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Original Research Article

Significance of Rouviere's Sulcus in Hepatobiliary Surgery: A Cadaveric study

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ABSTRACT

Background: Rouviere's sulcus(RS) was first identified in 1924 by Henri Rouviere. It lies oblique to the anterior and inferior border of the liver and holds the right portal pedicle**.**

Material and Methods: The study was conducted in the Department of Anatomy of a Medical College in Maharashtra, India, on 45 cadaveric livers. The morphological observations made were: presence/ absence RS;direction of RS (oblique/ horizontal/ vertical);sulcus type(deep/ slit/ scar); length, width and depth;presence of right hepatic pedicle; distance of the hepatic vessels from edge of the sulcus .

Results: 40livers showed the presence of Rouviere's Sulcus. It was absent in five specimens. Direction was horizontal in 40%, oblique in 57.5% and vertical in 2.5% .26 livers showed a deep type of sulcus, 12 showed the slit type and 2 showed scar type .29 livers showed the right hepatic pedicle entering the RS. Average length, depth, of the RS was 2.35 cm and1.07 cmrespectively. The average width was 0.32cm at medial end, 0.22cm at midpoint and 0.1cm at lateral end. Present study has added the details of depth of vessels from the edge of RS, which was not recorded in earlier studies. Depth of vessels from the edge of the sulcus was average 5mm (0.5cm) for the right branch of the hepatic artery and was 12mm (1.2cm) for the right branch of portal vein.

Conclusion: Rouviere's sulcus is a reference landmark for surgeons during laparoscopic surgeries on gall bladder and during hepatic resection to avoid injuries. This study wishes to provide detailed morphological data of the Rouviere's Sulcus to hepatobiliary surgeons including depth of hepatic vessels in the RS as an added parameter to aid them in their surgical endeavor.

KEYWORDS: Rouviere's sulcus, Anatomical Landmark, Morphology,Depth, Hepatobiliary Surgery.

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INTRODUCTION

Rouviere's sulcus or the incisura hepatica dextra or Gans incisura identifiedfirst in 1924 by Henri Rouviere, a French anatomist[1]. He used it as a reference point for safe liver dissection.Rouviere's sulcus is a sulcus

extending to the right of the porta hepatis, anterior to caudate lobe, lying oblique to the anterior and inferior border of the liver and holds the right portal pedicle.A once little known landmark Rouviere's Sulcus (RS) has now become a common reference point for surgeons during laparoscopic surgeries of gall bladder and also during hepatic resection[2]. Laparoscopic cholecystectomy, a minimally invasive surgical procedure is the preferred surgical treatment of gall stones nowadays.

Previously done studies by various authors have given data regarding the presence or absence(incidence) of RS.Reynaud et alnoted the presence of RS in 73% of livers[3]. Hugh et alin 78% of livers [4]and Dahmane et alin 82% of normal livers[5].Hugh *et al*were the first to draw attention to its importance during laparoscopic cholecystectomy[6] because it accurately indicated the plane of the common bile duct, stressing that the sulcus be used as the first landmark, ventral to which the dissection should begin during laparoscopic cholecystectomy to ensure fewer common bile duct injuries. Zubair *et al* described type of the sulcus as open and closed types[7] depending on whether the right hepatic pedicle was visible in the sulcus or not. Dahmane *et al* gave details regarding thedimensions of the sulcus such as its length and breadth, and what was contained in the floor of the sulcus- the right hepatic pedicle[5].

The present study was carried out to get detailed morphology of the Rouviere's Sulcus, the contents of the sulcus, and the depth of the vessels in the sulcus keeping in mind the importance of the sulcus as an anatomical landmark to reduce complications during hepatic surgery and laparoscopic cholecystectomy.

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy of Dr D.Y. Patil Medical College Hospital and Research Centre Pimpri, Pune, Maharashtra, India, on forty-five formalin embalmed adult cadaveric livers. The following morphological observations and measurements were made

· Presence or absence of RS

· Direction of RS whether it was oblique or horizontal or vertical

· Whether it was a deep sulcus or a slit or a scar

· Its length, width, depth

· Presence of right hepatic pedicle

· Distance of the hepatic vessels from edge of the sulcus

All measurements were carried out using a combination of vernier calipers, metric scale and silk thread.

OBSERVATIONS AND RESULTS:

Presence of RS: Out of the forty-five formalin embalmed cadaveric livers dissected, forty livers showed the presence of RS (incidence 88.88%). RS was absent in five specimens. (Table no 1)

Direction of RS: In the present study the Horizontal direction of RS was seen in 16 specimens (40%), 23 showed oblique direction of RS (57.5%) and one showed a vertical RS (2.5%).(Table no 2)

Type of sulcus: The RS was classified into sulcus, slit or scar variety according to if it was a deep cleft or a narrow gap or only a white scar. The deep sulcus was further identified into two varieties one with medial end of sulcus open or the one with medial end closed. In the present study 26 livers showed a deep sulcus (65%)(Fig no. 1) out of which 22 were open at the medial end near the porta hepatis and in them the right portal pedicle was clearly visible; 4 of the livers showing deep sulcus were open at the lateral end ,the medial end was fused(fig no. 2).12 livers showed the slit type of RS (30%)(fig no. 3) and 2 livers showed scar type of sulcus(5%).(Table no 1,3))

Measurements of RS: In the present study the average length of the RS was 2.35 cm, the longest being 4.2 cm. The average breadth/width of RS was 0.32cm at medial end, 0.22cm at midpoint and 0.1cm at lateral end. Average depth of sulcus was 1.07 cm, the deepest being 1.9cm. (Table no 2)

5. The right hepatic pedicle was seen entering the RS in 29 livers (72.5%)(fig no. 4)

6. **Depth** of vessels from the edge of the

sulcus was average 0.5cm for the right branch of the hepatic artery and was 1.2cm for the right branch of portal vein. (Fig no.5)

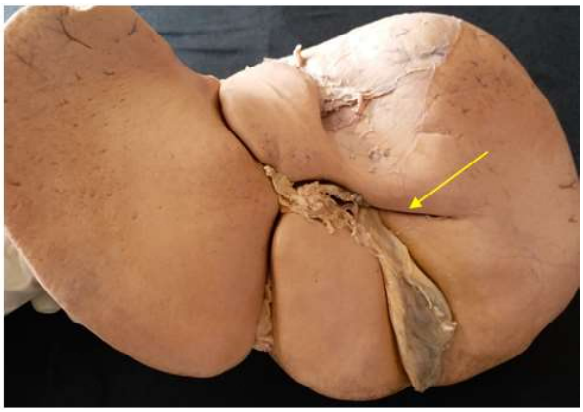

Fig. 1: Deep sulcus type of Rouviere's Sulcus.

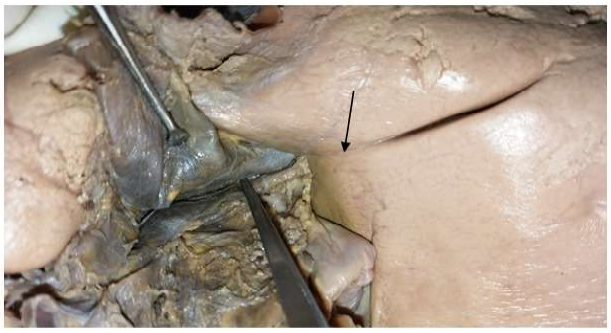

Fig. 2: Deep Rouviere's Sulcus with closed medial end.

Fig. 3: Slit type of Rouviere's Sulcus.

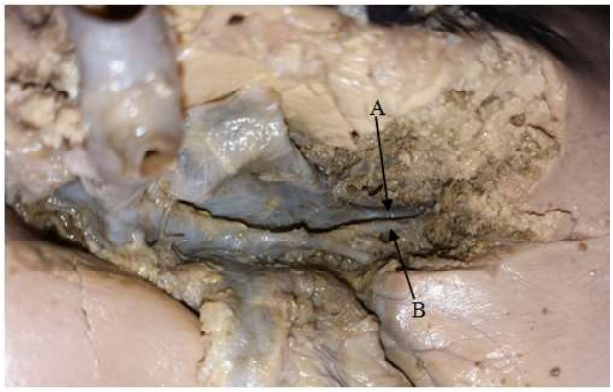

Fig. 4: Right portal pedicle at the floor of the RS.(A Branch of Portal vein B Branch of Hepatic artery).

Fig. 5: Measurement of Depth of vessels from edge of RS.

DISCUSSION

During laparoscopic Cholecystectomy Rouviere's sulcus is clearly visible and is used as an anatomical landmark. The importance of identifying Rouviere's sulcus lies in the fact that the cystic duct and the cystic artery lie anterosuperior to the sulcus, in conformation with the Calot's triangle. Using Rouviere's sulcus as a landmark to start the dissection of the Calot's triangle during laproscopic cholecystectomy ensures fewer bile duct injuries [8].Hugh et al. in their study, documented that there was a decrease in biliary tract injuries during laparoscopic cholecystectomy if dissection begins anterosuperior to Rouviere's sulcus [6].The incidence of bile duct injury in laparoscopic cholecystectomy is 0.3% in the study by Kim et al[9].

The presence of Rouvière's sulcus (RS) in various studies was found to be 52% by Rouviere[1],80% by [2], 78% by Hugh[4,6], 68.13% by Zubair [7], 82% by Dahmane [5], 75% by Kim [9], 90% by Arora et al [8], 100% by Singh[10], 82.67% by Lazarus [11] and 97% by Elwan [12]respectively. In the present study RS was found in 88.88% of specimens comparable to the findings of Arora et al. (Table 1.)

The RS was further classified as per the guidelines by Zubair et al into sulcus, slit or scar variety [7]. The deep sulcus was further classified into two varieties one with medial end of sulcus open or the one with medial end closed. In the present study 26 livers showed a deep sulcus (65%) out of which 22 were open at the medial end near the porta hepatis and in them the right portal pedicle was clearly visible; 4 of the livers showing deep sulcus were open at the lateral end and fused medially.12 livers

Table 1: Rouviere's Sulcus: Incidence and Morphology in various studies.

Authors	Year	Incidence %	Type of study:	Type of RS (%)		
			Cadaveric/Operative	Deep sulcus	Slit	Scar
Rouviere [1]	1924	52				
Ganz [2]	1955	80				
Reynaud et al [3]	1991	73				
Hugh et al [4,6]	1997	78	Operative			
Dahmane et al [5]	2013	82	Fresh autopsied	70		12
Zubair et al [7]	2009	68.13	Operative	30		38
Thapa et al[13]	2015	75	Operative			
Kim et al [9]	2016	75	Operative	62	12	0
Arora et al [8]	2016	90	Operative			
Singh & Prasad[10]	2017	100	Operative	71	23	6
Lazarus et al [11]	2017	82.67	Cadaveric	50.67	25.33	6.67
Al Nazer [14]	2018	79.3	Operative			
Elwan [12]	2020	97.7	Operative			
Present Study	**2021**	**88.88**	**Cadaveric**	**65**	**30**	**5**

showed the slit type of RS (30%).2 livers showed scar type of sulcus (5%).(Table 1).

Studies done by Dahmane[5], Singh[10] , Lazarus[11], have observed the direction of RS to be mostly horizontal, curved and rarely vertical. In the present study 16 livers showed horizontal RS (40%) comparable to the work done by Lazarus[11], 23 showed oblique direction of RS (57.5%) and one showed a vertical RS (2.5%) comparable to the work done by Singh[10].Table no 2.

The detailed measurements of the length and depth of the RS are available in the studies of Dahmane(fresh autopsied) [5]Singh (per operative) [10]and Lazarus(cadaveric) [11]. In the present study the average length of the RS was 2.35 cm, the longest being 4.2 cm which is comparable to the study of Dahmane et al[5]. Average depth of sulcus was 1.07 cm, is comparable to the study of Singh [10],the deepest being 1.9cm. The average width of RS was 0.32cm at medial end, 0.22cm at midpoint and 0.1cm at lateral end. These measurements are slightly different from the measurements of Singh [10] and Lazarus[11]the only two available studies for comparison. (Table no 2)

Table 2: Rouviere's Sulcus: Direction and Measurements in different studies.

Authors	Direction of RS %			Average Length	Average Depth (cm)	Average Width (cm)
	Horizontal	Oblique/ Curved	Vertical			
Dahmane et al[5]	3	97	0	2.8	0.6	-
Singh and Prasad[10]	70	31	2	2.03	0.96	0.97
Lazarus [11]	41.33	41.33	0	3.16	0.78	0.16
Present study	**40**	**57.5**	**2.5**	**2.35**	**1.07**	**0.32**

Table 3: Comparison of Deep Sulcus subtypes.

Authors	Deep sulcus (Incidence%)	
	Open type	Closed type
Lazarus [11]	33/75 (44%)	5/75 (6.67%)
Singh & Prasad[10]	60 (84.5%)	11 (15.5%)
Present study	22 (84.6%)	4 (15.3%)

Singh et al in their study found hepatic vessels in 75% of deep open type sulcus and in 9% in deep closed type sulcus.The present study showed the hepatic and portal vessels entering in the RS in 29 livers (72.5%). (Table no 3)

Present study has added the details of depth of vessels from the edge of RS, which was not recorded in earlier studies. Depth of vessels from the edge of the sulcus was average 5mm (0.5cm) for the right branch of the hepatic artery and was 12mm (1.2cm) for the right branch of portal vein. There are no studies available for the comparison of these measurements.

CONCLUSION

As already known the Rouviere's sulcus is now a reference point for surgeons during

laparoscopic surgeries on gall bladder and during hepatic resection. It is used as the first landmark from where the dissection should begin during laparoscopic cholecystectomy to avoid common bile duct injuries. This study wishes to provide detailed morphological data of the Rouviere's Sulcus to hepatobiliary surgeons including depth of hepatic vessels in the RS as an added parameter to aid them in their surgical endeavor.

Conflicts of Interests: None

REFERENCES

[1]. RouvierH.Sur la configuration et la signification du sillon du processuscaude.Bulletins et memoires de la societeanatomique de paris.1924;94:355-358.
[2]. Gans H (1955) Introduction to Hepatic Surgery. Introduction to Hepatic Surgery. Elsevier, Netherlands, pp 50–53
[3]. Reynaud BH, Coucoravas GO, Giuly JA (1991) Basis to improve several hepatectomy techniques involving the surgical anatomy of incisura dextra of Gans. Surg GynecolObstet 172:490–492
[4]. Hugh TB, Kelly MD, Mekisic A (1997) Rouvière's sulcus: a useful landmark in laparoscopic cholecystectomy. Br J Surg 84:1253–1254
[5]. Dahmane et al. Anatomy and Surgical Relevance of Rouviere's Sulcus. The ScientificWorld Journal.2013; Volume 2013, Article ID 254287, 4 pages.
[6]. Hugh TB. New Strategies to prevent laparoscopic bile duct injury: surgeons can learn from pilots. Surgery 2002;132(5):826-35.
[7]. Zubair et al. Rouviere's Sulcus: a guide to safe dissection in laparoscopic cholecystectomy. Pakistan journal of Surgery.2009;25(2):119-121.
[8]. Arora and Ranga. Rouviere's Sulcus as Landmark during Laparoscopic Cholecystectomy. Global Journal for Research Analysis.2016;5(3):448-50
[9]. Kim et al. Clinical Significance of Rouviere Sulcus during Laparoscopic Cholecystectomy. HPB. 2016;18 (S1):e 515-e516.
[10]. Mohinder Singh and Neeraj Prasad . The anatomy of Rouviere's sulcus as seen during laparoscopic cholecystectomy: A proposed classification. J Minim Access Surg. 2017; 13(2): 89–95.
[11]. Lazarus et al. Anatomical parameters of the Rouviere's sulcus for laparoscopic cholecystectomy. Eur. J. Anat. 2018.22 (5): 389-395
[12]. Elwan.Critical view of safety and Rouviere's sulcus: extrahepatic biliary landmarks as a guide to safe laparoscopic cholecystectomy .The Scientific Journal of Al-Azhar Medical Faculty, Girls. 2019;3 (2):297-301.
[13]. Thapa PB, Maharjan DK, Tamang TY, Shrestha SK (2015) Visualisation of Rouviere's sulcus during laparoscopic cholecystectomy. JNMA J Nepal Med Assoc 53:188–191
[14]. AlNaser.Rouviere's Sulcus: A Useful Anatomical Landmark for Safe Laparoscopic Cholecystectomy. International Journal of Medical Research & Health Sciences.2018;7(1):158-161

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