

# Rouviere's Sulcus, A Safe Landmark for Laparoscopic Cholecystectomy

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## ABSTRACT

**Aim:** The objective of this study is to determine the frequency of Rouviere's Sulcus along with its types, Open or Fused in our population and its importance to avoid bile duct injury in laparoscopic cholecystectomy.

**Study Design:** Descriptive case study

**Setting and Duration:** Surgery Department of King Edward Medical University (KEMU), Mayo Hospital Lahore from April 2017 to September 2018.

**Methodology:** A total of 131 patients of both genders were included in this study, who presented with symptomatic gall stones confirmed on ultrasound and underwent laparoscopic cholecystectomy. Keeping in view the importance of rouviere's sulcus during surgery before starting the dissection of gall bladder in calot's triangle, the Rouviere's sulcus was identified and its types open or fused noted and documented in operative notes, then Rouviere's sulcus if present was taken as a landmark to start dissection, as cystic duct and cystic artery lies invariably above the sulcus. Open type, defined as one which was open throughout its length and in which right hepatic pedicle was visualized.

**Results:** A total of 131 patients underwent laparoscopic cholecystectomy which were included in this study. Open type of rouviere's sulcus was visualized in 57 patients and 41 patients had fused type of sulcus. Hence in a total of 98(74.80%) patients rouviere's sulcus was visualized. All laparoscopic cholecystectomies performed using Rouviere's sulcus as landmark for dissection were uneventful without any risk to CBD.

**Conclusion:** Rouviere's sulcus is important frequent extra biliary landmark, present in majority of patients as Open or Fused type. We recommend that surgeons must identify it as a initial step in laparoscopic cholecystectomy and start dissection above this point in order to prevent bile duct injury during surgery.

**Keywords:** Laparoscopic cholecystectomy, Rouviere's Sulcus, Bile duct injuries

## INTRODUCTION

The sound knowledge of surgical anatomy is important for the safe dissection of any surgical procedure<sup>1</sup>. With the establishment of laparoscopic cholecystectomy as the 'gold standard' method of treatment for symptomatic gallstones, surgeons have had to come across an increased risk of injuries to the bile ducts due to limitations of laparoscopy<sup>2</sup>. The identification of anatomical structures in laparoscopic surgery is complicated, because of these structures exist in a 3-D axis, yet the surgeon's view is fundamentally 2-D. Some other factors which increases the risk of bile duct injuries include inflammation/infection during acute cholecystitis, hemorrhage, aberrant anatomy and surgeon inexperience<sup>3</sup>. In recent years, researchers have focused on many strategies to avoid complications during laparoscopic cholecystectomy and to limit iatrogenic biliary tract injuries<sup>4</sup>.

The incidence of bile duct injuries in laparoscopic cholecystectomy approaches 0.5%. Despite the advances in laparoscopic surgery, bile duct injuries continue to happen, and there has been little decline in the rates of injury<sup>5</sup>. In last decade with increasing emphasis on patient safety, it is being recommended to identify and follow some important landmarks as reference point, which may guide the surgeons from where to begin the dissection by identifying the plane of the common bile duct even before the dissection begins<sup>6</sup>.

An important landmark being increasingly described in recent reports is the Rouviere's sulcus<sup>7</sup>. In 1924, M.H. Rouviere, a French surgeon, described a fissure that now bears his name<sup>8</sup>. Rouviere's sulcus is a 2-5 cm fissure in the liver between the right lobe and caudate process seen in laparoscopic cholecystectomy during the posterior dissection in majority of patients. It contains the right portal vein and its branches. The sulcus identifies the plane of common bile duct accurately<sup>9</sup>. The anatomy of Rouviere's sulcus as seen during laparoscopic cholecystectomy was hardly seen and described in the open surgery era, but is seen very clearly during laparoscopic cholecystectomy, due to the pressure of CO<sub>2</sub> insufflation opening up the sulcus widely and due to the enhanced illumination and image quality of the digital endoscopic cameras<sup>10</sup>.

Whatever is previously known about the sulcus comes to us from some seminal studies on liver anatomy by Rouviere, Gans and Couinaud who just noted that this sulcus was present in the majority of specimens, but the importance of the sulcus was not described<sup>11</sup>. Reynaud et al. drew attention to its importance in improving hepatectomy techniques. Hugh et al. were the first to draw attention to its importance during laparoscopic cholecystectomy because it accurately indicated the plane of the CBD<sup>12</sup>.

So, keeping in view the importance of rouviere's sulcus for safe dissection of calot's triangle, the aim was to determine the incidence of its frequency with its types in our population, so that surgeons can utilize the benefits of this important landmark in laparoscopic cholecystectomy<sup>13</sup>.

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## METHODOLOGY

This descriptive study was conducted on 131 patients, who presented with symptomatic gall stones and underwent laparoscopic cholecystectomy from April 2017 to September 2018 in Surgery Department of King Edward Medical University (KEMU), Mayo Hospital Lahore. Frequency and types of Rouviere's sulcus was documented. Open type, defined as one which was open throughout its length and in which right hepatic pedicle was visualized. Fused type, defined as one in which sulcus was not seen or if it was open only at its lateral end.

## RESULTS

A total of 131 patients underwent laparoscopic cholecystectomy which were included in this study. Out of 131 patients rouviere's sulcus was visualized in 98(74.80%) patients and in these fused type was observed in 41(31.29%) and open in 57(43.51%) patients. 33(25.19%) patients had no sulcus. In all laparoscopic cholecystectomies, Rouviere's sulcus taken as landmark to start dissection and were completed uneventful without any risk to CBD.

## DISCUSSION

Laparoscopic cholecystectomy is a gold standard treatment for gall stones<sup>14</sup>. Its advantages have been discussed extensively in the literature, but safe laparoscopic cholecystectomy has been a challenging task<sup>15</sup>. To overcome this challenge, surgeons have performed cholecystectomies under different safety protocols and researchers have focused on many strategies to avoid complications during laparoscopic cholecystectomy<sup>16</sup>.

The risk of complications is possible in any patient undergoing laparoscopic cholecystectomy, despite of advancement in instrumentation and video system<sup>17</sup>. Most common complications are hemorrhage and bile duct injuries but risk of bile duct injury in laparoscopic cholecystectomy has been a major concern<sup>18</sup>. With the introduction of laparoscopic cholecystectomy, initially there is an increase in the incidence of bile duct injury two to three times more than that seen in open cholecystectomy<sup>19</sup>.

Despite increased experience with laparoscopy, incidence of bile duct injuries dropped but we are still seeing these injuries today<sup>20</sup>. Bile duct injuries requiring operative intervention have plateaued and remains at 0.23%<sup>21</sup>. Due to the serious nature of this complication, surgeons must pay attention to minimize the risk of bile duct injury, which can be achieved by accurate identification of hepatobiliary anatomy and fixed internal and external biliary system landmarks<sup>22</sup>.

Various aspects of this procedure have been discussed in past, to avoid complications and performing procedure with safety measures<sup>23</sup>. Some consider achieving critical view cholecystectomy as the most safest approach of laparoscopic cholecystectomy and others fundus first<sup>24</sup>.

In this study we identify the Rouviere's sulcus as an important landmark towards safe laparoscopic cholecystectomy<sup>8,9</sup>. Hugh and kuldip have shown minimal incidence of bile duct injury in their series of laparoscopic

cholecystectomy by starting dissection ventral to this sulcus<sup>13,25</sup>. In our study rouviere's sulcus was visualized in 98(74.80%) patients comparing with other studies done by Zubair, et al. which visualized a rouviere's sulcus in 68.13%<sup>13</sup>, another study by Al-Naser, et al. which studied 402 patients with symptomatic gall stones, the frequency of Rouviere's sulcus visualized 79.3% of patients<sup>8</sup>. Rouviere's sulcus has been found by Hugh, et al. in 78% of the liver<sup>25</sup> another study by Dahmane, et al. which studied a 40 macroscopically healthy undamaged liver removed during autopsies from cadavers of both sexes older than 18 years and the frequency of Rouviere's sulcus visualized was 82%<sup>26</sup>.

The advantage of Rouviere's Sulcus over Calot's triangle for safe dissection in laparoscopic cholecystectomy lies in a fact, that recurrent cholecystitis leading to inflammation, adhesions and fibrosis can obscure anatomical landmark making difficult to achieve a critical view of safety in contrast to Rouviere's Sulcus, which remains relatively unaffected by inflammation and fibrosis<sup>8</sup>. So, Rouviere's sulcus might be used as confirmatory tool and is particularly helpful when identification of structures within calot's triangle remain difficult, as in majority of patients this useful landmark is identifiable and its importance lie in a fact that cystic artery and duct lays anterosuperior to this sulcus, so it should be used as reference point to begin dissection to avoid bile duct injuries.

## CONCLUSION

We recommend that with other well documented strategies, such as 'critical view of safety', an important extrabiliary landmark 'Rouviere's sulcus' which is identifiable in majority of patients should be used as reference point to begin dissection ventral to it, in order to eliminate any danger to bile duct.

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