# **Original Research Article**

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# A prospective observational analytical study on Rouviere's sulcus: a single institutional study

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#### **ABSTRACT**

**Background:** Laparoscopic cholecystectomy is the most commonly performed laparoscopic surgery worldwide. Safe cholecystectomy is the priority to reduce the morbidity and mortality. There is a paradigm shift from extensive Calot's dissection to identification of Rouviere's sulcus and lesser dissection. Identification and analysis of Rouviere's sulcus will help us doing a safe cholecystectomy and avoiding further injuries to bile ducts.

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**Methods:** The study included 160 cases of laparoscopic cholecystectomy, posted in elective OT and identified Rouviere's sulcus during laparoscopy. Table visual inspection and analysis was done. And the collected data was analyzed for different types of sulcus, its position, morphology and content.

**Results:** Of 160 cases, 147 cases had Rouviere's sulcus. 13 cases did not have a sulcus. Open type sulcus was present in 99 cases, 35 had closed type, whereas 19 had slit type and only 7 had a scar like sulcus. The study showed 92% of our patients had Rouviere's sulcus and of them 61.9% had an open type which was the most common type of sulcus of them 18 cases had a visible pulsating vessel in the floor of the sulcus i.e. posterior sectional pedicle in the sulcus.

**Conclusions:** Present study showed, in 92% cases it is easy and approachable to visualise the Rouvier's sulcus. So, it is feasible and beneficial to identify the sulcus and keep the dissection above this level to avoid common bile duct injury and further complication thereof.

Keywords: Identification, Rouviere's sulcus, Safe laparoscopic cholecystectomy, Types

# **INTRODUCTION**

Today laparoscopic cholecystectomy is the most commonly performed laparoscopic surgery worldwide. The insurgence of minimally invasive surgery in almost all available surgeries has made complications unavoidable unless done with precaution. In the present era, laparoscopic cholecystectomy has common complications like an array of bile duct injuries, and haemorrhage. During classical Calot's dissection the percentage of bile duct injury is 0.3-1%.

Rouviere's sulcus is a groove present in posterior aspect of hepatobiliary triangle to the right of hilum. Identification of this sulcus during laparoscopic cholecystectomy is easy. Its identification helps in getting the level of common bile duct thus avoiding bile duct injuries. <sup>2,3</sup> the sulcus varies in shape, position, and size in different patients and roughly can be divided into various subtypes. Simple identification and various subtyping of the sulcus will give us a further step ahead in using the sulcus as an identifying landmark during cholecystectomy.

#### **Objective**

The objective of the study was to identify and study the morphology (length, breadth) frequency, orientation, and anatomic subtype of Rouviere's sulcus in cases of laparoscopic cholecystectomy.

#### **METHODS**

#### Study design

Prospective observational and analytical study.

# Study place

The study was conducted among patients undergoing elective laparoscopic cholecystectomy in department of general surgery, SCB medical college, Cuttack, Qdisha, India.

#### Period of study

The duration of the study was 11 months, i.e. from February 2018 to December 2018.

#### Inclusion criteria

Patients from both sex and above 18 years of age, those who were to undergo elective laparoscopic cholecystectomy. None of the patients chosen had any previous abdominal surgeries (avoids any adhesion or distortion of normal anatomy). None of them were cirrhotic nor any history of chronic liver disease.

#### Exclusion criteria

Below the age of 18 were excluded from the study. And those with previous laparotomy or laparoscopic surgeries were also excluded.

The study was done on 160 number of patients who underwent laparoscopic cholecystectomy. Intraoperatively, after the creation of pneumoperitoneum visually identified the Rouviere's sulcus (RS). We determined the anatomical subtype, morphology (length, breadth, direction) of the sulcus. We measured the length and width using a graduated Ryle's tube in cm.

## Technique to identify the sulcus

It is relatively easy to identify the RS i.e. 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 rt. side of the hilum. Anatomically it is located on the posterior aspect of hepatobiliary triangle, mostly it is oblique to anterior and external edge of liver. We used simple statistical method to find out the mean length of the Rouvier's sulcus, its mean breadth and direction of the sulcus. Different types of sulcus were subclassified according to their visual appearances intraoperatively. The frequency of presence and absence of sulcus was calculated in this study.

# **RESULTS**

In all 160 cases we found the Rouvier's sulcus were found to be an open groove or a closed groove, slit type

or a remnant scar and others didn't have any sulcus i.e. absent sulcus.

After analysis of the collected data the following was noticed. Of 160 laparoscopic cholecystectomies cases 147 had sulcus, 13 had no sulcus.

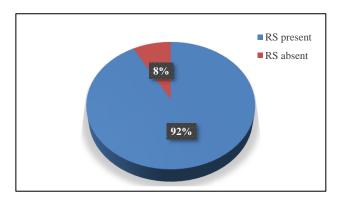


Figure 1: Frequency of sulcus.

Open type was in 99 cases, 35 had closed type, 19 had slit type and only 7 had a scar like sulcus (Table 1).

#### Direction of the RS

Most cases had horizontally placed sulcus i.e. 83 of 140 (excluding scar type and those with absent sulcus). 53 had oblique directed sulcus. 5 cases had vertical sulcus.

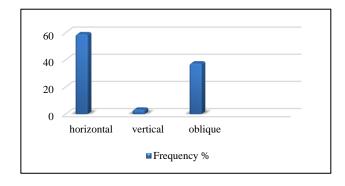


Figure 2: Direction of Rouviere's sulcus.

Length of the sulcus ranged from 1 cm to 4.5 cm mean length was 2.6 cm. Maximum breadth was 1.5 cm minimum was 0.5 cm. Mean breadth was 0.8 cm. Right hepatic posterior sectional pedicle (vessel) was present in 18 cases (11.2%).

Table 1: Summary and mean length and breadth.

| Subtype of sulcus | No of cases | Percentage (%) |
|-------------------|-------------|----------------|
| Open type         | 99          | 61.9           |
| Closed type       | 35          | 21.7           |
| Slit type         | 19          | 11.9           |
| Scar type         | 07          | 4.3            |
| Mean length (cm)  | 2.6         |                |
| Mean breadth (cm) | 0.8         |                |

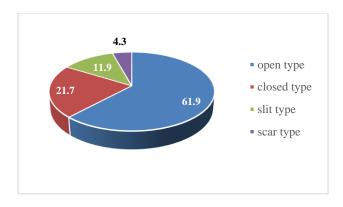


Figure 3: Frequency of subtype of sulcus.

#### DISCUSSION

At present there is a paradigm shift from Calot's triangle to Rouviere's sulcus identification during laparoscopic cholecystectomy for performing safe surgery. So, it's pertinent to know more anatomical details and its frequency in the population. The sulcus is a safe and constant anatomical landmark that is present on the hilar surface of liver. Secondly, it is easily and clearly visible during cholecystectomy as guiding point. Thirdly, common bile duct is present at the level of Rouviere's sulcus. Thus, dissecting above the level safeguards the bile duct and thus prevents complication and biliary injures.

Lastly and most importantly in case of frozen Calot's where we may not be able to delineate structure, Rouviere' sulcus can be a useful guide to avoid bile duct injury and use it as a reference point to guide the commencement of safe dissection.<sup>4-8</sup>

Table 2: Comparison of the present study with previous study.

| Parameters              | Present study | Singh et al <sup>13</sup> |
|-------------------------|---------------|---------------------------|
| Frequency of sulcus (%) | 92            | 90.6                      |
| Open type (%)           | 61.9          | 60                        |
| Closed type (%)         | 21.7          | 11                        |
| Slit type (%)           | 11.9          | 23                        |
| Scar type (%)           | 4.3           | 6                         |
| Length range (mm)       | 10-45         | 10-50*                    |
| Breadth range (mm)      | 5-15          | 5-20                      |
| Horizontal (%)          | 59.2          | 67                        |
| Oblique (%)             | 37.8          | 31                        |
| Vertical (%)            | 3.5           | 2                         |

<sup>\*</sup>compared the length range of open type sulcus.

In the absence of sufficient anatomic literature, various previous studies have shown variation in the findings about the sulcus. 9-12 Singh in his studies has shown 90.6% cases to have the sulcus, whereas, Dahmane et al found in 86% of their cases. 13,14 Whereas, present study showed an incidence of 92% of all cases taken into consideration.

Hugh had shown minimal common bile duct injury during laparoscopic cholecystectomy by beginning the dissection ventral to the RS. <sup>10</sup> In the resection of segment 5, cholecystectomy is performed first, ventral to RS to avoid injury to the right posterior sectional pedicle. <sup>11,12</sup> The open sulcus usually contains the bilio-venous component in the floor of the sulcus, but rarely has a tortuous pulsating vessel in the floor. Earlier studies have shown the different types of sulcus and variation in its direction. <sup>9</sup>

But there has been lack of sufficient knowledge and anatomical facts about the sulcus and its importance during lap cholecystectomy. Many studies have classified it as open and fused type (closed) type and many have other ways of classification into type I-III. <sup>14,15</sup> So there is a clear lack of classification system or subtyping of sulcus. <sup>15</sup> This sulcus and its subtyping needs more clear classification system and subtyping with larger studies in future.



Figure 4: Medial end of the sulcus open in the porta hepatis. A pulsating tortuous posterior sectional pedicle (arrow) was seen in horizontal direction.

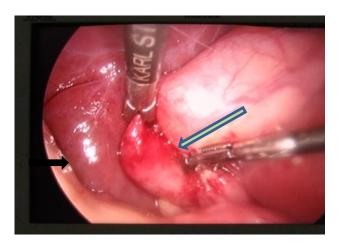


Figure 5: Closed type showing the medial end does not open to porta/hilum and positioned obliquely (black arrow); gall bladder (green arrow).



Figure 6: Slit type sulcus due to its appearance; situated away from the porta hepatis; vertically oriented; the gall bladder neck is pulled to left and away from the liver.



Figure 7: Absence of Rouviere's sulcus.

#### **CONCLUSION**

From the above study we conclude that, Rouviere's sulcus is a consistent surgical landmark during laparoscopic procedure. It has different anatomical subtypes and has morphological variations in direction size and shape. The ease of identification of the sulcus during laparoscopic cholecystectomy may allow us to avoid unnecessary extensive Calot's dissection thus preventing unwanted bile duct injuries. More extensive and multicentric studies should be conducted to get more conclusive results.

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Institutional Ethics Committee

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