

# THE MORPHOMETRY EXTRAHEPATIC BILE DUCTS

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## ABSTRACT

The extrahepatic bile duct morphometry was determined by the analysis of the colangiographies performed at Medimar Imaging Services SRL of the "St. Andrei" in Constanta on a General Electric Brightspeed Select CT scanner 16 slides. For the left liver duct found a caliber of 3.5-6.6 mm, its length ranging from 4.2-24.9 mm, and the right hepatic duct had a caliber ranging from 4.2-7.2 mm, the length being between 3.0-25.0 mm. At the confluence of the two hepatic ducts an angle of 35.0-124.1° was formed. In the common hepatic duct we found a caliber of 3.9-9.7 mm, in length between 20.2-52.9 mm. Cystic duct having a size of 2.4 to 5.5 mm, finding a length ranging from 24.6 to 66.4 mm. The angle formed at the end of the cystic duct in the hepatic duct had a value between 6.2-55.8°, and between the cystic and biliary ducts an angle of between 88.5-170.4° was formed. The coledoc duct had a caliber of 3.1-14.7 mm and a length of 19.8-57.3 mm.

Keywords: extrahepatic bile ducts - morphometry

## Introduction

The extrahepatic biliary ducts components were probably mentioned starting with "Galenus, who describe the hepatic duct and asserting that the bile reaches the duodenum through the coledoc duct. In the sixteenth century, Berengario de Carpi describes that the duodenal wall is traversed by the coledoc duct, Andreas Vesalius describes the bile ducts, stating that the bile drain into the duodenum, and Fallopius describes the obliquity of the biliary pathways. In the seventeenth century, Bidloo is the first who describe the confluence of the common bile duct with the main pancreatic duct" (1). These are just

a few of the initial descriptions of extrahepatic bile duct components, which have continued and continue today due to the improvement of anatomical research methods and, in particular, due to the means of advanced exploration, which confirm the increase in the number of morphological variants of extrahepatic bile ducts. (2) states that for him "the main biliary pathway is of major surgical interest; the knowledge of its anatomy, of the deep and complex topographical region that it crosses, of possible amodal variants (origin, termination, tract, morphometry), is a mandatory condition for the performing of a fully secure surgeon."

## Materials and methods

Our results were obtained by analyzing the colangiographies performed at Medimar Imaging Services SRL of the “St. Andrei” in Constanta on a General Electric Brightspeed Select CT scanner 16 slides. The following were observed: the size and length of the right and left hepatic ducts, the common hepatic duct, the cystic duct and the common bile duct. The angles formed at the confluence of these ducts were also recorded. The morphological targets pursued were studied in relation to the sex of the examined person.

## Results

For the left hepatic duct we found a caliber of 3.5-6.6 mm, being 3.8-6.6 mm for male, and between 3.5-6.6 mm for female. The length of the left hepatic duct was between 4.2-24.9 mm, was 12.8-18.8 mm in male, and female 4.2-24.9 mm.



Fig. 1. Left hepatic duct length: 12.1 mm (female).

The right hepatic duct had a caliber of between 4.2-7.2 mm, being between 4.2-6.7 mm for male and 4.6-6.2 mm for female. The length of the right hepatic duct was between 3.0-25.0 mm, the male being between 8.5-25.0 mm and the female between 3.0-12.0 mm. At the confluence of the two hepatic ducts to form the common hepatic duct, an angle of 35.0-124.1°

was formed, the angle was 53.0-109.0° for the male, and for the female x of 35.0- 124,1°.



Fig. 2. Right hepatic duct length: 12.0 mm (female).

For the common hepatic duct we found a caliber of 3.9-9.7 mm, in the male the caliber was 4.7-9.7 mm, and in the females the common hepatic duct had a caliber of 3.9 -9.5 mm. The length of the common hepatic duct was between 20.2-52.9 mm, the male being 24.7-52.9 mm, and the female gender 20.2-52.9 mm.

The cystic duct was 2.4-5.5 mm in size, male 2.4-5.5 mm, and female 2.5-4.0 mm. The length of the cystic duct was found to be between 24.6-66.4 mm, male 34.1-46.2 mm in length, and female 24.6-66.4 mm.



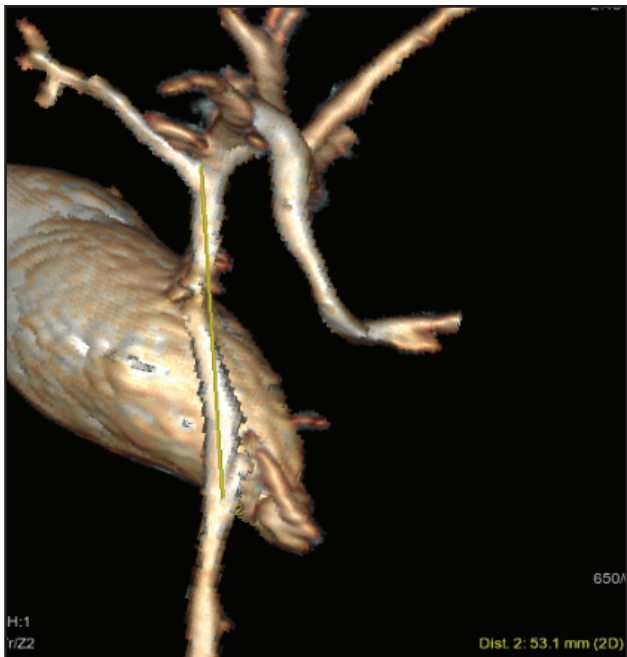
Fig. 3. Inter-hepatic angle: 69.9° (male)

The angle formed at the end of the cystic duct in the common hepatic duct had a value between 6.2-55.8°, the male angle being between 6.2-55.8°, and in the female angle value was between 15,6-40,6°.

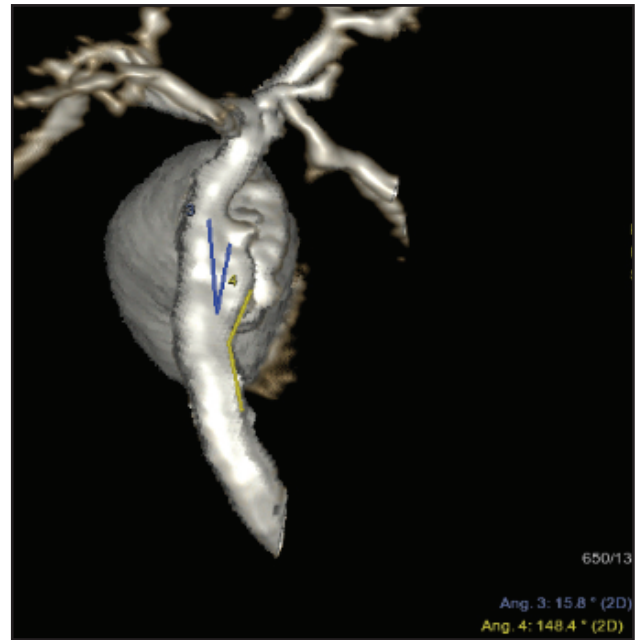


*Fig. 4. Cystic duct length: 42.3 mm (male)*

Between the cystic duct and the coledoc duct we found that an angle between 88.5-170.4° was formed, the male angle being 88.5-170.4°, and the female 118.0-164.5°.



*Fig. 5. Common hepatic duct length: 53.1 mm (female)*



*Fig. 6. Hepato-cystic angle: 15.8 °; cystic-coledocian angle: 148.4° (female)*



*Fig. 7. Length of the coledoc duct: 57.3 mm (male)*

For the coledoc duct we found a caliber of 3.1-9.5 mm, with 3.1-5.7 mm caliber in the male and the caliber found in the female ranging between 3.8-9.5 mm. The length of the coledoc duct was 19.8-57.3 mm, the male being of 19.8-

77.3mm, and the female 27.7-56.0 mm.

## Discussions

By comparing the caliber of the two hepatic ducts, we found that the right hepatic duct had a larger caliber than the left one in 54.54% of cases, with variations of 0.1-3.1 mm, in 27.27% of cases the left hepatic duct had a larger caliber than the right one with differences of 0.2-1.0 mm, and in 18.18% of cases the two ducts were of the same caliber. In relation to sex, the left hepatic duct had a lower caliber in female sex of 0.3 mm, both in the minimum and the maximum value.

Concerning the length of the two hepatic ducts, the right hepatic duct had a longer length in 36.36% of the cases, with differences between 3.5-7.8 mm, while the left hepatic duct had a longer length in 63,64% of cases, with differences between 1.6-20.20 mm. Depending on gender, the length of the right hepatic duct was lower in female gender, with differences of 5.5-13.0 mm, while the length of the left hepatic duct at the minimum was higher in male sex by 8.6 mm , at the maximum level the female having a greater length with 6.1 mm.

Regarding the length of the two proper hepatic ducts, right and left, (3,4) find that the left hepatic duct is longer than the right hepatic duct, we finding that the right hepatic duct was longer than the left hepatic duct in 27.28% of the cases.

At the level of the joint angle, this was higher in male at the minimum value with 18.5°, and at the maximum value was higher for female by 15.1°.

The common hepatic duct had a larger caliber in the male, at the minimum value the difference being 0.8 mm and the maximum value of 0.2 mm. The length of the common hepatic duct minimum value, was lower in female by 4.5 mm, and at the maximum value had the same value for both genders.

By comparing the results found by us regarding the common hepatic duct morphometry with the results from the literature, it is noted that the length and caliber in the literature are not specified in relation to the individual's gender.

Table 1. The common hepatic duct morphometry

Author	Length(cm)	Caliber(mm)
Testut	0.3-4.2	4-5
Rouvière	3-4	5
Gray	6-8	6
Kamina	3-4	3
Arianoff	-	5.1
Papilian	4.5-5.0	5
Iancu	3	5
Duca	3	-
Chiriac	3	5
Popescu	3	-
Personal results	2.02-5.29; M: 2.47-5.29; F: 2.02-5.29	3.9-9.7; M: 4.7-9.7; F: 3.9-9.5

The smallest length of the common hepatic duct is quoted by (5), less than the minimum value found by us by 1.72 cm and the longest length by (6), superior to the maximum value found by us with 0,71-2.72 cm. Most frequently, the length of 3 cm (2,3,7,8,9,10), is cited in the literature, (3,7) giving a maximum length of 4 cm and (5) giving the maximum length of 4.2 cm. (4) finds this length between 4.5-5.0 mm. The smallest caliber is quoted by (7), smaller than the one found by us by 0.9 mm. The largest caliber is quoted by (6), but the caliber is lower than the maximum value found by us by 3.7 mm. Most frequently, a 5 mm (3,4,5,8,9), caliber is cited in the literature, (11) giving a size of 5.1 mm.

The cystic duct had a larger caliber in female by 1 mm at the minimum value, at the maximum value the caliber being higher for the male by 1.5 mm. The length of the cystic duct was higher for male by 9.5 mm at the minimum value, and the maximum value was higher for females by 9.8 mm.

Table 2. The cystic duct morphometry

Author	Length(cm)	Caliber(mm)
Testut	3.3-4.5	3,4
Rouvière	3	2.5-3-4
Moore	3.5-4.5	2-4
Hyondo	3-4	3-4
Dayton	3-4	-
Duca	4	-
Blidaru	4	4
Personal results	2.46-6.64; M: 3.41-4.62; F: 2.46-6.64	2.4-5.5; M: 2.4-5.5; F: 2.5-4.0



In the literature, the minimum value of the cystic duct length was 0.54 mm higher than that found by us (3,12,13), less by 0.84-1.04 mm than (5) and (14), and smaller by 1.54 cm than that found by (2,15). The maximum value of the cystic duct length was less in the literature by 1.64 cm than that found by us (3), with 2.64 cm comparing to (2,12,13,15), and 2.14 cm from the maximum value quoted by (5,14). The minimum value of the cystic duct caliber found by us is 0.4 mm higher than at (14), being smaller by 0.1 mm than (3), by 0.6 mm than (12), by 1,0 mm than (5) and 1.6 mm than (15). We found a maximum value of the cystic duct caliber greater than that quoted in the literature by 2.1 mm than (5) and by 1.5 mm than (3,12,14,15).

The cystic-hepatic angle was higher for females at the minimum value by 9.4°, and the maximum value was higher for male sex by 15.2°. The cystic-coledoc angle was lower for male sex, for the minimum value of 29.5°, and for the maximum value of 5.9°.

The coledoc duct had a lower minimum value for females by 0.7 mm, and at the maximum value the caliber was also higher for the female sex by 4.2 mm. The length of the coledoc duct was higher for females, both at the minimum value (by 0.7 mm) and at the maximum value (by 1.4 mm).

Table 3. The coledoc duct morphometry.

Author	Length(cm)	Caliber(mm)
Testut	6-8	4-5
Rouvière	5	5-6
Gray	6-8	6
Kamina	5	3-5-6
Beauthier	7,5	6
Barraya	-	6
Hand	-	6.5
Arianoff	-	5.8
Papilian	3-3,5	5
Iancu	6-7	5
Chiriac	5-6-7	6-10
Duca	6	-
Blidaru	7	6-7
Panaitescu	7	-
Personal results	1.98 - 5.73; M: 1.98-5.73; F: 2.77-5.60	3.1-9.5; M: 3.1-5.7; F: 3.8-9.5

At the level of the coledoc duct, the minimum value of the length found was less than

that quoted in the literature, by 1.2 cm than that quoted by (4), by 3.02 cm to (9), and by 4.02 cm the length quoted by (5,6,8).

At the level of the coledoc duct, the minimum value of the length found was less than that quoted in the literature, by 1.2 cm than that quoted by (4), by 3.02 cm to (9), and by 4.02 cm the length quoted by (5,6,8). The maximum value of the length of the coledoc duct found by us was 0.773 mm bigger than that quoted by (3,7) and by 2.23 cm than the length quoted (4) but less with: 0.30 cm compared to (2), and 1.30 cm from (8,9,15,16), with 1.77 cm from (17) and 2.27 cm from (5,6). The minimum caliber of the coledoc duct found by us was 0.1 mm larger than (7), in one case, the rest being 0.9 mm smaller than (5), 1.9 cm than (3) and by 2.9 cm than (9,15). The maximum value of the coledoc duct caliber was less than that of the literature in only one case, by 0.5 mm (2). In the rest of the cases it was 4.5 mm higher than (4,5,6,8), 3.7 mm than (11), 3.5 mm than (3,6,7,18), with 3,0 mm than (18) and 2.5 mm than (15).

## Conclusions

There are observed differences between the morphometric results found by us and the same results cited in the specialized literature we have consulted. Also, there are gender differences, with female being higher than male for the following : the maximum length of the common hepatic duct and cystic duct, the minimal length of coledoc duct and minimum and maximum values of the coledoc duct caliber. Concerning the angles formed at the confluence of the bile ducts, for the female gender was higher: the maximum value at the confluence of the right and left hepatic ducts level and the minimum values of the cistico-hepatic and cistico-coledocian angle.

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