies done by Zubair, et al. [15] which visualized a Rouviere's sulcus in 68.13%, another study by Dahmane, et al. [16] which studied a 40 macroscopically healthy undamaged liver removed during autopsies from cadavers of both sexes older than 18 years and the frequency was 82%, Rouviere's sulcus has been found by Hugh, et al. [12] in 78% of the livers, another study by Singh, et al. [17] showed a frequency of (84.5%) of Rouviere's sulcus.

Identifying Rouviere's sulcus during laparoscopic cholecystectomy can prevent major bile duct injuries because it lies in the fact that cystic duct and the cystic artery lay anterosuperior to the sulcus [15] and the common bile duct lays below the level of Rouviere's sulcus. Hugh [18] had shown minimal common bile duct injury during laparoscopic cholecystectomy by beginning the dissection ventral to the sulcus, so the use of Rouviere's sulcus as a fixed extrabiliary landmark especially during difficult operation can be so useful.

Rouviere's sulcus has several advantages over Calot's triangle for safe dissection during difficult laparoscopic cholecystectomy. First, Calot's triangle in an operative textbook, and Calot's triangle during the operation itself often bears little resemblance [19]. Dissection is needed to expose the vital structures that form the boundaries of the triangle. Safe dissection might be difficult due to the consequences of acute or recurrent cholecystitis, with inflammation, edema, and fibrosis of the structures leading to obscuration of the anatomical landmarks. Calot's triangle in this setting is often solid and cannot be expanded, and it can be hard to achieve a critical view of safety [9]. This is in contrast to Rouviere's sulcus, which remains relatively unaffected by inflammation and fibrosis [19]. Rouviere's sulcus might be used as a confirmatory tool and is particularly useful when identification of structures within Calot's triangle remains difficult. The cystic duct and artery lie anterosuperior to the sulcus, thus acting as a safety check before the ligation of any structures.

CONCLUSION

Using well-described anatomical landmarks and fixed extra biliary reference points, combined with other well-documented strategies, such as the 'critical view of safety', the risk of injury to the biliary tract during laparoscopic cholecystectomy will be minimized. The easy recognition of Rouviere's sulcus makes it a dependable landmark during severe acute inflammation. By dissecting ventral to Rouviere's sulcus, the surgeons ensure that they are operating away from the danger area. Given the consequences of bile duct injuries, Rouviere's sulcus should be a valuable addition to the surgeon's anatomical armamentarium.

DECLARATIONS

Conflict of Interest

There are no known conflicts of interest, financial or otherwise for the author of this manuscript which would interfere with the integrity of this research.

Statement of Ethics

Informed consent was obtained from all patients for being included in the study. Ethical approval was obtained from the institutional ethical and scientific committee before commencing this study.

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