IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 12 Ser. 6 (December. 2024), PP 46-50
www.iosrjournals.org

Rouvier's Sulcus-Aspects Of Incorporating This Valuable Sign In Safe Laparoscopic Cholecystectomy An Observational Study

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Date of Submission: 15-12-2024 Date of Acceptance: 25-12-2024

I. Introduction

- Laparoscopic cholecystectomy was first performed by the Professor Erich Muhe of Germany, on September 12, 1985.[1]
- It is the most common procedures done by surgical residents for cholelithiasis cases.[2]
- Most dreadful complications of this procedure is bile duct injury and injury to hepatic artery.[3]
- These complications requires further major surgery, and usually occurs due to a failure to recognize the critical structures in Calot's triangle
- Critical view of safety is the widely recommended method to avoid bile duct injury in this procedure[4]
- If there are dense adhesions in the Calot's triangle, it is almost impossible to achieve critical view of safety.
- Apart from the critical view of safety, the usage of some additional extra biliary reference point for the identification of common bile duct (CBD) should be used sometimes because it may remain unaffected even in the inflammatory conditions of the gallbladder.

II. Rouviere's Sulcus

- Rouviere's sulcus is a 2–5 cm fissure on the liver between the right lobe and caudate process.(white arrow)
- Importance of Rouviere's sulcus is that cystic duct and artery lies anterosuperior to the sulcus and CBD lies below the sulcus.
- Rouviere's sulcus can serve as an important anatomical landmark to avoid bile duct injuries.[5]

III. Aims And Objectives

A. To identify Rouviere's sulcus as extra biliary reference point in safe laparoscopic cholecystectomy.
B. Rouviere's sulcus as one of the additional reference point to achieve "Critical view of safety"

IV. Materials And Methods

- This was a observational study done in the Victoria hospital from August 2022 to October 2022 in elective General surgery operation theatres.
- Total of 60 patients >18 years , who were willing to give consents and posted for laparoscopic cholecystectomy are included in the study.
- Acute cholecystitis, bleeding disorders, hepatomegaly, portal hypertension, liver cirrhosis, viral hepatitis , presence of adhesions , congenital anomalies of cystic duct and patients who were not willing to give consents were excluded from the study.

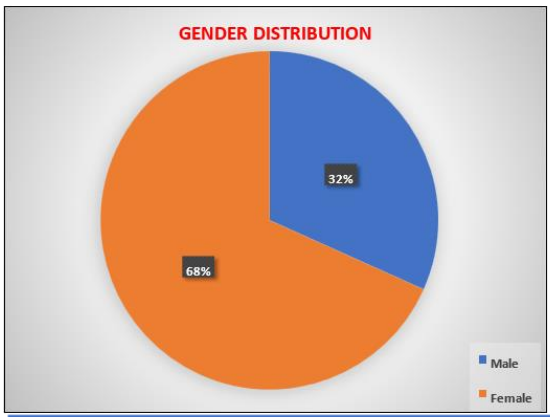
Sample Size

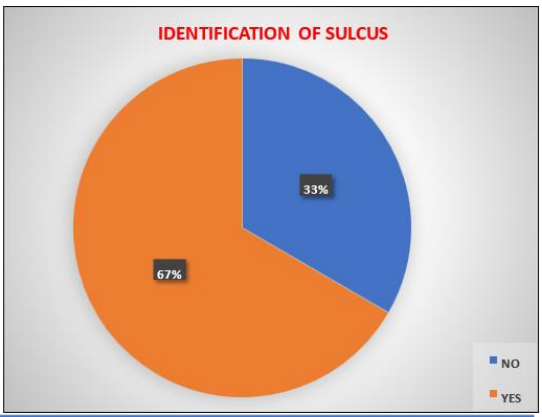
- Based on the the previous study conducted by **Kumar Jha** et al, by considering the proportion of cases where Rouviere's sulcus was identified, the sample size is calculated as follows.
- Proportion of cases where Rouviere's sulcus was identified (P) = 63.63 • Relative precision = 20% of PZ^2pq
- Substituting to sample size formula $n = \frac{\quad}{\quad}{}_2d$
- Sample size is 54.92 and rounded off to **60.**

Statistical Analysis

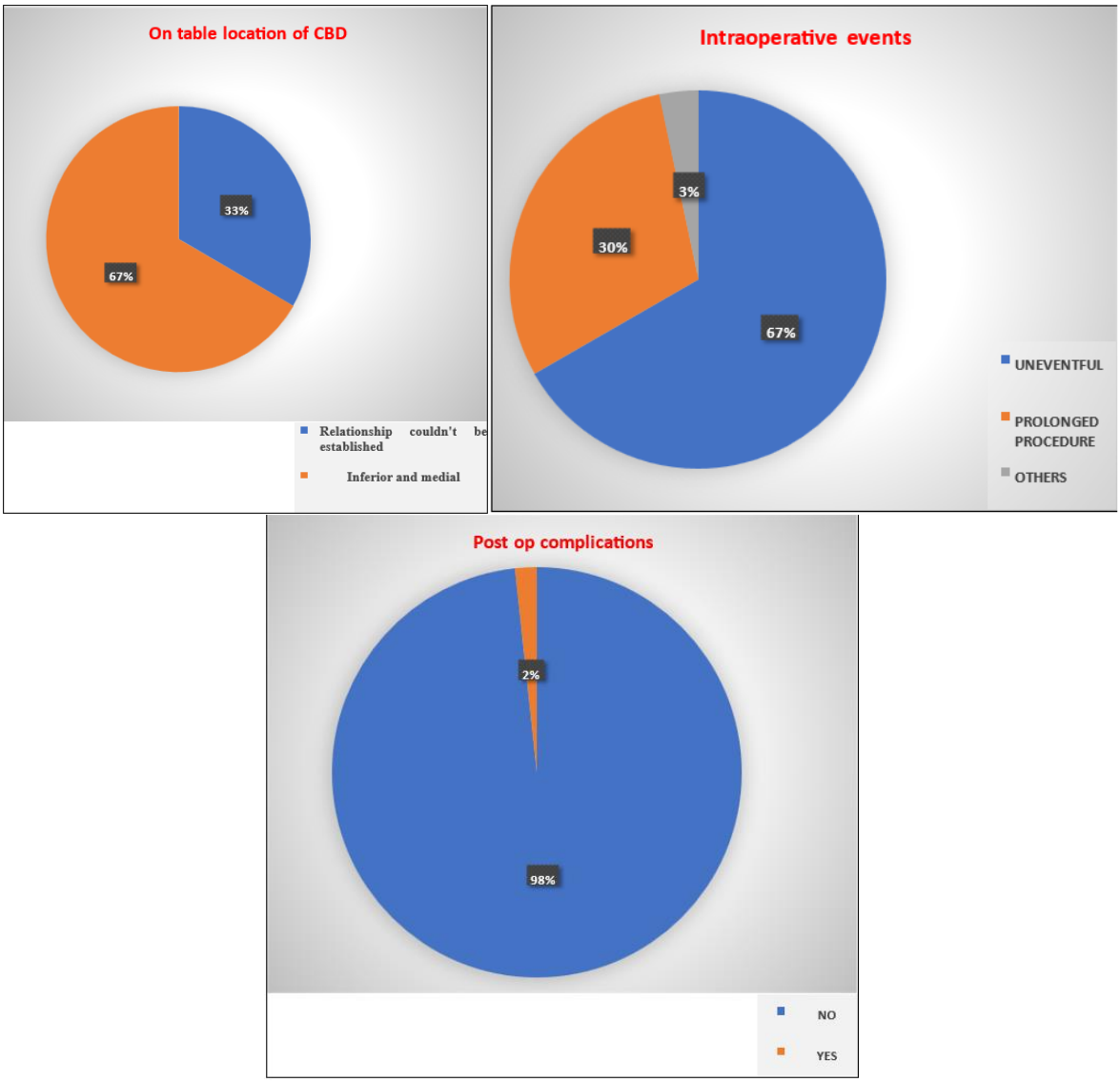
- The collected data was analysed using IBM SPSS software ver.20.0
- Kolmogorov-Srimonov test was used to check the normality of the data.
- Continuous variables are expressed in terms of MEAN $\pm$ SD.
- Categorical variables are expressed in frequency (n) and percentage (%)
- Independent t test was used to determine the significance between 2 groups.
- $P < 0.05$ was considered as statistically significant*
- $P > 0.05$ was considered as statistically insignificant
- There are 60 participants in this study (n=60)

V. Results





MEAN AGE				
N	Minimum	Maximum	Mean	Std. Deviation
60	20	75	42.27	13.207



- On table cystic artery injury with bleeding and conversion into open cholecystectomy
- On table CBD injury
- In both these cases ROUVIERE'S SULCUS was not visualised

Independent T Test Statistics

Mean operation time between sulcus identified and not identified patients

ON TABLE ROUVIERE'S SULCUS IDENTIFICATION	N	MEAN	STANDARD DEVIATION	STANDARD ERROR MEAN	'P' VALUE
YES	40	50.70	3.098	.490	<0.0001*
NO	20	56.54	1.877	.420	

* There was significant difference in the Mean operation time between 2 groups.

Independent T Test Statistics
To achieve Critical view of safety between sulcus identified group and not identified group

ON TABLE ROUVIERE'S SULCUS IDENTIFICATION	N	MEAN	STANDARD DEVIATION	STANDARD ERROR MEAN	'P' VALUE
YES	40	24.65	2.167	0.343	0.0001*
NO	20	28.25	0.910	0.204	

* There was significant difference in the time to achieve view of safety between 2 groups

VI. Discussion

- In our study, the age of presentation of cholelithiasis was predominantly in the fourth decade of life.
- Our data are in accordance with the studies of Ashesh Kumar Jha et al[6] . Most of the patients with cholelithiasis were found to be of female gender. Rosen and Broody[7] also found female preponderance in cases of cholelithiasis in their studies.
- In our study, Rouviere's sulcus was identified in 67% of patients and not identified in 33% of patients. CBD lies inferior and medial to the sulcus in 67% of patients and relationship couldn't be established in 33% of patients.
- Zubir *et al*. in their study of 160 patients could visualize Rouviere's sulcus in 109 (68.13%) patients during laparoscopic cholecystectomy[8]. Hugh *et al*.,out of 402 cases of laparoscopic cholecystectomy, Rouviere's sulcus was present in 319 (79.3%)9
- Training in a laparoscopic surgery should be adequate, delineation of anatomy in Calot's triangle following the principles of critical view, careful use of electrocautery, avoiding the blind application of clips, and cautery in Calot's triangle are the measures to avoid a bile duct injury[10]
- One of the cause for injury of CBD is due to mistaking CBD as the cystic duct.

So it is necessary for meticulous inspection of the area.

- So it is better to identify CBD by using some extrahepatic reference point and then proceeding with the calots's triangle dissection.
- Some other landmarks including cystic lymph node and gallbladder neck have also been advocated for identifying the cystic duct and safe dissection.
- During laparoscopy, the Rouviere's sulcus can be exposed after retracting the fundus of the gallbladder and its relation to the nearby structure can also be noted
- Rouviere's sulcus corresponds to the level of portal-hepatis where the right pedicle enters the liver, and hence, it has been suggested that all the dissections are to be kept above the level of this sulcus to avoid injury to the major bile duct[11]
- This sulcus being an extrabiliary reference point means its presence can still be noted even in the inflammatory conditions of the biliary system.
- The cystic artery and cystic duct lay invariably anterosuperior to the sulcus.
- Hugh t b et al, The application in the operating room of commonly taught navigation principles, the use of extrabiliary reference points such as Rouvière's sulcus, and the introduction of human factors education for surgeons reduces the frequency of bile duct injury[12] .

VII. Conclusion

- Based on our study on table identification of Rouviere's sulcus serve as one of the extra biliary reference point to identify common bile duct and to dissect the calots triangle safely.
- The sulcus identification also reduces the time to achieve critical view of safety and operative time
- Complications like cystic artery injury, on table bleeding, damage to major bile ducts and CBD can be easily avoided if we identify the sulcus on table.

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