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Histological Study of Luminal Diameter of the Extra Hepatic Biliary Ducts

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Abstract

Context: *The extra hepatic biliary ducts include the right and left hepatic ducts, common hepatic duct and common bile duct. The luminal diameter of the biliary ducts gradually increase with age but it may dilate significantly in obstructive disease in the biliary passage. A variety of factors have been reported to have an effect on the size of the biliary ducts, such as dislodged calculi from the gallbladder, history of prior cholecystectomy, congenital abnormalities or anatomical variations. Ultimately, the luminal size should be considered as a single part of the entire assesment of the biliary tree. However, such an assesment implies knowledge of the normal size of the biliary passage.*

Materials and Methods: *A cross sectional descriptive type of study was carried out in the department of Anatomy, Sir Salimullah Medical College on sixty two (62) human cadaveric extra hepatic biliary apparatus. The samples were collected from unclaimed dead bodies that were under examination in the department of Forensic Medicine of Dhaka Medical College, Dhaka and Sir Salimullah Medical College, Dhaka. The present study was conducted to determine the normal luminal diameter of extra hepatic biliary ducts histologically and their age related changes.*

Results: *The differences in mean (±SD) luminal diameter of the cystic duct, common hepatic duct and common bile duct were found statistically significant (P<0.001) between different age groups.*

Conclusion: *In the present study the luminal diameter of the extra hepatic biliary duct was found to increase with advancing age.*

Keywords: *Extra hepatic biliary ducts, luminal diameter, age.*

Introduction

The human extra hepatic biliary ducts consist of right & left hepatic duct, common hepatic duct, cystic duct and common bile duct[1]. The normal luminal diameter of the biliary ducts are 4 to 8 mm which is considered to increase with age. A standard US text states, " A simple rule of thumb is to consider as normal a 4 mm mean duct diameter at age 40, a 5 mm mean duct diameter at age 50, a 6 mm mean duct diameter at age 60 and so on"[2]. The histology of the biliary ducts is highly similar with the gallbladder. The wall of the biliary ducts consists of external fibrous and internal mucosal layer. The mucosa is lined by simple columnar epithelium with subepithelial collagen fiber. The outer fibrous layer containing very few smooth muscle[3]. A striking feature of bile passages is the relative absence of muscle compare with the intestine. The bile duct passages are therefore capable of distension but not much contraction[4]. Gallstones are common and are frequently squeezed into the duct. Pain from distension and spasm of the biliary tract is severe especially when an obstruction is present. This incidence rises with advancing age[5]. Thus an appropriate knowledge about the luminal diameter of the extra hepatic biliary ducts has an important implication for proper diagnosis and treatment of biliary diseases.

Materials

The present study was performed on sixty two (62) human cadaveric extra hepatic biliary apparatus. The specimens were collected from unclaimed dead bodies that were under examination in the department of Forensic Medicine of Dhaka Medical

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College and Sir Salimullah Medical College (SSMC), Dhaka from July 2010 to June 2011. The samples were divided into three age groups, i.e. Group A (10-20 years), Group B (21-40 years) and Group C (41-70 years) (Table 1).

Table-I
Age distributions of different study groups (According to Sarkar[6])

Study group	Age range (in years)	No. of samples (n=62)
A	10-20	14
B	21-40	30
C	41-70	18

Methods

The collected samples were washed gently and thoroughly with running tap water and preserved with 10% formol saline solution for fixation and preservation. Six samples were selected for histological study from each group. Tissue blocks were taken from the mid portion of cystic duct, common hepatic duct and 3 mm distal to the origin (junction between the cystic duct & common hepatic duct) & 3 mm proximal to the termination (junction between the common bile duct & pancreatic duct) of common bile duct. Thus total four pieces of blocks were taken for subsequent processing. Then tissue blocks were refixed in Carnoy's fluid. Then four blocks for each sample were sectioned and stained with Mallory-Azan. Luminal diameter of the cystic duct, common hepatic duct and the common bile duct were measured by using micrometers. Two measurements were taken from each lumen. One of the maximum transverse diameter and the other one perpendicular to the first. The ultimate diameter was calculated by taking the mean of the two diameters (Fig 1).

Ethical Clearance

This study was approved by the Ethical Review Committee of Sir Salimullah Medical College, Dhaka.

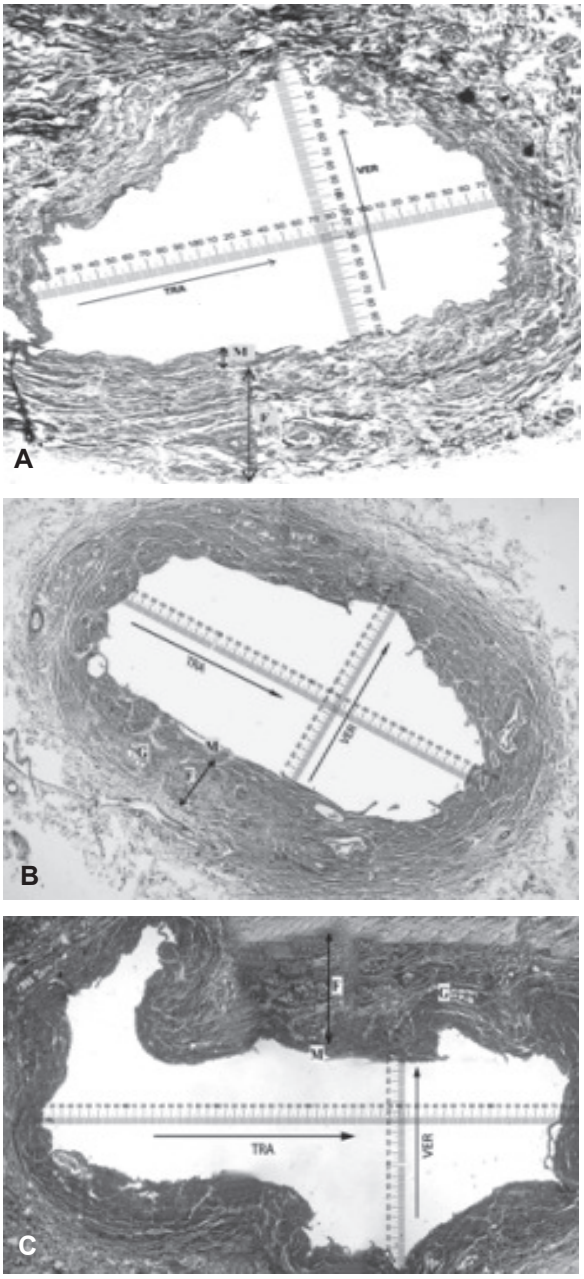


Fig.-1: *Photomicrograph of the wall of the cystic duct (A), common hepatic duct (B) & common bile duct (C) showing the measurement of the luminal diameter where the ocular micrometer was superimposed. Stain:Mallory-Azan under low power of magnification (10X). TRA-transverse diameter, VER- vertical diameter.*

Results

The mean (±SD) luminal diameter of the cystic duct was 1.39±0.30 mm in group A, 2.11±0.06 mm in

group B and 2.65±0.50 mm in group C. The mean (±SD) luminal diameter of the common hepatic duct was 2.25±0.65 mm in group A, 3.26±0.14 mm in group B and 3.68±0.59 mm in group C.The mean (±SD) luminal diameter of the common bile duct was 2.98±0.60 mm in group A, 4.39±0.34 mm in group B and 5.76±0.25 mm in group C. The differences of luminal diameter of the cystic duct were highly significant (P<0.001) between A vs B, highly significant (P<0.001) between A vs C and significant (P<0.05) between B vs C. The differences of luminal diameter of the common hepatic duct were highly significant (P<0.001) between A vs B, highly significant (P<0.001) between A vs C and not significant (P>0.05) between B vs C.The differences of luminal diameter of the common bile duct were highly significant (P<0.001) between A vs B, highly significant (P<0.001) between A vs C and significant (P<0.01) between B vs C (Table II & Fig.-2).

Table-II

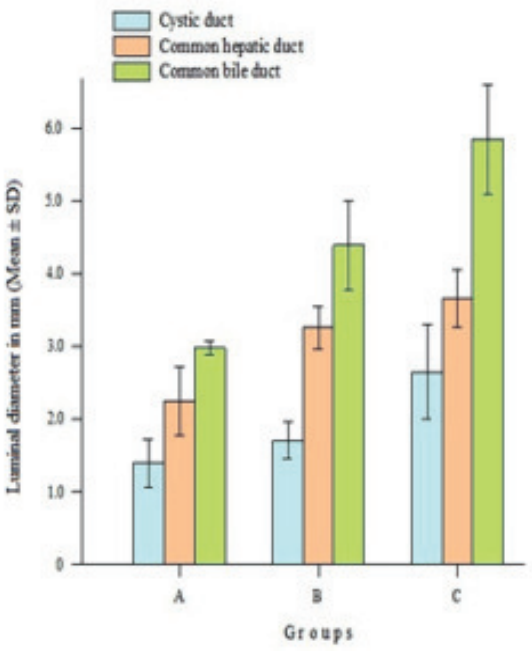
Luminal diameter of the cystic, common hepatic and common bile duct in different age groups

	Luminal diameter of ducts in mm		
Age group	Cystic duct Mean±SD	Common hepatic duct Mean±SD	Common bile duct Mean±SD
A	1.39±0.30	2.25±0.65	2.98±0.60
(n=6)	(0.93 1.75)	(1.70 2.99)	(2.95 3.15)
B	2.11±0.06	3.26±0.14	4.39±0.34
(n=6)	(1.39 1.99)	(2.87 3.52)	(3.30 4.97)
C	2.65±0.50	3.68±0.59	5.76±0.25
(n=6)	(2.05 3.09)	(2.99 4.10)	(5.08 6.79)
	P value	*P value*	*P value*
A vs B	0.0001***	0.0001***	0.0001***
A vs C	0.0001***	0.0001***	0.0001***
B vs C	0.041*	0.093ns	0.001**

Level of significance, ns = not significant at P>0.05, * = significant at P<0.05, ** = significant at P<0.01, *** = significant at P<0.001

Figures in parentheses indicate range. Comparison between age groups done by One way ANOVA (PostHoc).

Group A : Age 10 20 years
Group B : Age 21 40 years
Group C : Age 41 70 years



Discussion

In the present study, the highest diameter of the cystic duct, common hepatic duct and common bile duct were found in group C whereas the lowest were found in group A. The values of the luminal diameter of the cystic duct of the present study were nearly similar with Williams[7], Sinnatamby[8] and Simeone[9]. The luminal diameter of the common hepatic duct described by Brunicardi[10], Moore & Dalley[11], Feldman[12] and Hagen-Ansert[13]were in agreement with the measurements of the present study. Bacheret al[14]also found a significant correlation between diameter of common bile duct and age. They found that the duct gradually dilates by 0.04 mm per year. Perretet al[15] stated that the mean diameter of the common bile duct in older people (60 years and above) remained “normal”, being less than 7 mm in 99% of cases. This statement agreed with the diameter of the common bile duct in group C of the present study. Wilson & Khalik[16]stated that the size of the bile duct is considered to increase normally with age. They found that the diameter of the common bile duct was 4 mm at the age of 40 years, 5 mm at the age of 50 years, 6 mm at the age of 60 years and so on. They reported that the diameter of the common bile duct normally increases by 1mm

every decade. This statement also agreed with the results of the present study.

Conclusion

In the present study, changes were found in the luminal diameter of the cystic duct, common hepatic duct & the common bile duct to increase with increasing age. To establish a standard data, similar studies with larger sample size in different age groups including both sexes are recommended.

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