

## VISUALISATION OF ROUVIERE'S SULCUS FOR SAFEGUARDING COMMON BILE DUCT IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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**Abstract**

**Background:** It is crucial to dissect Calot's Triangle safely while doing laparoscopic cholecystectomy. This research aims to fill the gaps in our understanding of the significance of Rouviere's sulcus in facilitating safe dissection inside Calot's triangle and the frequency at which it is present in individuals experiencing gall stone symptoms. **Materials and Methods:** This is a prospective descriptive study design done in Department of surgery, Tertiary care hospital from March 2022 to March 2023. All patients scheduled for laparoscopic cholecystectomy were considered. Before commencing dissection using laparoscopy, the presence of Rouviere's sulcus was confirmed. This sulcus was documented along with its Type and frequency. **Result:** During our study period of 1 years a total of 96 patients underwent laparoscopic cholecystectomy. Out of which Rouviere's sulcus was visualized in 78 (81.3%) patients. Type I (open type) was most common type in 48(61.5%), type II (closed) was seen among 19(24.4%), Type III (Slit) type was seen among 11(14.1%) and type IV (fused type or scar) was seen among 18(18.7%). **Conclusion:** Rouviere's sulcus, a deep groove at the medial end, is a crucial marker for surgeons performing laparoscopic cholecystectomy. It can be open, closed, or fused. The sulcus's architecture is classified for ease of use, with scars, slits, and the groove serving as reference points.

## INTRODUCTION

The current gold standard for gallstone disease treatment is laparoscopic cholecystectomy. In comparison to open cholecystectomy, laparoscopic cholecystectomy carries a higher risk of biliary, vascular, and visceral injuries.<sup>[1]</sup>

The surgeon must take all necessary precautions to avoid damaging the bile ducts, as this complication is quite dangerous. For laparoscopic cholecystectomy to be successful, the hepatobiliary anatomy must be precisely identified. It is believed that most bile duct injuries happens because the biliary architecture is misunderstood or misidentified.<sup>[2,3]</sup> Surgical attention, and in-depth understanding of the anatomy and its variations, and careful dissection are the only real precautions against iatrogenic biliary system injuries, even though several procedures have been detailed to reduce their incidence.<sup>[4]</sup>

Situated 2–5 centimetres anterior to the caudate lobe and extending down the right side of the liver hilum is Rouviere's sulcus. The right portal vein and its surrounding components are contained inside it. Cholangiography investigations have shown that the

sulcus correctly pinpoints the common bile duct's plane. This is detectable in eighty percent of instances. For the purpose of beginning a safe dissection, this sulcus is considered the starting point. Throughout the procedure, the plane of the sulcus must be carefully considered. There is no disease that may alter this extra biliary reference point, making it a continuous landmark on the liver surface.<sup>[5,6]</sup>

Sulcus subtypes are based on patient-specific differences in sulcus form, location, and size. In order to use the sulcus as a marker during cholecystectomy, it is necessary to first identify it and then subtype it. The purpose of this research was to establish how often Rouviere's sulcus is visible and how it facilitate safe dissection inside Calot's triangle.

**Objectives:** To identify and study the morphology (length, breadth) frequency, orientation, and anatomic subtype of Rouviere's sulcus in cases of laparoscopic cholecystectomy.

## MATERIALS AND METHODS

**Study Design:** Prospective Cross-sectional hospital-based study.

**Study Period:** 12 months.

**Study population:** Patients who were posted for laparoscopic cholecystectomy.

**Sample size:** All 96 patients who were posted for laparoscopic cholecystectomy.

**Sampling Method:** Consecutive sampling was applied and all patients who were willing to participate in study were included in study.

**Inclusion Criteria**

- Patients from both sex and above 18 years of age
- All Patients who were posted for laparoscopic cholecystectomy and patients willing to participate in the study.

**Exclusion Criteria:** Patients who are not willing to participate in the study.

**Data Collection:** A pretested proforma was prepared and it was administered to OPD patients attending Tertiary care hospital. All questions were asked face to face and the responses were recorded and a total of 96 patients were administered a questionnaire about their Sociodemographic factors and symptoms and risk factors among patients. The majority of respondents indicated that the language used was simple, and the questionnaire's lengthways also suitable. During laparoscopic cholecystectomy, standard four abdominal ports were made and routinely identification and photographic documentation of Rouviere's Sulcus and classification was done. We measured the length and width using a graduated Ryle's tube in cm. It is relatively easy to identify the Rouviere's Sulcus by giving a traction after grasping on the neck of gall bladder and retracting up and to left that opens up the sulcus which lies to the right side of the hilum. Anatomically it is located on the posterior aspect of hepatobiliary triangle. We used simple statistical method to find out the mean length of the Rouvier's sulcus, its mean length, breadth and direction of the sulcus. Different types of sulcus were sub classified according to their visual appearances intraoperatively. The frequency of presence and absence of sulcus was calculated in this study. If conversion to open cholecystectomy needed, reason was documented and any incidence of bile duct injury was documented.

Classification of Rouviere's Sulcus

Type I: Open type was defined as a cleft in which the right hepatic pedicle was visualized and the sulcus was opened throughout its length.

Type II: Closed type was defied as Partially fused sulcus opened only at its lateral end.

Type III: Slit type was defined as Partially fused sulcus opened only at its medial end.

Type IV: Fused type or Scar type was defined as one in which the pedicle was not visualized or absent sulcus.

**Statistical Analysis:** The data collected was entered in a Microsoft Excel sheet and later analyze dusing SPSS software version 21 and the Quantitative data was expressed as Mean and Qualitative data as Frequency.

**RESULTS**

During our study period of 1 years a total of 96 patients under went laparoscopic cholecystectomy. Mean age among patients was 42.6 years with a SD of 14.4 years. Among patients, Males were 60(62.5%) and females were 36(37.5%). Mean operating time was 54.3 min with a SD of 13.6 min. mean hospital stay was 1.3 days with a SD of 0.6 days.

According to indications for surgery, symptomatic cholelithiasis was seen among 44(45.8%), Acute Calculus Cholecystitis was seen among 29(30.2%), Acute Biliary pancreatitis was seen among 13(13.5%) and Gall bladder polyp was seen among 10(10.4%).

Out of which Rouviere's sulcus was visualized in 78 (81.3%) patients. According to Type of Sulcus, Type I (open type) was most common type in 48(61.5%), type II (closed) was seen among 19(24.4%), Type III (Slit) type was seen among 11(14.1%) and type IV (fused type or scar) was seen among 18(18.7%).

According to Direction of sulcus, sulcus was Horizontal among 61(63.5%), sulcus was Oblique among 33(34.4%) and sulcus was vertical among 2(2.1%).

According to dimensions of sulcus, Mean Length was 2.2 cm with a SD of 0.4 cm, Mean Breadth was 1.02 cm with SD of 0.1 cm and Mean depth was 0.89 cm with a SD of 0.2 cm. Right hepatic posterior sectional pedicle (vessel) was seen among 5 cases (7.5%).

**Table 1: Sociodemographic and patient characteristics among study participants.**

Variable		
Age	Mean	42.6 years
	SD	14.4 years
Gender	Males	60(62.5%)
	Females	36(37.5%)
Mean operating time	Mean	54.3 min
	SD	13.6 min
mean hospital stay	Mean	1.3 days
	SD	0.6 days

**Table 2: Indications for surgery among study participants.**

Indication	Frequency (%)
symptomatic cholelithiasis	44(45.8%)
Acute Calculus Cholecystitis	29(30.2%),

Acute Biliary pancreatitis	13(13.5%)
Gall bladder polyp	10(10.4%)
Total	96(100%)

**Table 3: Frequency distribution of study participants according to visualisation of Rouviere's sulcus.**

Visualisation of Rouviere's sulcus	Frequency (percentage)
Seen	78 (81.3%)
Not Seen	18(18.7%)
Total	96(100%)

**Table 4: Frequency distribution of study participants according to Type of Rouviere's sulcus.**

Type of Rouviere's sulcus	Frequency (percentage)
Type I (open type)	48(61.5%)
Type II (closed)	19(24.4%)
Type III (Slit) type	11(14.1%)
Type IV (fused type or scar)	18(18.7%)
Total	96(100%)

**Table 5: Descriptive statistics of study participants according to Dimensions of Rouviere's sulcus.**

Descriptive statistics	Length	Breadth	Depth
Mean	2.2 cm	1.02 cm	0.89 cm
SD	0.4 cm	0.1 cm	0.2 cm

## DISCUSSION

The present study was carried out in department of surgery during 1 year. A total of 96 patients under went laparoscopic cholecystectomy. In our present study Mean age among patients was 42.6 years with a SD of 14.4 years. Among patients, Males were 60(62.5%) and females were 36(37.5%). In a study done by NaserMK et al,<sup>[11]</sup> Mean age among patients was 48.4 years. Males were 284(70.6%) and females were 118(29.4%). In our present study Mean operating time was 54.3 min with a SD of 13.6 min. mean hospital stay was 1.3 days with a SD of 0.6 days. Our study findings were consistent with study done by Basukala S et al,<sup>[13]</sup> among study participants where Rouviere's sulcus mean operating time was 51.2 min with a SD of 12.8 min. mean hospital stay was 1.18 days with a SD of 0.52 days.

According to indications for surgery, symptomatic cholelithiasis was seen among 44(45.8%), Acute Calculus Cholecystitis was seen among 29(30.2%), Acute Biliary pancreatitis was seen among 13(13.5%) and Gall bladder polyp was seen among 10(10.4%). Our study findings were consistent with study done by Thapa PB et al,<sup>[12]</sup> where main indication for surgery was symptomatic cholelithiasis.

In our present study Out of which Rouviere's sulcus was visualized in 78 (81.3%) patients. In a study done by Mishra BB et al,<sup>[7]</sup> among 147(92%) sulcus was Visualised. In a study done by Singh et al,<sup>[8]</sup> among 90.6% sulcus was seen. In a study done by Jha AK et al,<sup>[9]</sup> among 63.63% sulcus was seen. In a study done by Rafi Y et al,<sup>[10]</sup> among 74.8% sulcus was seen.

In our present study According to Type of Sulcus, Type I (open type) was most common type in 48(61.5%), type II (closed) was seen among 19(24.4%), Type III (Slit) type was seen among 11(14.1%) and type IV (fused type or scar) was seen among 18(18.7%). In a study done by

Mishra BB et al,<sup>[7]</sup> Type I was seen in 99(61.9%), type II among 35(21.7%), Type III among 19(11.9%) and type IV among 7(4.3%). In a study done by Jha AK et al,<sup>[9]</sup> 25.39% had closed type, 68.25% had open type, 6.35% had scar type.

In our present study According to Direction of sulcus, sulcus was Horizontal among 61(63.5%), sulcus was Oblique among 33(34.4%) and sulcus was vertical among 2(2.1%). In a study done by Mishra BB et al,<sup>[7]</sup> 59.2% had horizontal sulcus, 37.8% had Oblique sulcus and 3.5% had vertical sulcus.

In our present study According to dimensions of sulcus, Mean Length was 2.2 cm with a SD of 0.4 cm, Mean Breadth was 1.02 cm with SD of 0.1 cm and Mean depth was 0.89 cm with a SD of 0.2 cm. in a study done by Singh et al,<sup>[8]</sup> Among open type, Mean Length was 2.31 cm, Mean Breadth was 1.11 cm and Mean depth was 1.11 cm. Among closed type Mean Length was 2.18 cm, Mean Breadth was 0.86 cm and Mean depth was 0.86 cm. Right hepatic posterior sectional pedicle (vessel) was seen among 5 cases (7.5%).

Rouviere's Sulcus is a safer option for laparoscopic cholecystectomy due to its ability to remain unaffected by inflammation and fibrosis. This landmark is particularly useful when identifying structures within Calot's triangle, as it is often identifiable and serves as a reference point to begin dissection.<sup>[14,15]</sup> This is because the cystic artery and duct lie anterosuperior to the sulcus, preventing injuries from bile duct injuries. Therefore, Rouviere's Sulcus is a valuable confirmatory tool in laparoscopic cholecystectomy.

## CONCLUSION

Rouviere's sulcus is commonly open, and it shows that the right hepatic portal pedicle is leaving the liver hilum. A surgeon doing a laparoscopic cholecystectomy will find it to be an valuable marker.

It is closed, occasionally a narrow and shallow sulcus (SLIT), or fused, sometimes seen as a white line of fusion (SCAR), however the latter is the more frequent of the two. To facilitate laparoscopic cholecystectomy, the architecture of Rouviere's sulcus is classified as either open or closed, with scars, slits, and the sulcus serving as reference points. In order to keep the main bile duct safe during surgery, they advise that surgeons locate its plane as a reference point and refrain from dissecting below it.

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