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Original Research Article

A CADAVERIC STUDY ON ROUVIERE' S SULCUS – MORPHOLOGY & MORPHOMETRIC STUDY

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Abstract

Background: The liver is the largest abdominal viscera, divided into right, left, caudate & quadrate lobes by peritoneal and ligamentous attachments. Rouviere's sulcus (RS) is present in the posterior surface of the liver and acts as an anatomical landmark for safe liver dissection and a surgical landmark for Laparoscopy cholecystectomy. Knowledge about surgical anatomy is important for the safe execution of any surgical procedure. The study aims to enumerate the presence or absence of sulcus, types of the sulcus (Type 1, Type 2 & Type 3) & morphometric measurement of Rouvier's sulcus (Length & Breadth). **Materials and Methods:** An observational study was conducted with 52 macroscopically healthy and undamaged liver specimens removed during routine dissection from both sexes while teaching undergraduate medical students. The specimens were washed, dried, numbered, and stored in formalin-filled containers. They were examined for the presence or absence of RS and the type of sulcus if present. **Result:** Rouviere's sulcus (RS) was found in 47 specimens, classified as Type 1, 2, and 3. Type 1 RS was found in 30 specimens, Type 2 RS in 8 specimens, Type 3 in 9 specimens, Type 1A sulcus in 26 specimens, and Type 1B in 4 specimens. RS was absent in 5 specimens, and the average length and breadth of the sulcus were 2.6 cm and 0.3 cm, respectively. **Conclusion:** RS is a landmark for identifying and isolating the CBD in laparoscopic cholecystectomy surgeries, reducing iatrogenic damage to the biliary duct. It is also useful for hepatic resection.

INTRODUCTION

Knowledge about surgical anatomy is extremely important for performing any surgical procedures safely. Much research has been done to identify ways and ideas to avoid complications during surgical procedures. Laparoscopic cholecystectomy is one such common surgical procedure done as a routine nowadays. Prof. Dr Einch Muche of Germany performed the first laparoscopic cholecystectomy in 1985. An important complication during this procedure is injury to the bile duct & hepatic arteries. Identifying Rouviere's sulcus, which acts as a guide to identify common bile ducts in Laparoscopic cholecystectomy procedures, helped avoid complications.

Rouviere's sulcus (RS) was initially described in1924 by a French surgeon, M.H. Rouviere, who noted a fissure on the posterior surface of the liver, running transversely from the caudate process to the right lobe (Rouviere (1924),[1] Dahmane et al,[2] (2013)), the floor of which contained the branches of the right hepatic artery, right portal vein and right hepatic bile duct. RS lies in the plane of the common bile duct (CBD) and is an important anatomical landmark to guide surgeons in hepatobiliary procedures, particularly cholecystectomy (Hugh et al.3 (1997), Dahmane et al (2013).[2] Hence, a detailed examination of the Morphology & Morphometry of Rouviere's sulcus is undertaken in the present study.

MATERIALS AND METHODS

An observational study was conducted in the Department of Anatomy with 52 macroscopically healthy and undamaged liver specimens removed during routine dissection from both sexes while teaching undergraduate medical students.

Exclusion criteria

Lobectomy livers, Macroscopic pathological liver changes like nodules, cysts and cirrhotic (shrunken) liver were excluded.

After removing the specimen from the abdominal cavity, the specimen was washed by running tape water to clean all specimen surfaces. Then

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specimens were allowed to dry to handle them specimens easily. All the specimens were numbered and stored in separate formalin-filled containers. The right and left lobes and all surfaces of each specimen were examined for the presence or absence of RS, and the sulcus type was studied if present.

RS is classified as Type 1, 2 and 3 based on the degree of depth into the right lobe of liver tissue. The Type 1 sulcus is defined as a deep sulcus. The Type 1 sulcus is further subdivided into 1A and 1B. Type 1A is described when the sulcus is open at its medial end and continuous with the hilum of the liver. Type 1B is described when the sulcus is closed on the medial end due to the fusion of liver parenchyma at that point. Type 2 RS was defined as a slit-like, superficial, narrow sulcus. Type 3 is described as a white line scar. The length & breadth of the sulcus of each specimen were measured by using a digital vernier calibre. All the measurements were entered in a separate table, and the average was taken for the length and breadth of the sulcus.

RESULTS

In the present study, Rouviere's sulcus was present in 47 specimens [Table 1].

Table 1: Presence & absence of sulcus

Presence & absence of sulcus		
Type of sulcus	**No of specimens**	**Percentage**
1	30	64%
2	8	17%
3	9	19%
Absent	5	10%

Table 2: Parameters of RS

Parameter	Average (cm)	Maximum (cm)	Minimum (cm)
Length	2.6	5.2	1.3
Breadth	0.2	0.5	0.1

Table 3: Morphometry and Morphology of RS Comparison

Author (year)	Method of Study	Sample Size	Length Mean (cm)	Breadth Mean (cm)
Dahmane et al,[2] (2013)	Cadaveric	40	2.8	-
Lazarus et al,[5] (2018)	Cadaveric	75	3.16	0.16
Deepali D Deshatty et al,[6] (2020)	Cadaveric	50	3.5	0.14
The present study (2022)	Cadaveric	52	2.6	0.2
	Sample size	Type of RS (%)		
		Type 1	Type 2	Type 3
Dahmane et al,[2] (2013)	40	70	0	12
Lazarus et al,[5] (2018)	75	50.67	25.33	6.67
Deepali d. Deshatty et al,[6] (2020)	50	58	8	6
The present study (2022)	52	64	17	19

Figure 1: Absent Rouviere's sulcus

RS is classified as Type 1, 2 and 3 based on the degree of depth into the right lobe of liver tissue. The type 1 sulcus is further subdivided into 1A and 1B. In this study, Type 1RS was found in 30 specimens (Type 1 defined as a deep sulcus), Type 2 RS in 8 specimens (Type 2 RS was defined as a slit-like, superficial, narrow sulcus.) and Type 3 in 9 specimens (Type 3 is described as a Whiteline scar). Further, Type 1A sulcus was present in 26 specimens (Type 1A is described when the sulcus is open at its medial end and continuous with the hilum of the liver) and Type 1B sulcus in 4 specimens (Type 1B is described when the sulcus is closed on the medial end due to the fusion of liver parenchyma at that point). RS was absent in 5 specimens. The average length and breadth of the sulcus were 2.6 cm & 0.3 cm, respectively [Table 2].

Figure 2: Type IA Rouviere's sulcus (open at its medial end and continuous with the hilum of the liver)

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Figure 3: Type IB Rouviere's sulcus (closed on the medial end)

Figure 4: Type II Rouviere's sulcus

DISCUSSION

Identifying RS and keeping the dissection ventral to it is a successful method in preventing injury to the bile duct during Laparoscopic cholecystectomy surgeries.

Morphometry of RS

The present study's mean length and breadth of RS are 2.6 cm and 0.2 cm. The mean length is similar to that of Dahmane et al studies (2013).[2] But when the same is compared with Lazarus et al (2018) and Deepali D. Deshatty et al (2020) studies, it was found to be lower in range [Table 3].[3-6] The mean breadth (0.2 cm) is comparatively higher than Dahmane et al (2013),[2] Lazarus et al (2018) and Deepali D. Deshatty et al (2020) studies.[5,6]

Morphology of RS

In the present study, Singh et al. classification was followed for the classification of RS. In this classification, RS is described as three types, namely Type 1 (Deep sulcus), Type 2 (Slit-like) and Type 3 (Scar-like). Type 1 sulcus is further subdivided into Type 1A (open at its medial end and continuous with the hilum of the liver) and Type 1B (closed on the medial end).

In this study, the Type 1 sulcus is reported as open in entire length, partially open and as a cleft. The Type 1A sulcus was most commonly seen in this study which is comparatively lower than in Dahmane et al studies (2013).[2] But it is in higher percentage when compared with Lazarus et al (2018) and Deepali D. Deshatty et al (2020) studies.[5,6]

Type 2 RS and Type 3 RS are significantly higher when compared with all the above studies. In 10% of specimens, RS was absent. But Singh et al (2017) reported 100% of RS was recorded during laparoscopic cholecystectomy surgeries.[8-10]

CONCLUSION

This study was done to give comprehensive details about RS. The identification of RS can help the surgeons to reach the Gall bladder without damaging the common bile duct during laparoscopic cholecystectomy surgeries because RS is present in the plane of the common bile duct. This sulcus is a landmark for identifying and isolating the CBD, thereby reducing iatrogenic damage to the biliary duct. The identification of RS is also useful for hepatic resection.

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