

# THE ROLE OF INTRAVENOUS CHOLANGIOGRAPHY IN PREDICTING PAPILLARY STENOSIS

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## SUMMARY

Size of common bile duct and density of contrast material in CBD have been evaluated by IVC, in order to predict papillary stenosis, in 187 patients who underwent biliary surgery. At laparotomy findings and operative cholangiograms 143 CBDs were normal, 44 obstructed. The average diameter of the normal ducts was  $6,19 \pm 1,75$  mm. In females and in aged patients the CBD size was larger. The average diameter of the stenotic ducts was  $10,98 \pm 5,12$  mm. All ducts larger than 11,45 mm were obstructed, all those smaller than 6,75 mm were unobstructed. Seventy four ducts, of which 30 (40,54%) were stenotic, were included in the 6,75-11,45 mm size group. Of the 44 ducts with CBD stenosis found at operation, the 77,27% had stasis of contrast material more than 2 hours. The duct size, alone, is not useful in predicting papillary stenosis. Stasis of contrast material in a dilated CBD is a suitable criteria for evaluating papillary stenosis. Even if, today, preoperative manometric study is available, IVC appears to be still a valid technique for functional and anatomic evaluation of the biliary tract.

## RESUMO

### A CIV no diagnóstico da estenose papilar

O calibre do colédoco e a densidade do contraste intra-luminal foram avaliados por colangiografia intra-venosa, numa tentativa de prever a existência ou não de estenose papilar, em 187 doentes submetidos a cirurgia biliar. A avaliação durante a laparotomia, que incluiu colangiograma intra-operatório, revelou 143 V.B.Ps normais e 44 obstruídas. O diâmetro dos ductos normais era de  $6,19 \pm 1,75$  mm. Em doentes do sexo feminino e em idosos o calibre da V.B.P. era maior. O diâmetro médio dos ductos considerados obstruídos era de  $10,98 \pm 5,12$  mm. Todos os ductos maiores que 11,45 mm tinham obstrução e, contrariamente, todos com menos que 6,75 mm não tinham evidência de qualquer obstrução. Setenta e quatro ductos, dos quais 30 (40,54%) eram estenóticos, estavam incluídos no grupo cujo calibre variava de 6,75 mm a 11,45 mm. Dos 44 colédocos cuja estenose foi verificada em cirurgia 77,27% tinham estase do material de contraste para além das 2 horas. O calibre coledócico, por si só, não é um parâmetro útil na previsão de estenose papilar. Estase de material de contraste numa V.B.P. dilatada é um bom critério na avaliação de estenose papilar. Hoje em dia, ainda que exista a possibilidade de avaliação manométrica, a colangiografia intra-venosa parece continuar a ser um bom método de avaliação funcional e anatómica do tracto biliar, na fase pré-operatória.

## INTRODUCTION

In the preoperative study of the biliary tract, one of the most important parameters, required from both the radiologist and the surgeon, concerns the presence or absence of an ampullary stenosis.

On the basis of clinical and laboratory findings: upper abdominal pain related to meals, intermittent jaundice, chemical evidence of cholestasis and stasis of contrast material within a dilated duct as seen on intravenous cholangiography (IVC) are considered the criteria for diagnosing papillary stenosis.<sup>1</sup>

In recent years the use of ultrasonography, endoscopic retrograde cholangiography, transhepatic cholangiography, computed tomography and radioisotope imaging have modified the approach to study the biliary tract. The function of the sphincter of Oddi is evaluated as well by manometric studies.<sup>2, 3, 4</sup>

IVC, which has been the most employed examination for almost 30 years, has progressively lost its primary<sup>2, 5, 6, 7</sup> role. Nevertheless, in several centres, IVC is still largely performed on all patients who had only pain, mild jaundice or history of jaundice.

IVC is also used in post-cholecystectomized symptomatic patients.

In this study we wanted to verify if the size and the time density of contrast material in the common bile duct (CBD), on IVC, can help in determining whether or not there is papillary stenosis.

## MATERIALS AND METHODS

Two hundred IVCs have been reviewed. All the patients were submitted to surgery.

The age of the patients, 152 females and 48 males, ranged from 22 to 83 years (average:  $49 \pm 12$  years).

TABLE 1 Surgical procedure

	No.
Cholecystectomy	143
Cholecystectomy and papilostomy	30
Cholecystectomy and choledocoduodenostomy	2
Cholecystectomy and choledocotomy	1
Cholecystectomy and choledocojejunostomy	1
Cholecystectomy and papillary divulsion	2
Choledocotomy	2
Choledocotomy and papilostomy	2
Papilostomy	3
Papillary divulsion	1
	187

TABLE 2 Size of common bile duct on IVC

No.	Average diameter (mm)
143 unobstructed CBDs	6.19 $\pm$ 1.75 (range 2-11.45)
35 males	5.54 $\pm$ 1.4* (range 3.25-9.45)
108 females	6.37 $\pm$ 1.8* (range 2-11.45)

\*  $p = 0.019$ 

The IVCs were performed employing conventional techniques. Pharmacodynamic testing was not used. All examinations included tomograms. The interval between IVC and operation was always less than 30 days (average: 7,68  $\pm$  6,02 days).

Thirteen IVCs were excluded from this study because they were non-diagnostic examinations.

The diameter of the 187 CBDs was measured at the largest point just below the insertion of the cystic duct.

As far as the flow of the contrast material is concerned, a prolonged marked opacification of the duct, over 2 hours, has been considered significant for papillary stenosis.

This datum was compared with the intraoperative findings obtained by physical examination of CBD and operative cholangiography.

All the operative cholangiograms were evaluated at time of operation from both radiologist and surgeon. The presence of unequivocal filling defect and constant tapered distal choledocus with poor passage of contrast in duodenum were the radiological criteria for obstruction.

The surgical procedures are shown in Table 1.

Furthermore the size of normal CBD was related to the age and sex of the patients. The < 36, 36-54, > 54 age groups were considered.

The visualization or the non-visualization of the gallbladder was also observed, correlating it to the duct size.>

TABLE 3 Size of common bile duct on IVC

No.	Average diameter (mm)
44 OBSTRUCTED CBDs	10.98 $\pm$ 51.12 (range 6.75-36.30)
20 (only papillary stenosis)	9.08
24 (stones)	12.72

## RESULTS

Based on laparotomy findings and operative cholangiography 143 CBDs out of 187 were assessed to be normal, 44 CBDs obstructed.

Twenty four of these 44 patients had calculi, the remaining 20 patients had papillary stenosis without calculi.

The size of normal CBDs is shown in Table 2.

The size of the 44 CBDs obstructed is reported in Table 3.

All the CBDs with a diameter less than 6,75 mm were normal at surgery and those with a diameter greater than 11,45 mm were obstructed. Therefore, 74 cases (39,75%) were included between the minimum diameter found in obstructed CBDs (6,75 mm) and the maximum diameter of those unobstructed (11,45 mm).

Of these 74 cases, 30 presented papillary stenosis (40,54%), whereas in 44 cases there was no stenosis (59,46%) (Fig. 1).

The time density of contrast material was more than 2 hours in 66 cases (35,29%), less than 2 hours in the remaining 121. Of the 44 cases where papillary stenosis was found at surgery, 34 (77,27%) had a persistent marked opacification of the ducts more than 2 hours, 10 (22,73%) less than 2 hours.

In relation to age, an increase of duct size in older patients was found; a statistically significant difference between the 36-54 and the over 54 year-old age group was observed ( $p = 0.002$ ).

The diameter of the CBDs related to the visualization of the gallbladder and the size of the ducts in 7 patients previously cholecystectomized are reported in Table 4.

## DISCUSSION

The opinions reported in the literature as for the CBD size are not univocal. A normal width dimension has not been established. There is much controversy about the diameter of the CBD in predicting ampullary stenosis. Some authors report 7-9 mm as maximum diameter for the normal CBD.<sup>8, 9, 10</sup> Others consider 10 mm the maximum within normal limits.<sup>11, 12</sup>

On the other hand, there is no agreement about the minimum diameter, above which the CBD can be considered stenotic. Some researchers have observed obstruction in all the CBDs with diameter larger than 15-17 mm.<sup>8, 9</sup>

In our series all the CBDs larger than 11,45 mm were stenotic. In a large number of cases (74; 39,57%) the diameter of the ducts was of no value in predicting whether or not there is papillary stenosis. However, 22 ducts (73,33%) of the 30 obstructed coledoci included in the 6,75-11,45 mm size group show a time density of contrast material more than 2 hours.

TABLE 4 Size of common bile duct on IVC

(in relation to the gallbladder visualization)

No.	Average diameter (mm)
104 (gallbladder visualized)	6.51 $\pm$ 2.1*
76 (gallbladder non-visualized)	8,27 $\pm$ 4,59*
7 (previous cholecystectomy)	11.14 $\pm$ 2,37

\*  $p = 0.006$

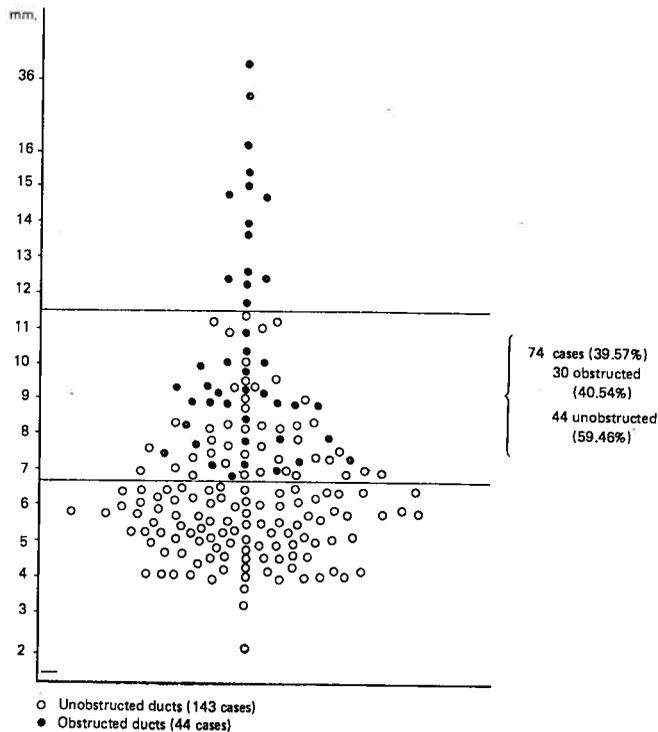


Figure 1: Size of common duct (187 cases)

Concerning CBD size differences in our cases between opaque and non opaque gallbladders, it may be proposed that a non opaque gallbladder yields the functional result as a cholecystectomy. Many workers point out an increase in CBD size after cholecystectomy. Duct dilatation following cholecystectomy was first reported in dogs by Oddi in the 1890's (cited in Edmunds) and this finding was confirmed in man by several other authors.<sup>13, 14, 15, 16</sup>

These increased duct calibers of unopacified gallbladders as well as after cholecystectomy could be due to the loss of reservoir and decompressive functions of the gallbladder.<sup>17</sup>

However we feel it necessary to make one comment: a difference of about 2 mm may be due to error in measurement; in fact a fixed standard point of reference for diameter measurement can not be stated: the cystic duct insertion, usually considered to be the landmark, presents several variants. On the other hand some authors do not agree that CBD post-cholecystectomy dilatation occurs.<sup>18, 19</sup>

Concerning the CBD size in older patients, other authors as well have found an increase in aged patients.<sup>17</sup>

Its mechanism is unexplained. The loss of tone in the CBD wall might be an explanation. Some authors, however, have not found changes in size of the CBD with age.<sup>20</sup>

In conclusion:

1. A normal width for the CBD can not be established, and, in particular, in aged patients.
2. In a large number of cases, stenotic and non stenotic, the diameter of the CBD is not useful in predicting papillary stenosis.
3. Stasis of contrast material in a dilated duct increases the ability of IVC in predicting papillary stenosis.
4. Although manometric evaluation of the sphincter of Oddi appears to be a valid method of functional study, IVC is still employed and considered an efficient technique to assess the anatomy and function of the biliary tree.

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