ORIGINAL ARTICLE

Rouviere's Sulcus as an Anatomical Landmark for Safe Laparoscopic Cholecystectomy

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Abstract:

Background: Laparoscopic cholecystectomy is associated with more biliary, vascular and visceral complications when compared with open cholecystectomy. This study was undertaken to assess the utility of Rouviere's Sulcus as an anatomical landmark for safe laparoscopic cholecystectomy with reference to: frequency of occurrence, anatomical description and relationship with level of difficulty in performing safe laparoscopic cholecystectomy. *Material and Methods:* It was a prospective study of 50 patients with symptomatic gall stone disease. The cases were grouped as easy, difficult and very difficult, as per pre-defined criteria. The study included 17 males and 33 females. Majority of patients (34%) were in the age group 21-30 years. Rouviere's Sulcus was identified in 49 patients. Type I Rouviere's Sulcus was the commonest (78%). *Results:* Out of the 49 cases, in which Rouviere's Sulcus was identified, 30 cases were identified in the 'easy' group and the relationship was statistically significant. The relationship between operating time and level of difficulty in performing laparoscopic cholecystectomy was statistically significant. Out of the 3 patients in whom complications (bleeding and bile spillage) were noted, two patients were in 'difficult' group. Rouviere`s Sulcus is an easily identifiable anatomical landmark for safe laparoscopic cholecystectomy, present as open or fused type. *Conclusion:* Evidence-based safety protocols using validated anatomical landmarks for safe dissection are the need of the hour to reduce the incidence of bile duct injuries after laparoscopic cholecystectomy.

Key words: Laparoscopy, Rouviere's Sulcus, Safe Cholecystectomy

Introduction:

Laparoscopic cholecystectomy has been readily accepted and adopted universally as the gold standard for treatment of symptomatic cholelithiasis [1, 2]. The knowledge of surgical anatomy is important for the safe execution of any surgical procedure. Laparoscopic cholecystectomy is associated with more biliary, vascular and visceral complications when compared with open cholecystectomy [3]. Occurrence of these complications even in the hands of experienced surgeons indicates underlying systemic predispositions to the injury, which warrant in-depth study. This study was undertaken to assess the utility of Rouviere's Sulcus as an anatomical landmark for safe laparoscopic cholecystectomy with reference to: frequency of occurrence, anatomical description and relationship with level of difficulty in performing safe laparoscopic cholecystectomy.

Material and Methods:

This was a prospective study of 50 patients with symptomatic gall stone disease, treated with laparoscopic cholecystectomy at a tertiary care centre. The study was done over a period of 15 months. The study was approved by Institute Ethics Committee. Written and informed consent was obtained from all patients before enrollment in the study. Detail clinical examination and investigations including liver function tests and abdominal sonography were done for all patients. All patients underwent laparoscopic cholecystectomy under general anaesthesia. The operative timing was noted from the first port site incision till the last port closure. The scoring system devised by Randhawa *et al.* [4] to predict the degree of difficulty in performing laparoscopic cholecystectomy was used and the cases were grouped as easy, difficult and very difficult.

All patients underwent laparoscopic cholecystectomy under general anesthesia. Rouviere's sulcus was identified (Fig. 1a and 1b). Evaluation of Rouviere's Sulcus as an anatomical landmark for safe laparoscopic cholecystectomy was done in terms of: Frequency of occurrence, anatomical description and relationship with level of difficulty in performing laparoscopic cholecystectomy. The relationship between occurrence of complications and level of difficulty in performing laparoscopic cholecystectomy was also noted. The results were analyzed using the Chi-square test.

Group	Description
Easy	Time taken <60 min, No bile spillage, No injury to duct, artery
Difficult	Time taken 60 to 120 min, Bile/stone spillage, Injury to duct, No conversion
Very difficult	Time taken >120 min, Conversion

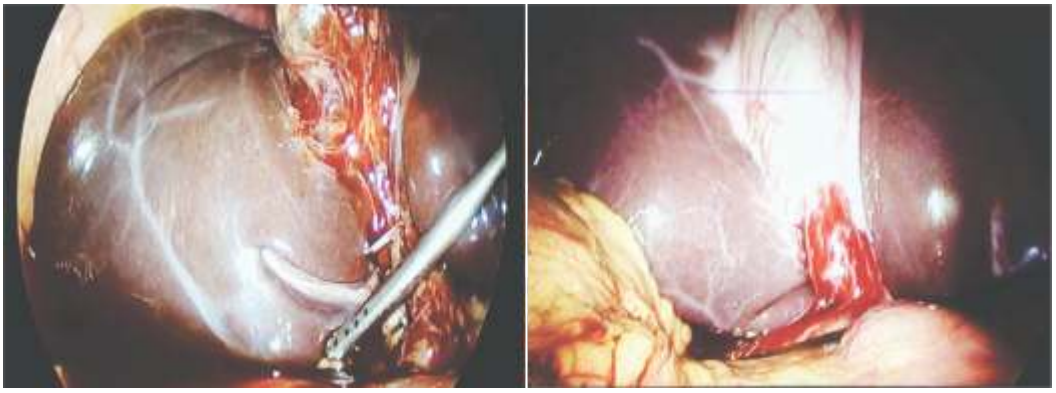

Fig. 1a and 1b: Rouviere's Sulcus

Results:

The study included 17 males and 33 females. The age of the youngest patient in the study was 22 years and that of the oldest patient was 68 years. Majority of patients (34%) were in the age group 21-30 years (Table 1). Rouviere's Sulcus was identified in 49 patients (Fig. 1). Type I Rouviere's Sulcus was the commonest (78%) (Fig. 2). Out of the 49 cases in which Rouviere's Sulcus was identified, 30 cases were identified in the 'easy' group and the relationship was statistically significant (Table 2). Out of the 3 patients in whom complications (bleeding and bile spillage) were noted, two patients were in 'difficult' group.

Table 1: Age and Gender Distribution

Age Group (Yrs.)	Male	Female	Total	Percent
21 – 30	4	13	**17**	**34**
31 – 40	3	7	**10**	**20**
49 – 50	4	2	**6**	**12**
51 – 60	3	7	**10**	**20**
> 60	3	4	**7**	**14**
Total	**17**	**33**	**50**	**100**

Chi square=17.347 with 6 degrees of freedom; P=0.008; statistically significant

Table 2: Relationship of Rouviere's Sulcus with Level of Difficulty in Performing Laparoscopic Cholecystectomy

Level of Difficulty	Rouviere's Sulcus				Total
	I	II	III	IV	
Easy	25	4	1	0	**30**
Difficult	12	3	1	1	**17**
Very Difficult	1	0	1	0	**2**
Total	**38**	**7**	**3**	**1**	**49**

Chi square=17.347 with 6 degrees of freedom; P=0.008; statistically significant

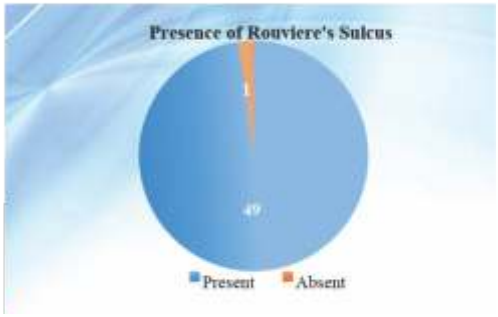

Fig. 1: Presence of Rouviere's Sulcus

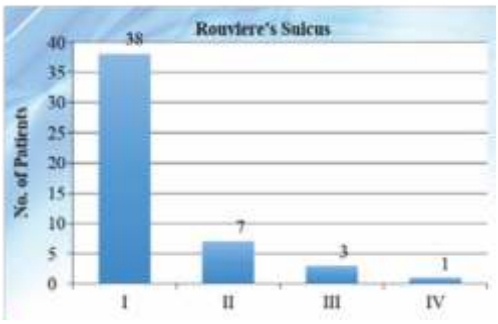

Fig. 2: Classification of Rouviere's Sulcus

Discussion:

Misinterpretation of normal anatomy as well as presence of anatomical variations, contribute to the occurrence of a significant rate of complications related to hepatobiliary surgical procedures, causing morbidity and mortality [4]. Rouviere's sulcus is also called as the incisura hepatica septa, or Gans incisura. It was initially described in 1924 by Henri Rouviere, a French anatomist [5]. He used it as a reference point to guide the commencement of safe liver dissection and named it "le sillon du processuscaude" [6]. It has been described in 80% of livers [7]. It is a 2 to 3 cm fissure on the liver between the right lobe and the caudate process, usually containing the right portal triad or its branches. The sulcus indicates the plane of the common bile duct accurately. The sulcus corresponds to the level of the porta hepatis where the right pedicle enters the liver. The plane of the bile duct is indicated accurately. The cystic duct and the cystic artery lie antero-superior to the sulcus, and the common bile duct lies below the level of the Rouviere's Sulcus [2, 5, 8]. Being an extra-biliary reference point, it does not get affected by distortion due to pathology [5]. Four types have been identified: I- Open right hepatic pedicle visualized and sulcus open throughout its length; II- Sulcus open only at its lateral end; III- Sulcus was open at its medial end; IV- Fused: Pedicle was not visualized [9].

Rouviere's Sulcus was identified in 49 patients (98%) in our study. Reynaud *et al.* [10] have reported Rouviere's Sulcus in 73% cases, Hugh *et al*. [2] in 78% patients and Zubair *et al*. [8] in 68% of their cases. Hugh [11] showed minimal common bile duct injury during laparoscopic cholecystectomy by beginning the dissection

Table 3: Findings of Rouviere's Sulcus in various studies

Rouviere's Sulcus	Our study	Thapa *et al.* (9)	Zubair *et al.* (8)
Identified in	98%	75%	68%
Type – I	78%	54%	44%
Type – II	14%	12%	-
Type – III	6%	9%	-
Type – IV	2%	25%	56%

ventral to the Rouviere's Sulcus. Thapa *et al*. [9] have mentioned Type I as the commonest (54%) in their study. Our study also had the Type I Rouviere's Sulcus as the commonest type (78%) (Table 3).

Peti and Moser [5] have also described a case where identification of the Sulcus helped prevent a common bile duct injury. Shinde and Pandit [12] have described a novel approach for dealing with a frozen Calot's triangle, by consistent identification of a series of anatomical landmarks including Rouviere's Sulcus, creation of a retro-gallbladder tunnel, and encircling of the gallbladder with gauze. In our study, the relationship of identification of Rouviere's Sulcus with ease of performing laparoscopic cholecystectomy was statistically significant.

Conclusion:

Rouviere`s Sulcus is an easily identifiable anatomical landmark for safe laparoscopic cholecystectomy, present as open or fused type. Evidence-based safety protocols using validated anatomical landmarks for safe dissection are the need of the hour to reduce the incidence of bile duct injuries after laparoscopic cholecystectomy. Based on the type of Sulcus, one could foresee possibility of complications or prolonged operating time.

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