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Rouviere's Sulcus as a Safety Landmark in Laparoscopic Cholecystectomy

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Abstract
Background: *Laparoscopic Cholecystectomy (LC) is the ―Gold Standard procedure for symptomatic gallstones nowadays. Knowledge of Surgical Anatomy is always important for a safe surgery. With the development of laparoscopic procedure, surgical interest in the Rouviere's sulcus and its relation to the right portal pedicle has increased recently. This prospective study aimed at safety landmarks for avoiding Bile Duct Injuries during surgery and reducing the number of intraoperative and post operative complications in laparoscopic cholecystectomy.*
Method: *This prospective study was conducted on 50 patients who underwent laparoscopic cholecystectomy. During the standard procedure, Rouviere's sulcus was identified and dissection of calot's triangle was done above the level of sulcus and critical view of safety was created.*
Results: *Our majority of patients (76%) had well defined Rouviere's Sulcus. In 22%, Sulcus was identified as ―just a faint line. And only a single patient presented with non identifiable Sulcus. There were only 2 intraoperative and 1 postoperative complication found in our study.*
Conclusion: *Rouviere's Sulcus at the initial step in laparoscopy strengthens surgeon's confidence and helps in reducing the operative time with safety so that we could reach to a zero Bile duct injury level in this surgery.*
Keywords: *Laparoscopic Cholecystectomy, Rouviere's Sulcus, Bile Duct Injury.*

Introduction

Cholecystectomy is one of the most commonly performed abdominal surgical procedures, and in developed countries many are performed Laparoscopically, whichrequires the use of new clues and landmarks, unlike open cholecystectomy. Phillipe Mouret performed the first human laparoscopic cholecystectomy in France in 1987. Tempton Udwadia of Hinduja Hospital, Mumbai is accepted by most as the father of Laparoscopic Surgery in India.

Laparoscopic cholecystectomy is now considered the "gold standard" for the surgical treatment of gallstone disease. 90 percent of cholecystectomies

in United States are performed laparoscopically.[1] This procedure results in less postoperative pain, better cosmesis, shorter hospital stays and disability from work than open cholecystectomy.[2] Serious complications that occur with laparoscopic cholecystectomy, including bile duct injury, bile leaks, bleeding, and bowel injury, result in part from patient selection, surgical inexperience, and the technical constraints that are inherent to the minimally invasive approach.[3]

The incidence of bile duct injuries were definitely increased as compared to open cholecystectomy.[4] It has been recognized that normal anatomical variations; especially around Calot's triangle, leads to major bile duct injuries in laparoscopic procedure as compared to open .

Knowledge of Surgical Anatomy is always important for performing any surgical procedure safely. In the last decade, researchers have focussed on many strategies to avoid complications during Laproscopy. Peti and Moser[5] determined that Rouviere's Sulcus dissection is a lesser known, but an important strategy for any safe Laproscopic cholecystectomy. Surgical interest in Rouviere's sulcus and its relation to the right portal pedicle has increased in recent years because of the development of laparoscopic cholecystectomy. The Rouviere's Sulcus, described by Henri Rouviere's in 1924 is used as a reference point to guide the commencement of safe dissection.[6] Rouviere's sulcus is a cleft in the liver in >90% of patients and is shown by retracting the gall bladder infundibulum medially.[7]

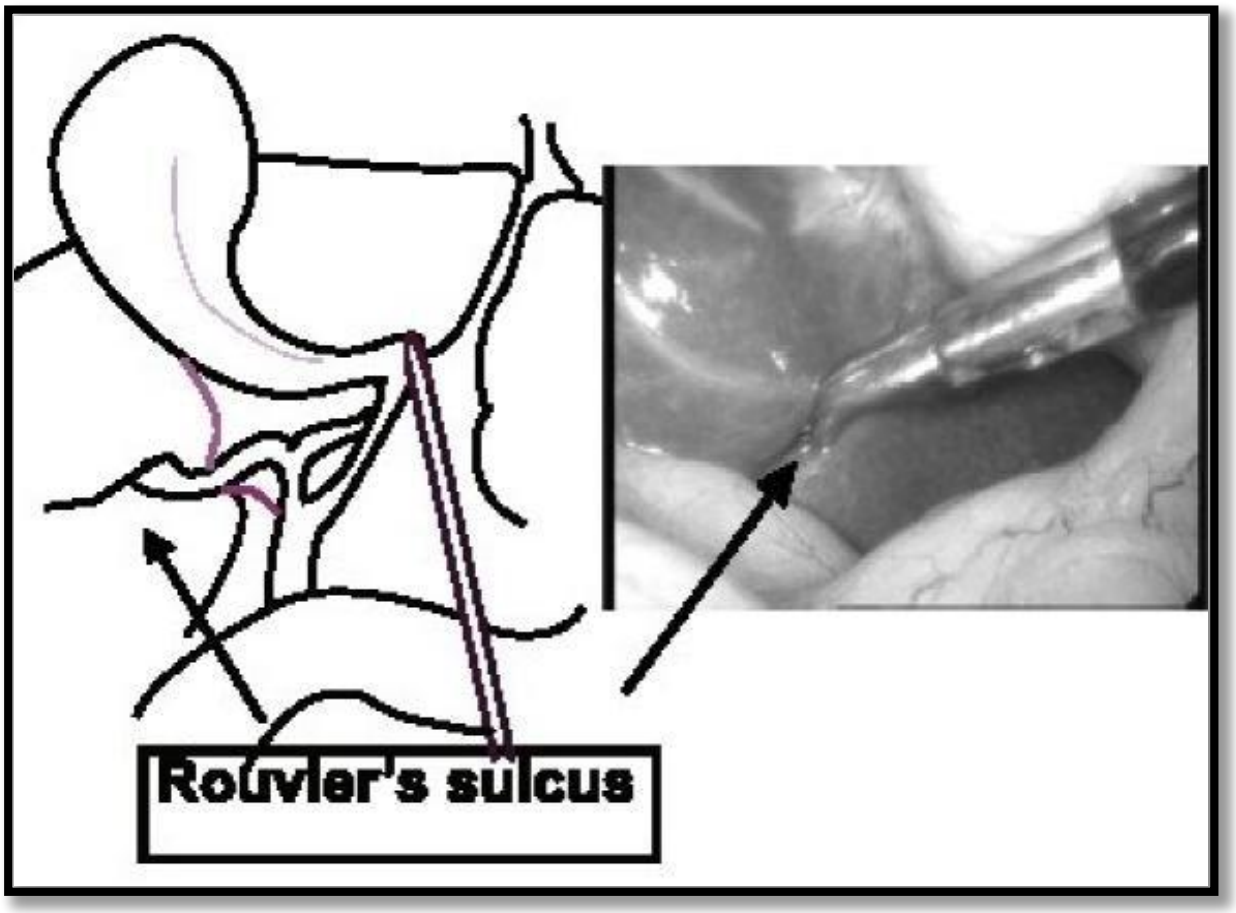

Figure 1: Relevant Anatomy


Figure 2a: Right Posterior Sectional Pedicle
Figure2b: Right Anterior Sectional Pedicle in the Rouviere's Sulcus.

Rouviere's Sulcus

The frequency of the Rouviere's Sulcus was 82%, open in 70% and the fused type was observed in 12% of Livers. But 18% of them had no Sulcus (i.e. just a faint line) .

Contents: The branches of the right posterior sectional pedicle were found in 70% and a branch of anterior sectional pedicle was dissected in 5%. Inside; 25% revealed the vein of segment 6. In 18%; there is inconstant cystic vein.

Surgical Relevance: Rouviere's Sulcus has been found by Hugh et al[8]in 78% of the liver during surgery. Normally, cystic duct and the cystic artery lay antero-superior to the Sulcus and common bile duct lays below the level of Sulcus. Hugh showed minimal common bile duct injury by beginning the dissection ventral to the Rouviere's Sulcus during laparoscopy.

The second technical reason for identifying the Sulcus is to perform safe right segmental liver resections. Fibrous sheath of Glisson encircles hepatic artery, portal vein, and bile duct at the hilum and continues as the liver capsule. Liver resection of segments 6 and 7 is feasible with no major difficulties because the Glissonian sheaths of these segments pedicles show early bifurcation near the hilar plate and their course may be apparent inside the sulcus.

Aims and Objectives

1. To use and experience Navigation Principles in Laparoscopic cholecystectomy.
2. To assess the use of safety techniques during laparoscopic cholecystectomy with principles and safety landmarks for avoiding Bile Duct Injuriesand other complications.

Material and Methods

A prospective study was conducted on 50 patients, who underwent laparoscopic cholecystectomy at our institutionin two year period. The study was conducted after approval from institutional thesis ethical committee and informed consent of the patients. All patients were well evaluated in terms of clinical, biochemical, haematological and ultrasonographic parameters.

Navigation system used in Laparoscopic Cholecystectomy

1) Started from a fixed point- Rouviere's Sulcus:(a) Well Defined (b) Just a faint line (c) Not Identifiable
2) We knew where were we all the time.
3) The clearing bearing – dissection was done in GB fossa without dividing any structures.

Surgery standard procedure/technique was applied

Patients were kept fasting overnight. The operative field prepared and draped. All patients received a dose of pre-operative prophylactic antibiotic. Four port technique for laparoscopic cholecystectomy was used. Two 10mm ports and two 5mm ports were used. 10mm ports in the umbilical and epigastric region. 5mm ports in the right hypochondrium and anterior axillary line (subcostal). Pneumoperitoneum was created by inserting Veress needle in the infraumbilical region. Once the pneumoperitoneum was created, a 10mm port was introduced and a telescope was put in. After the abdominal survey, rest of the ports were put under direct vision i.e. the 10mm port in the epigastric region, 5mm port in right hypochondrium, 5mm port in right anterior axillary line (subcostal). The patient was placed in Reverse Tredelenberg position (fowler's) position with the patients head up and tilted to left and the surgeon standing on the left side of the patient. Gall bladder was grasped from the fundus through a 5mm port and retracted. Rouviere's sulcus was identified and dissection of calot's triangle was done above the level of sulcus and critical view of safety was created. Cystic artery and duct were defined. Clipping of the cystic duct and artery was done separately using liga clips. Gall bladder was removed from a 10mm port (epigastric). Abdominal cavity was washed with normal saline to remove all the clots and spilled biliary contents if any. Complete hemostasis was achieved. All port sites were closed with non-absorbable suture. Drain was kept in liver bed for 2 days postoperatively and then removed. Patients were followed up after seven days for any postoperative complaints (nausea, vomiting, fever, bilious drain output alone, pain abdomen, peritonitis) and for stitch removal.

Results and Analysis

A total of fifty uncomplicated symptomatic and medically fit patients were taken for Laparoscopic Cholecystectomy. Age of presentation was predominantly in third decade of life (36%) with female predominance and a mean age of 38.72 years. Pain (98%), nausea and vomiting(70%) were the main complaints.

Our majority of patients (76%) had well defined Rouviere's Sulcus. In about 22% of patients, Rouviere's Sulcus was identified as ―just a faint line. And only a single patient presented with not identifiable Rouviere's Sulcus (patient had fatty infiltration of liver). 66% of total patients having well defined Sulcus underwent easy lap. chole while 32% underwent difficult. However, 45% of patients showing 'Just a faint line' underwent easy lap chole whereas 36% underwent difficult and 18% encountered with a very difficult lap chole.

Table 1: Incidence of Rouviere's Sulcus (At Operation)

Rouviere's Sulcus	No. of Patients	Percentage
A. Well defined	38	76%
B. Just a faint line	11	22%
C. Not identifiable	1	2%

There were only two intraoperative complications found. Bleeding episode in one patient and bile leak in another

Table 2: Intra Operative Complications

S.No.	Complications	No. of Patients (n=50)	Percentage
1	Bleeding	1	2%
2	Left over stones	Nil	0
3	Empyema	Nil	0
4	Bile leak	1	2%
5	Bile duct injury	Nil	Nil

Table 3: Post Operative Complications

S.No.	Complications	No. of Patients	Percentage
1.	Bleeding	00	00
2.	Pain	00	00
3.	Nausea and Vomiting	00	00
4.	Bilious drain output	1	2%
5.	Sign of peritonitis	00	00

There was only one postoperative complication observed in our study.

Ultrasonographically, 57% patients were considered in easy laparoscopic group with 33% in difficult and 10% in very difficult group.75% out of easy and 84% out of difficult patients had a

range of operating time between 31-60 mins. While 100% of very difficult took more than 60 mins.

Discussion and Conclusions

50 LC were done at the institution, where main emphasis was given on Rouviere's Sulcus. Rouviere's Sulcus was found to be a very important guiding landmark at time of LC and was present in almost all cases either open or fused type. Rouviere's Sulcus is a fissure between the right lobe and caudate process of liver and is clearly seen in laproscopy during posterior dissection, in majority of patients [Hugh TB et al 1997]. It corresponds to the level of the porta hepatis where the right pedicle enters the liver. Hence, it is always recommended that all dissections should be kept to a level above (or anterior) to the Sulcus [Hugh TB et al 1997] to avoid injury to the bile duct. This being an 'extrabiliary' reference point, it also does not get affected with any gall bladder pathology. The main reason of inadvertent transection of CBD during surgery is mistaking it for cystic duct.

Hartman's pouch is also often used as a landmark, as it is easily visualized and connects GB to cystic duct. Care, however, is taken in cases where it is distorted or abolished. Hence in our experience, it cannot be relied upon for safety; especially in difficult cases.

Rouviere's Sulcus is an anatomical landmark in almost all patients and indicates plane of CBD accurately, so dissection can be started safely by division of peritoneum immediately ventral to Sulcus. Identifying Rouviere's Sulcus at initial step strengthens confidence and helps in reducing the operative time with safety, especially to surgeon's in learning curve of laproscopy, than only we could reach to a zero Bile duct injury level in surgery.

There were only two minor intraoperative complications in our reported cases. None of the patients in present study was converted to open procedure, also didn't had any Bile Duct Injury.

Looking at all the prospectives, Rouviere's Sulcus identification should be made mandatory and more and more emphasis should be given to it, especially to less experience or surgeon in learning curve.

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