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Baha El-Dein El-Saman

*General Surgery, Faculty of Medicine, Al-Azhar University, Cairo Branch, bahaasaid166@gmail.com*

Adel Abdulhalim Lasheen

*Professor of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo Branch, dr.adellasheen@gmail.com*

Waleed Abdelaty

*Lecturer of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo Branch, walidsurg@gmail.com*

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## Role of Rouviere's sulcus in identification and dissection of Calot's triangle during Laparoscopic Cholecystectomy

General Surgery

Bahaa El-Din S. El-Samman <sup>1,\*</sup> M.B.B.Ch, Adel M. Lasheen <sup>1</sup> MD and  
Waled R. Abd El-Aty <sup>1</sup> MD

### \*Corresponding Author:

Bahaa El-Din S. El-Samman  
[bahasaid166@gmail.com](mailto:bahasaid166@gmail.com)

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<sup>1</sup>General Surgery Department, Faculty of Medicine, Al-Azhar University Cairo, Egypt.

### ABSTRACT

**Background:** One of most common surgical technique applied overall the world is laparoscopic cholecystectomy due to the high features instead of another surgical techniques. Furthermore; it is represents as the main technique for gallstones treatment; however the incidence of bile-duct injury still higher than that of open cholecystectomy. Various surgical procedures and principles have been proposed to reduces bile duct injury.

**Aim of the work:** To determine the frequency and the type of Rouviere's sulcus and its importance as landmark during laparoscopic cholecystectomy.

**Patients and methods:** This prospective study included hundred-patients who had symptomatic gallstone disease and underwent laparoscopic cholecystectomy in Al Azhar Universty Hospitals and Ahmed Maher Hospital.

**Results:** Our results revealed that, regarding the indications for cholecystectomy, the most common indication in the study participants were symptomatic gall stones in 36 (36%) of participants followed by acute cholecystitis in 29 (29%) participants and biliary pancreatitis in 16 (16%) participants.

**Conclusion:** Rouviere's sulcus was re-present in (76%) of total cases. It is an easily identifiable anatomic feature for secure laparoscopic cholecystectomy.

**Keywords:** Acute cholecystitis; Biliary pancreatitis; Gall stones; Laparoscopic Cholecystectomy; Rouviere's sulcus.

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### INTRODUCTION

Laparoscopic surgery is known as the standard procedure in stone disease. Whilst; laparoscopic cholecystectomy is correlating with more biliary, vascular and visceral complications than when compared with open cholecystectomy.<sup>1</sup>

The prevalence of ductal lesions in laparoscopic-cholecystectomy is close to 0.5%. In spite of advances in laparoscopic cholecystectomy, bile duct damage carry on to occur and there has been no reduction in mortality.<sup>2</sup>

Most duct injuries expected to performed due to mis-recognition of the bile duct anatomy due to misinterpretation and/or lack of understanding of the anatomical. Specific internal and external anatomy can help surgeons, specifically in difficult situations.<sup>3</sup>

By using the well-described anatomical features, in combination with other well-documented methods, such as the triple Calot incision to ensure critical safety, the surgeon will reduce the risk of damage to

the bile duct, especially if it is acutely inflamed. Another unknown known endoscopic term used for cholecystectomy is Rovier's-sulcus. The Rouvière-sulcus is another distinctive device that can be used to block the bile duct.<sup>3&4</sup>

Rovier, a French surgeon have been described Rovier's sulcus related to his name which is 2- to 5-cm groove that extends from the right anterior hilum of the liver to the caudal lobe. The decent trinity contains one or more of its branches.<sup>4</sup> Common sulcus accurately determines the level of the channel. This external path is always a sign of the surface of life and there is no unstudied pathology.<sup>5</sup>

The aim of this study was to determine the frequency and the type of Rouviere's sulcus and its importance as landmark during laparoscopic cholecystectomy.

### PATIENTS AND METHODS

In this prospective study hundred patients were enrolled diagnosed with gallstone disease and underwent laparoscopic cholecystectomy in Al Azhar Universty Hospitals and Ahmed Maher Hospital.

Symptomatic gallstone disease and candidate for laparoscopic cholecystectomy, early acute cholecystitis within 3 days, chronic non-calicular cholecystitis provides to be nonfunctioning, ages Eligible for Study: Above 14 years and both sexes were included. Pregnant women, high risk for general anasthesia, signs of gall bladder perforation as abscess, peritonitis, fistula, suspected malignancy, bleeding disorder , blood coagulation dysfunction, severe abdominal cavity adhesion and end stage liver disease with portal hypertension and severe coagulopathy were excluded.

All Patients were subjected to the Following: complete History; Full clinical Examination: general examination and local abdominal examination. Laboratory Investigations including: Complete blood picture, serum electrolytes, blood urea, serum creatinine, fasting blood sugar, liver function tests and coagulation profile, cross match and blood

group are requested. Imaging Studies: Ultrasound abdomen and pelvis.

After written informed consent for laparoscopic cholecystectomy, the operative data were recorded including the absence or presence of adhesion, the absence or presence of Rouviere’s sulcus, dissection of the Calot’s triangle was done at or just above the level of Rouviere’s sulcus with identification of the cystic artery and cystic duct. Post operatively the complications were recorded including biliary leake, obstructive jaundice or evidence of clipping or biliary tree injuries.

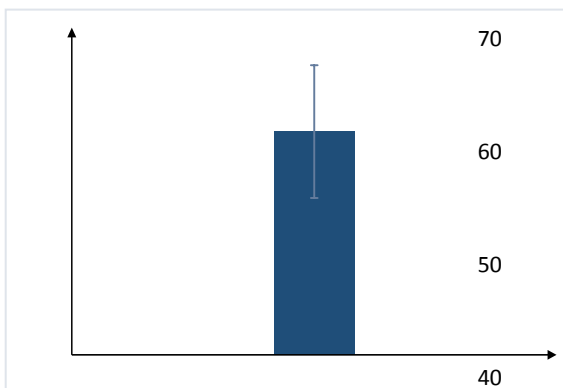
Key results were tabulated and analyzed by suitable statistical methods using the computer program Statistical Package for the Social Sciences (SPSS) version 16 software. Categorical data were presented as number and percentages while quantitative data were expressed as mean ± standard deviation (SD), and range and percentages.

**RESULTS**

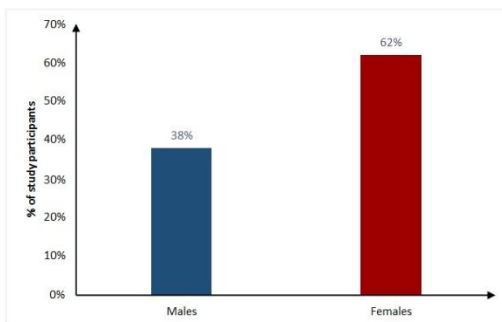
The age of the study cases ranged from 23 to 70 years old with a mean value of 47.74 ± 14.18 years. 38 (38%) cases were males while 62 (62%) were females.

		Study participants(n =100)
Age (years)	Mean ± SD	47.74 ± 14.18
	Range	23 - 70
Gender	Male	38 (38%)
	Female	62 (62%)

**Table 1:** Baseline characteristics of the study participants



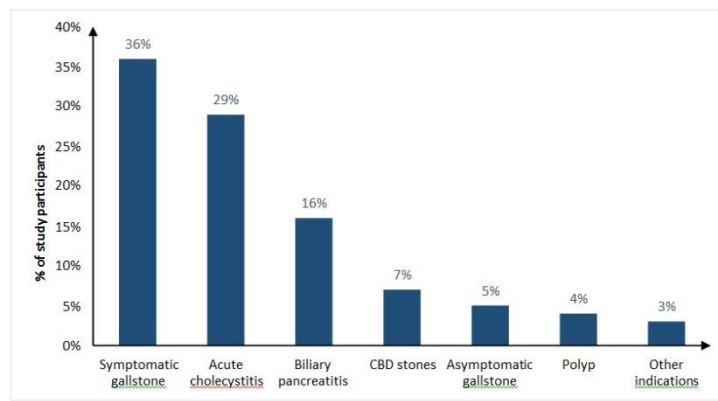
**Fig. 1 :** Age of the study participants



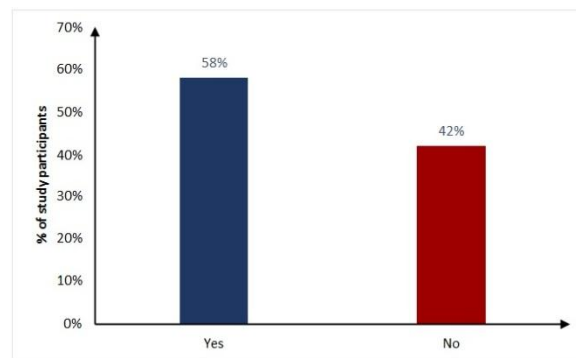
**Fig. 2:** Gender of the study participants

		Study participants(n =100)
Indications of cholecystectomy	Symptomatic gallstone	36 (36%)
	Acute cholecystitis	29 (29%)
	Biliary pancreatitis	16 (16%)
	Asymptomatic gallstone	5 (5%)
	CBD stones	7 (7%)
	Polyp	4 (4%)
	Other indications	3 (3%)
Presentation with acute attack	Yes	58 (58%)
	No	42 (42%)

**Table 2:** Preoperative data of the study participants



**Fig. 3:** Indications of cholecystectomy in the study participants



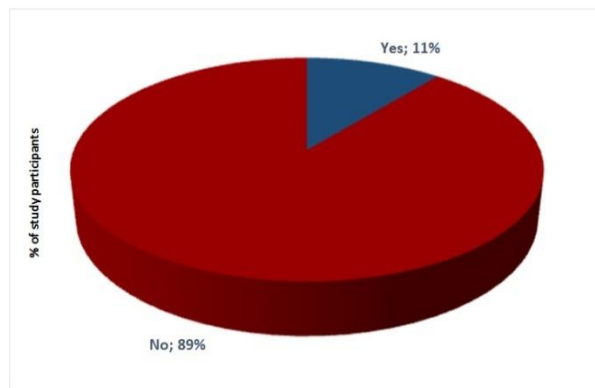
**Fig. 4:** Presentation with acute attack in the study participants

Regarding intraoperative data, adhesions were present in 11 (11%) cases, sulcus was visible in 76 (76%) cases. Sulcus was open type in 43 (43%) cases, closed in 13 (13%) cases, slit on 11 (11%) cases, and scar type in 9 (9%) cases. Calot dissection was done above in 69 (69%) cases and at or below in 31 (31%) cases, biliary injury, blood loss occurred in 2 (2%) and 8 (8%) cases respectively. In all cases, only 10 (10%) were converted to open cholecystectomy in the form of technical problem (3 cases). Severe adhesion and inflammation (4 cases).distorted anatomy (2 cases) and biliary injury (1case)

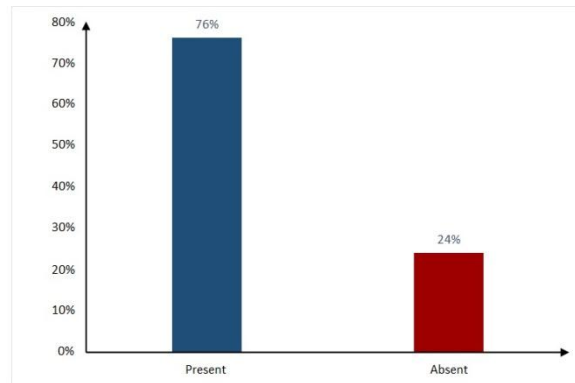
		Study participants(n =100)
Adhesions	Present	11 (11%)
	Not present	89 (89%)
Rouviere's Sulcus	Visible	76 (76%)
	Not visible	24 (24%)
	Open sulcus type	43 (43%)

Type of Rouviere's Sulcus	Closed sulcus type	13 (13%)
	Slit type	11 (11%)
	Scar type	9 (9%)
Calot dissection	Above	69 (69%)
	At or below	31 (31%)
Biliary injury	yes	2 (2%)
	no	98 (98%)
Blood loss	yes	8 (8%)
	no	92 (92%)
Conversion to open	yes	10 (10%)
	no	90 (90%)

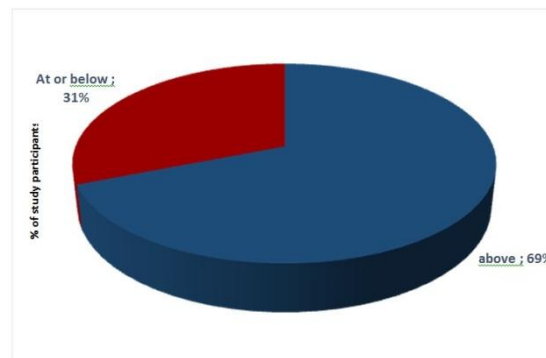
**Table 3:** Intraoperative data of the study participants



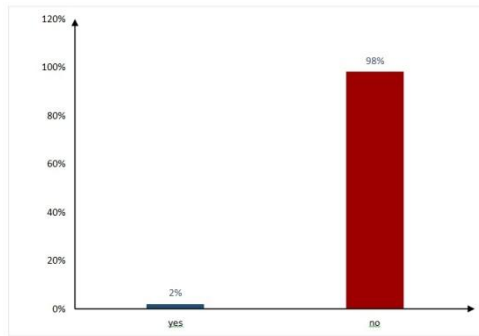
**Fig. 5:** Presence of adhesions in the study participants



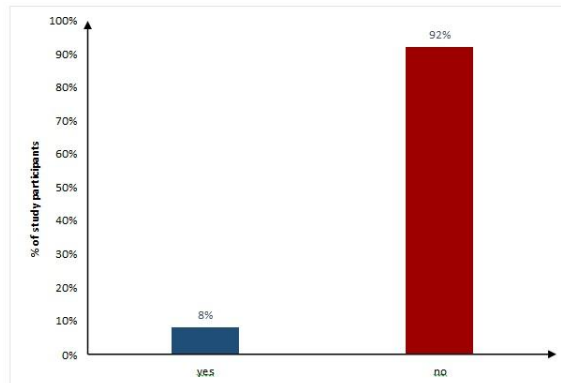
**Fig. 6 :** Presence of sulcus in the study participants



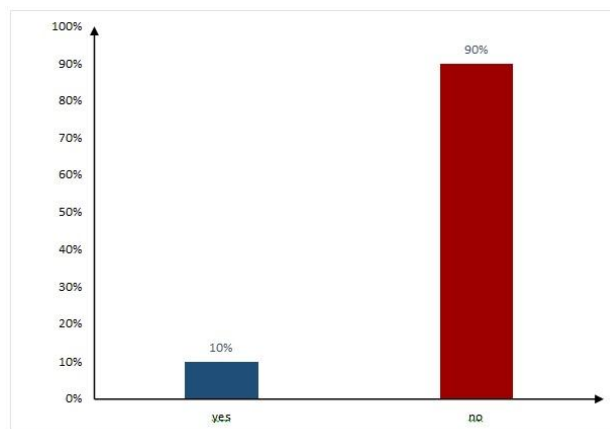
**Fig. 7:** Calot dissection in the study participants



**Fig. 8:** Biliary injury in the study participants



**Fig. 9:** Blood loss in the study participant



**Fig. 10:** Conversion to open cholecystectomy in the study participants

		Study participants(n =100)
Collection	Present	4 (4%)
	Not present	96 (96%)
Biliary leak	Present	3 (3%)
	Not present	97 (97%)
Postoperative wound infection	Occurred	7 (7%)
	Didn't occur	93 (93%)
Drain	Present	74 (74%)
	Not present	26 (26%)

**Table 4:** Postoperative data of the study participants

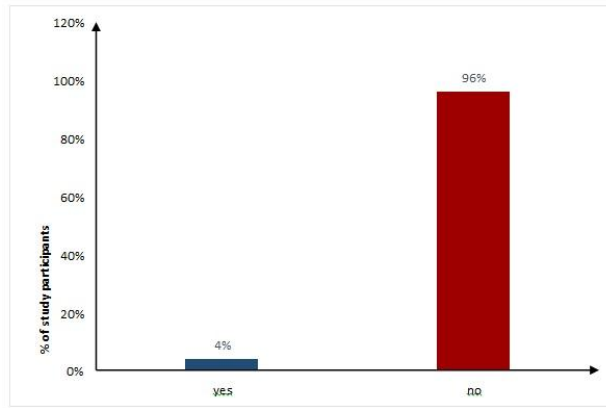


Fig. 11: Presence of collection in the study participants

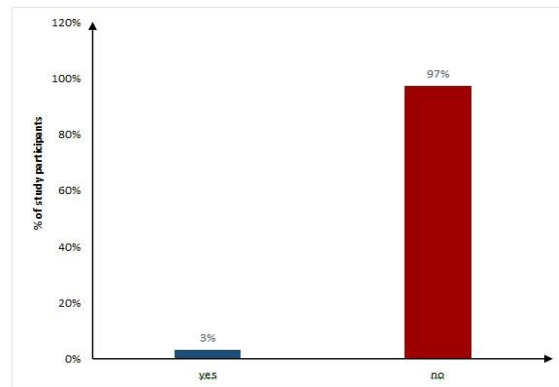


Fig. 12: Biliary leak in the study participants

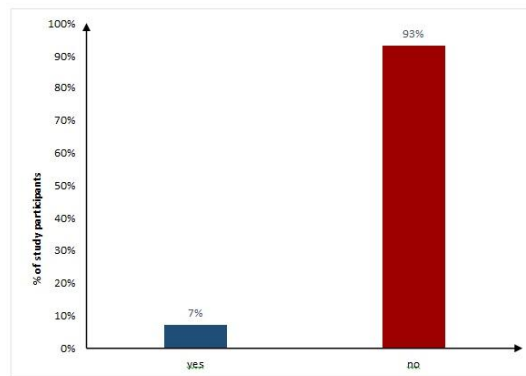
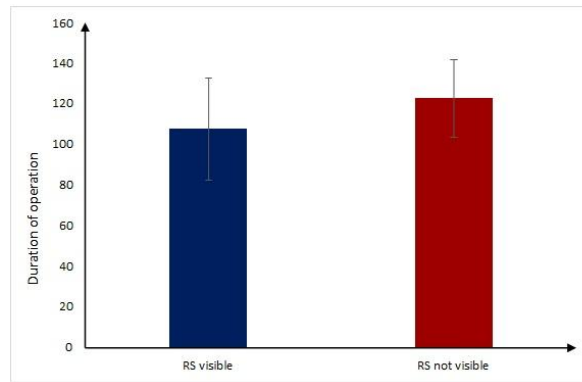


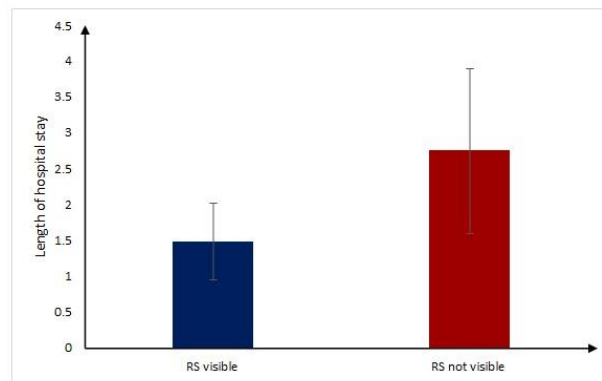
Fig. 13: Postoperative wound infection in the study participants

		RS visible(n =76)	RS not visible(n =24)	P value
Duration of operation (minutes)	<b>Mean ± SD</b>	107.76 ± 25.14	122.75 ± 19.11	<b>&lt;0.001*</b>
	<b>Range</b>	75 – 180	100 - 184	
Length of hospital stay (days)	<b>Mean ± SD</b>	1.48 ± 0.53	2.75 ± 1.15	<b>0.008*</b>
	<b>Range</b>	1 – 3	1 – 5	

Table 5: Duration of operation and hospital stay in the study participants



**Fig. 15:** Duration of operation in patients with or without visible RS



**Fig. 16:** Length of hospital stay in patients with or without visible RS

## DISCUSSION

This prospective study included hundred patients with symptomatic gallstones who underwent laparoscopic cholecystectomy at Al-Azhar University and Ahmed Maher Hospital.

The age of the participants in our study ranged from 23 - 70 years, with a mean of  $47.74 \pm 14.18$  years. 99 patients were included in the study for one year. In laparoscopic cholecystectomy, Jha et al. 6 that the age of onset of cholelithiasis was mainly in the fourth decade of life (33.6%).

Kumar et al.<sup>7</sup> found that middle-aged patients were  $41.56 \pm 14.27$  years old and had middle-aged uncomplicated gallstones. The highest reported frequency of Rovier ridges (GOR > 90%) was reported by Kumar et al.<sup>7</sup> who attributed this to excellent carbon dioxide production and image quality.

Consequently, Kumar et al.<sup>7</sup> showed that the overall incidence of biliary tract lesions (BIDs) at assessment was 1 in 230, equivalent to 0.4%, and the incidence of biliary tract lesions during laparoscopic cholecystectomy indicated dissection of the abdominal cavity in the SR representatives.

Sachdeva et al.<sup>8</sup>, where the mean age increased to  $41.5 \pm 15.4$  years in accordance with our results.

Our data are from Randhawa et al.<sup>9</sup> Most gallstone patients were women, the relationship between women and men Rosen and Brody<sup>10</sup> are working on cholelithiasis patients.

Saldinger and Bellorin-Marín<sup>11</sup> female/male ratio 2.43:1.1.56:1 in gallstones, however; In a study by shinde and pandit<sup>12</sup> female had higher preponderance of gall stone with female to male ratio of 1.56:1. Sridhar et al.<sup>13</sup> Estrogen promotes the excretion of cholesterol into the bile, resulting in excess bile.

High density, high quality, high density, high density, high density, high strength (76%). The splint opened in 43 (43%) cases, closed in 13 (13%) cases, broke in 11 (11%) cases and scored 9 (9%) cases. Anterior callus opening was performed in 69 cases (69%) and in at least 31 cases (31%). These are Tapa et al.<sup>14</sup> cases of early Rovier's disease were found in 75% of the patients, Mohamed et al.<sup>15</sup> Fifteen of them described Rover depression in 73% of the cases.

According to a study by Hugh et al.<sup>16</sup> The number of shells that can be withdrawn from the slurry slot 402 is 319 (79.3%) and 80 (20.7%). In 221 cases (54.9%) the splint was open and in 98 cases (24.4%) the splint was scarred.

In addition, Antoniou et al.<sup>17</sup> in their study of 160 patients were able to visualize the Rouvière sulcus in 109 (68.13%) patients during laparoscopic cholecystectomy. Rouvière's open type sulcus was observed in 48 patients, while 61 had a fused sulcus type and Dubhashi et al.<sup>18</sup> whose aim was to obtain the frequency and type of Rouvière's groove.

Other researchers have reported different frequencies of the presence of Rouvière's sulcus in their research. Dubhashi et al.<sup>18</sup> out of 78%, Dahmane et al.<sup>19</sup> in



82% and Danny A. Sherwinter,<sup>20</sup> noted a furrow in 68.13% of cases.

Kalra et al.<sup>21</sup> reported that Rouvière's groove was present in 63 study participants. It was found to be above the CBD level in 50 (79.36%) patients and above the CBD line at the sulcus level in 11 (17.46%) and 2 (5.97%) patients.

It has been suggested that all dissections should be kept above the level of this sulcus to avoid damage to the common bile duct.<sup>22</sup>

According to Elwan<sup>23</sup>, the aim was to explore the critical view of safety and sulcus Rouvière as extrahepatic landmarks and their usefulness in preventing damage to the common bile ducts. They reported that the open type was found in 175 (58.3%) patients and the closed type in 118 (39.3%) patients. The sulcus was absent in seven (2.3%) patients. Elwan<sup>23</sup> reported conversion to open cholecystectomy in two (0.7%) patients due to severe adhesions that could not be safely ruptured laparoscopically. There were no major intraoperative or postoperative complications.

A recent meta-analysis of 23 anatomical or laparoscopic studies found an overall incidence of Rouvière's sulcus of 83% in 49 patients (98%) in their study.

At one facility, 1,046 patients underwent laparoscopic cholecystectomy from 2002 to 2007, 998 of which included the safety-critical eye. The conversion rate for open cholecystectomy was 2.7%. In addition, at a single facility, 1,046 patients underwent laparoscopic cholecystectomy from 2002 to 2007, using safety-critical vision in 998 cases. There were five gall leaks that were resolved with conservative measures.<sup>24</sup>

In addition, Lockhart S and Singh-Ranger et al<sup>25</sup> reported that the duration of admission in the visible SR group was significantly shorter than in the non-visible SR group. The shorter hospital stay in the visible SR group can be attributed to a shorter operation time, less dissection and less need for the placement of drains in this group.

### CONCLUSION

Rouvière's sulcus was present in (76%) of our cases. It is an easily identifiable anatomical landmark for safe laparoscopic cholecystectomy.

Conflict of interest : none

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