



ROUVIERE'S SULCUS : A NOVEL ANATOMICAL LANDMARK FOR SAFE LAPAROSCOPIC CHOLECYSTECTOMY

General Surgery

Dr. Parul Yadav* 3rd Year General Surgery Resident At Dr. S.N. Medical College, Jodhpur. *Corresponding Author

Dr. Mahendra Kumar Assistant Professor At Dr. S. N. Medical College, Jodhpur.

Dr. Anshul Mathur Senior Resident At Dr. S. N. Medical College, Jodhpur.

Dr. Irshad 3rd Year General Surgery Resident At Dr. S. N. Medical College, Jodhpur.

ABSTRACT

Introduction-The information of surgical anatomy is imperative for the safe implementation of any surgical procedure. A less well-recognized fixed internal anatomical landmark in laparoscopic cholecystectomy is Rouviere's sulcus. The current literature provides only scarce and heterogeneous data regarding this groove. The present study is intended to identify and study the frequency, orientation, and anatomic subtype of Rouviere's sulcus in cases of laparoscopic cholecystectomy. **Material And Method**-A prospective observational study was conducted on 70 patients from May 2020 to October 2021 at Department of General Surgery, Dr. S. N. Medical College, Jodhpur, Rajasthan. Patients from both sex and above 18 years of age with symptomatic gall stone disease were included. Databases were searched with the following keywords: fissure or sulcus of the caudate process, incisura dextra, incisura dextra of Gans, Rouviere's sulcus, sillon du processus caudé. Statistical analysis done and results and observations were concluded. **Result**-Out of 70 patients, 58 (82.86%) patients had Rouviere's sulcus. Open type of sulcus was present in 45 (64.28%) patients. Closed type of sulcus was present in 13 (18.57%) patients. Slit type was present in 5 (7.14%) patients. Scar like was present in 4 (5.71%) patients and sulcus was not identifiable in 3 (4.26%) patients. **Conclusion**-We hereby conclude that, Rouviere's sulcus is a consistent surgical landmark during laparoscopic cholecystectomy. Identification of the sulcus during laparoscopic cholecystectomy help us to avoid bile duct injuries.

KEYWORDS

Laparoscopic cholecystectomy, Rouviere's sulcus, Calot's triangle, Critical view of safety, cholelithiasis, cholecystitis.

INTRODUCTION

The information of surgical anatomy is imperative for the safe implementation of any surgical procedure. In the last decade, researchers have focused on many strategies to avoid complications during laparoscopic cholecystectomy.^{1,2} With the help of well-described and fixed anatomical landmarks, combined with other well-documented strategies, such as the dissection of Calot's triangle to achieve the 'critical view of safety'.³ The surgeon will diminish the risk of injury to the biliary tract, predominantly in the setting of acute inflammation. Another less well-recognized fixed internal anatomical landmark in laparoscopic cholecystectomy is Rouviere's sulcus.⁴ It precisely identifies the plane of common bile duct.⁵

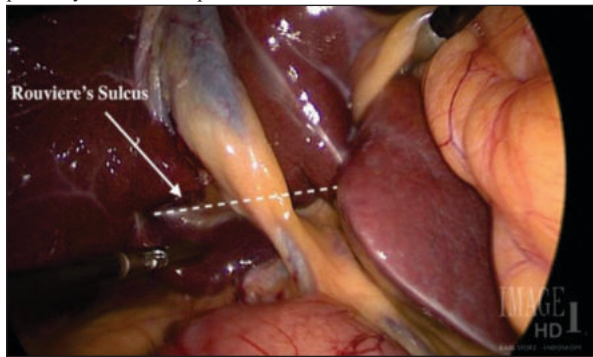


Figure 1: Rouviere's Sulcus (white arrow)

Rouviere's sulcus is a naturally present groove on the visceral aspect of the junction between right and caudate lobe of liver.⁶

The current literature provides only scarce and heterogeneous data regarding this groove. The reported prevalence is 52–98.7%. Couinaud estimated its prevalence at 73%.⁷ Gans estimated it near 80%.⁸

Correct recognition of Rouviere's sulcus is done by anterosuperior and leftward traction of the gallbladder neck.⁹ This sulcus is considered as the starting reference point for the beginning for a safe dissection.⁵ The present study is intended to identify and study the frequency, orientation, and anatomic subtype of Rouviere's sulcus in cases of laparoscopic cholecystectomy.

MATERIAL AND METHOD

A prospective observational study was conducted on 70 patients from May 2020 to October 2021 at Department of General Surgery, Dr. S. N. Medical College, Jodhpur, Rajasthan. *Institute Ethics Committee approval was obtained before the start of the study. Written and informed consent was obtained from all participants before enrolment into the study.* Patients from both sex and above 18 years of age, with uncomplicated symptomatic gall stone disease were included. Patients below the age of 18 years, patients with previous laparotomy or laparoscopic surgeries and patients with cirrhosis or any history of chronic liver disease and liver tumors were excluded from the study.

We performed a literature review through major databases, such as PubMed, Science Direct, Google Scholar, and Cochrane Library with the following keywords: fissure or sulcus of the caudate process, incisura dextra, incisura dextra of Gans, Rouviere's sulcus, sillon du processus caudé. We selected studies from articles and reference books from 1924 to 2020. We selected a classification developed by Singh et al.⁹ to organise the study. Rouviere's sulcus, if present, was classified according to three types. Type I refers to a deep sulcus, with vascular or biliary elements visible; open type, if not visible; closed type. Type II is a slit-like sulcus and Type III is a scar-like sulcus, which appears as a white line of fusion. Statistical analysis was done using computer software (SPSS version 21 and Primer). Proper statistical tests were applied to obtain results and observations were recorded.

All patients had a preoperative abdominal ultrasound, liver function tests, and complete blood count. The surgery was done under general anaesthesia with classical 4 ports technique. Rouviere's sulcus was appreciated 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. Drain was kept in liver bed for 2 days post operatively and then removed. Patients were followed up after 7 days for any post operative complaints (biliary drain output, nausea, vomiting, fever, pain abdomen, sign of peritonitis) and for stitch removal.

RESULT AND OBSERVATIONS

70 patients with uncomplicated symptomatic gall stone disease were

included in study and taken up for Laparoscopic Cholecystectomy.

Age of presentation was predominantly in fourth decade of life (39 %) with female predominance.

Out of 70 patients, 54 (77.14%) were females and 16 (22.86%) were males. Pain abdomen was chief complaint; in 97% patients.

Table 1 : Sex Distribution

Sex	No. of Patients	Percentage
Female	54	77.14 %
Male	16	22.86 %

Out of 70 patients, 58 (82.86%) patients had Rouviere's sulcus. Open type of sulcus was present in 45 (64.28%) patients. Closed type of sulcus was present in 13 (18.57%) patients. Slit type was present in 5 (7.14%) patients. Scar like was present in 4 (5.71%) patients and sulcus was not identifiable in 3 (4.26%) patients.

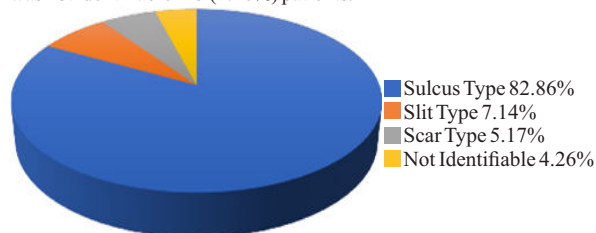


Figure 2: Frequency Of Rouviere's Sulcus During Laparoscopic Cholecystectomy

Table 1 : Incidence Of Rouviere's Sulcus

S. No.	Rouviere's sulcus		No. of Patients (n=70)	Percentage (%)
1.	Sulcus Type	Open Type	45	64.28 %
		Closed Type	13	18.57 %
2	Slit type		5	7.14 %
3	Scar type		4	5.71 %
4.	Not identifiable		3	4.26 %

Out of 45 patients of Open type, 25 (55.56%) patients had cholelithiasis, 12 (26.67%) patients had acute cholecystitis, 4 (8.89%) patients had chronic cholecystitis, 3 (6.67%) patients had gall bladder polyp and only 1 (2.22%) patient had mucocele of gall bladder.

Out of 13 patients of Closed type of sulcus, 8 (61.54%) patients had cholelithiasis, 3 (23.08%) patients had acute cholecystitis, 1 (7.69%) patient had gall bladder polyp and 1 (7.69%) patients had empyema gall bladder.

Out of 5 patients of Slit type, 3 (60%) had acute cholecystitis, 1 (20%) patient had mucocele gall bladder and 1 (20%) patient had empyema gall bladder.

Out of 4 patients of Scar like, 3 (75%) patients had acute cholecystitis and 1 (25%) patient had chronic cholecystitis.

Rouviere's sulcus was not identifiable in 3 patients. Out of 3, 2 (66.67%) had chronic cholecystitis and 1 (33.33%) patient had gangrenous gall bladder.

DISCUSSION:-

Laparoscopic Cholecystectomy has various complications which were not known in era of open cholecystectomy. The most serious complication is major bile duct injury. The significant morbidity which is associated with this procedure is mainly due to lack of knowledge about laparoscopic anatomy of hepatobiliary system, two dimensional vision and absence of tactile sensation.¹⁰

In this study Rouviere's sulcus was visualized in 67(95.71%) of patients, comparing with other studies done by Mishra BB et al.¹¹ which visualised Rouviere's sulcus in 92% patients. In study done by Singh M et al.⁹, Rouviere's sulcus was visualised in 94% of patients.

Identification of Rouviere's sulcus during laparoscopic cholecystectomy can help in prevention of major bile duct injury, because it is present in such a place that cystic duct and cystic artery

present anterosuperior to it and common bile duct lies below to the sulcus.¹³

Table 2 : Comparison Between Result Of Different Studies

Study	Percentage (showing Rouviere's sulcus)
Gans ⁸ , 1955	80 %
Hugh et al. ¹² 1997	78 %
Zubair et al. ¹³ 2009	68 %
Dahmane et al. ¹⁴ 2013	86%
Singh M et al. ⁹ 2017	90.6 %
Mishra BB et al. ¹¹ 2020	92 %

Hugh had shown very less chances of common bile duct injury during laparoscopic cholecystectomy by starting the dissection ventral to the sulcus, so the Rouviere's sulcus is useful as a fixed extra biliary landmark particularly while doing difficult cholecystectomy.¹²

Rouviere's sulcus has numerous advantages over Calot's triangle for safe dissection during difficult laparoscopic cholecystectomy.¹⁵ During laparoscopic cholecystectomy dissection is needed to expose the vital structures which play role in forming 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 that causing difficult identification of the anatomical landmarks of calot's triangle. In this situation dissection of calot's triangle is not possible and it can be hard to achieve a critical view of safety.⁴

In contrast to this, Rouviere's sulcus is relatively unaffected by inflammatory process. So, Rouviere's sulcus can be used as confirmatory tool for starting dissection when identification and dissection of calot's triangle is difficult.¹⁵

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. 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. 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. More extensive and multicentric studies should be conducted to get more conclusive results.

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