Infection Diseases Section *Original Article*

Predicting Factors of Common Bile Duct Diameter in South Khorasan; Addiction as a Public Dilemma

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Abstract

Introduction: Given the importance of identifying common bile duct diameter in diseases diagnoses and being different in different races, this paper aimed to investigate the relationship between the diameter of the common bile duct and demographic factors and drug addiction in patients who referred to the imaging department of Imam Reza hospital in Birjand during the year 1391-1392.

Methods: This cross-sectional-analytical study was conducted on patients referred to the Imam Reza Hospital, Birjand University of Medical Sciences, during the year 91-1392. The study population consisted of patients with complaints other than the complaints associated with disorders of the liver and bile duct. Information about sex, drug use, BMI, age and duct diameter in proximal, middle and distal parts were recorded by the checklist. Data were analyzed using the SPSS software version 11.0 and the mean values, frequency of tests, Mann-Whitney and the Kruskal-Wallis tests. And values of $p < 0.05$ were considered significant.

Results: A total of 315 subjects participated in the study. One hundred and sixty-two participants (51/4 percent) were female and the mean age of participants was 38/18±15/6. The mean diameter of the common bile duct in three proximal, middle and distal parts were determined as 5/1±2/4mm, 5/6±2/4 mm and 5/9±2/4mm. The results showed a significant relationship between bile duct diameter with age, gender, body mass index and addiction. ($p<0/05$).

Discussion: According to these results, in the case of dilated common bile duct in sonographic imaging and considering the age, gender, body mass index status and the addiction; findings need to be adapted to his clinical status.

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Introduction

Extrahepatic bile duct includes the right and left hepatic duct, common hepatic duct, cystic duct and common bile duct(pack spindle) that enters the second portion of the duodenum through Oddi sphincter muscle. Biliary diseases such as cholecystitis and cholelithiasis are the most common diseases in Iran and around the world that are associated with common bile duct disorders. To study the common bile duct, various ways including CT scan, Capital Scan, Oral Cholecystography, Percutaneous Transhepatic Cholangiography, Magnetic Resonance Imaging and Endoscopic Ultrasound can be used. In most cases, sonography is usually the first method of assessment[1-4] .

The diameter of the common bile duct is used for the diagnosis of obstructive and non-obstructive jaundice[5]. Dilated common heptic bile duct is considered as a risk factor for the increased possi-

bility of urethral stones[6-8]. Therefore, a standard measure is required for the size of the common bile duct to use in clinical application. Although imaging techniques have been developed significantly in recent years, but there are still many different opinions the scientific community on the effect of age, weight, sex, and Cholecystectomy on common bile duct diameter[9, 10]. Several studies have shown that the average normal common bile duct diameter is 4 mm at age 40, and 5 mm at age 50 and 8 mm at age 80[4, 9, 11, 12]. In contrast to these results, Harrow and colleagues found no relationship between age and diameter of the common bile duct[5].One of the most important factors in bile duct diameter attention in recent decades has been the issue of the impact of drug addiction on bile duct dilatation[13].

Considering the importance of determining the common bile duct diameter in diagnoses of diseases, and the failure to address this issue in the population of South Khorasan due to the relative prevalence of addiction and racial differences in this region, this study aimed to study the relationship of the common bile duct diameter with demographic factors and drug addiction in the patients who referred the imaging department of Imam Reza hospital in Birjand during the years 91-1392.

Methods

This is a cross-sectional study. The study population consisted of patients with complaints other than the complaints associated with disorders of the liver and bile duct and referred the imaging department of Imam Reza hospital in Birjand during the years 91-1392.

To determine the sample size based on the study of Adibi and colleagues and average estimation formula or $n = \frac{z_1^2 - \alpha \times \delta^2}{d^2}$ with $\delta = 1.2$ and $d = 0/13$ were estimated as $n = 327$[13].

Probability -cluster sampling was used, so that the sex and age ratio were taken into consideration in clusters. The criterion for entering the study was having at least 16 years of age and having no exclusion criteria including any history of liver disease, biliary, pancreatic, intrahepatic duct dilatation, hepatomegaly (liver size more than 15 cm) pancreatic mass or abdominal wall (which obstructs the sonography). Before running the plan, the study protocol was approved by the Ethics Committee of Birjand University of Medical Sciences. Written informed consents were taken from all the participants before entering the study. All sonographic evaluations were performed by a radiologist. The size of the common bile duct was measured with Scanner Real Time(curve linear array probe, 3.5-5 MHz, Toshiba, model Just Vision 1999). Imaging was performed with a maximum inspiration in the supine position. In early sonographic evaluation, the patient's liver size was evaluated in the parasagittal plane and in *Midclavicular* line. Then using the anterior subcostal view, the diameter of the common bile duct and portal vein was recorded in portahepatis(as in the proximal common bile duct). Finally the diameter of the common bile duct was evaluated in the pancreatic head in a longitudinal view of a distal portion. Conduit size was evaluated using electronic caliper, which contained the distance between the two interior walls. (Figure 1).

Body Mass Index (BMI) was measured with the method used in the study of Chourdakis. The meter with a minimum of 1/0 cm was used to measure the height and a digital scale with the accuracy of 1/0 kg was used to measure the weight. Finally BMI was calculated by dividing weight (kg) to the square of height (m2)[14].

In order to assess addiction, we ensured to collect data by asking questions about the status of addiction without asking for personal information and not using them in non-research purposes. In case of a refusal or unwillingness of the individual to answer questions in this area, he/she will be excluded from the study. If the individual wants to enter the study, his/her positive answer to the question "Do you have a drug addiction?" was recorded as a negative response as the non-addiction.

Information about sex, drug use, BMI, age and duct diameter of the proximal, middle and distal parts have been collected by a checklist. The collected data were entered into SPSS version 11.0 software. Mean values (± SD) and frequency(in percent) were presented. To study the normal distribution of data, the Kolmogorov-Smirnov test was used. In order to compare the diameter of the common bile duct and the effect of variables due to the lack of normal distribution of data, Mann-

Whitney and Kruskal-Wallis test was used. Values of p <0.05 was considered significant.

Results

A total of 315 subjects participated in the study. Most participants were female (162 participants 51/4%). The mean age of the study participants was 38/18±15/6 years. The mean BMI of study participants was kg/m^2 24/9±4 and most of them were considered as the normal weight group (124 patients, 39/4 %) and overweight (n = 124, 39/4 percent). 113 patients (35/8 percent) of the participants were addicted and the most used drug was opium (n = 56, 49/5 %) and the most used method was smoking(91 patients, 80 percent). Table 1 shows the demographic characteristics of the study participants. The mean diameter of the common bile duct in three proximal, middle and distal parts were determined as 5/1±2/4mm, 5/6±2/4 mm and 5/9±2/4mm.

In examining the relationship between gender and the diameter of the common bile duct, the results showed that the duct diameter in all three sections of proximal, middle and distal was significantly greater in men than in women. (Respectively, P=0/000, P=0/001, P=0/038) (Table 2).

In examining the relation between BMI and the diameter of the common bile duct, the results showed that there is a significant relation between the body mass index and the diameter of the common bile duct in the middle section (P=0/019) and distal section (P=0/022). So that the diameter of the middle and distal common bile duct in (Respectively P= 0/036 and P= 0/039). Table 3 shows the complete information regarding the relationship between body mass index and bile duct diameter. In examining the relation between the diameter of the common bile duct and age, the results showed that there is a significant relation between the between age and lumen diameter in all three sections of proximal (P=0/005), intermediate (P=0/035) and distal (P=0/011). So that the relation between the common bile duct and the young and middle age groups, the results showed that the diameter of the distal portion of the duct in adult (6±2/4 mm) is significantly greater than younger patients (5/7±2/4 mm). (P=0/033). In examining the relation between the diameter of the bile duct in the proximal, middle and distal among the older patients, the results showed that the duct diameter is significantly greater than the middle-age patients. (Respectively, P=0/004 and Z= -2/858, patients with normal body mass index was higher than the other persons.

Table 1. baseline characteristics

Frequency((%	Variables
	Gender
(51/4)162	Female
(48/6)153	Male
	age[1]
(63/5)200	Young
(26/7)84	Middle age
(9/8)31	Old age
	Body mass index[2]
(11/4)36	Thin
(39/4)124	Normal
(39/4)124	Obsess
(9/8)31	Severe obsess
	Addiction
(35/6)113	Yes
(64/4)202	No
	Type of abused substance
(49/5)56	opium
(15)17	Crystal drug
(13/3)15	heroin
(12/3)14	Crack
(10/6)12	Cannabis
	Way of opium
(80)91	Inhalation
(15/9)18	Oral
(0/03)4	Intravenous

1. Age categories, young : till 39 y/o, middle age : 40-59 Y/O, Old: above 60 y/o
2. BMI categories : thin : less than 19, normal : 19-24, overweight : 25-30, obsess : above 30

Table 2. comparison of CBD in three sections according to the gender

Gender / Variable	male N=152 X±SD	female N=152 X±SD	Mann-Whitney
Proximal diameter(mm)	5/4±2/5	4/8±2/4	Z=0/000 P=-3/818
middle diameter(mm)	5/9±2/4	5/3±2/4	Z=0/001 P=-3/255
Distal diameter(mm)	6/1±2/5	5/7±2/4	Z=0/038 P=-2/070

Table 3. mean of CBD in three sections according to the BMI

BMI / Variable	thin =36N X±SD	normal =124N X±SD	Overweight =124N X±SD	Obsess =31N X±SD	Kruskal-Wallis
Proximal diameter(mm)	4/5±2/2	5/6±2/5	5/1±2/5	4/5±2/1	X^2=5/107 df=3 P=0/164
middle diameter(mm)	4/9±2/2	6±2/5	5/5±2/5	5±2/1	X^2=9/922 df=3 P=0/019
Distal diameter(mm)	5/2±2/2	6/3±2/5	5/8±2/5	5/4±2	X^2=9/587 df=3 P=0/022

Table 4. CBD comparison in three section according to the age

age group / Variable	Young N=200 X±SD	Middle age N=84 X±SD	Old age N=31 X±SD	Kruskal-Wallis
Proximal diameter(mm)	4/9±2/4	5/3±2/4	5/9±2/3	X^2=10/665 df=2 P=0/005
middle diameter(mm)	5/4±2/6	5/8±2/4	6/2±2/4	X^2=6/727 df=2 P=0/035
Distal diameter(mm)	5/7±2/4	6/1±2/4	6/6±2/4	X^2=9/076 df=2 P=0/011

P=0/029 and Z= -2/189, P=0/005 and Z= -2/791). Table 4 shows the complete information regarding the relationship between age and the diameter of the bile duct. In examining the relation between the diameter of the bile duct and addiction, the results showed that the diameter of the common bile duct observed in the proximal, middle and distal sections in addicts (respectively 1 ± 8/2 mm, 1 ± 8/7 mm and 0/9 ± 9 mm) was significantly greater than non-addicts (respectively 0/7 ± 4/3 mm, 7 ± 3/9 mm and 0/6 ± 4/2 mm). (Respectively P=0/000 and Z= -14/808, P=0/000 and Z= -14/433, P=0/000 and Z= -14/850).

Discussion

This paper aimed to investigate the relationship between the diameter of the common bile duct and demographic factors and drug addiction in patients who referred to the imaging department of Imam Reza hospital in Birjand during the year 1391-1392. The results of this study showed that the mean diameter of the common bile duct was determined in three proximal, middle and distal parts. The results showed a significant relationship between bile duct diameter with age, sex, drug abuse, drug use, and type of drug. Normal common bile duct diameter was different in various methods, so that the duct diameter in sonographic examinations is less than the examinations conducted by the CT scan[15]. our study findings have been closer to the normal values reported in sonographic examinations. In the study of Adibi and colleagues that was done by the sonography of the common hepatic duct diameter, it was found that the average diameter of the common hepatic duct at the proximal and distal sections was 1/2 ± 3/64 mm and 1/2 ± 3/72 mm[9]. Also the study by Joshi that determined the common bile duct diameter by using sonography, the duct diameter of the proximal section was 3/76 mm, the middle part was 4/26 mm and the distal section was 4/90 mm[16]. However, Kaim and colleagues reported the sonographic diameter of the common bile duct as 2/5 ± 6/5 mm. This can be due to the study population (elderly) and the impact of aging on the duct diameter[4].

Results of this study showed that there is a significant relation between the diameter of the common bile duct and BMI. Similar results of Adibi et al have been reported that the common bile duct diameter was significantly increased

with the increased BMI[13]. Due to the increasing risk of dyslipidemia with increasing BMI, the observed may be due to the sphincter dysfunction secondary hyperlipidemia[17, 18]. However, this relationship may be due to the fact that the duct diameter is a function of the physical state of the body and increases proportionally with the increasing the size of individual.

In this study, the mean diameter of the common bile duct was significantly greater in men than women. There are many differences in the various studies about the impact of gender on the duct diameter. So that the study of Poralla and colleagues shows the higher duct diameter in men but there was no significant relation between these two variables in the studies of Adibi and Joshi[13, 16, 20] Considering the fact the men have a higher body mass index than women and the duct diameter increases with the increased BMI, thus the relationship observed in this regard can be justified[21]

The mean diameter of the common bile duct in this study significantly increased with increasing age. These results have been confirmed by other studies[9, 11, 16, 19]. However, the relationship between age and the diameter of the common bile duct has not been observed in the study of horrrow and colleagues[5]. The fragmentation of the duct smooth muscle increased with aging. This could be due to the observed association between increasing age and the diameter of the common bile duct[4].

In this study, the diameter of the common bile duct in the addicts was significantly higher than non-addicts. These results were as the same as the results of Adibi and colleagues, Farahmand and colleagues, and Mousavi and colleagues[13, 23, 24]. Drugs affect the oddi sphincter and increase the base pressure, the biphasic contraction range, the frequency of the biphasic contraction of the oddi sphincter and the common bile duct pressure and its distension. (Resulting in urethral smooth muscle dysfunction)[25, 26].

The limitations of this plan are the dependence of the sonography results on the person's skill, the limitations to be used in obese patients with ascites. In this study, gold standard methods were not used, so the future works are suggested to use these methods in order to confirm the findings of the present study.

Conclusion

The results of this study showed a significant relationship between bile duct diameter with age, sex, drug abuse, drug use, and type of drug. According to these results in the case of the presence of the dilated common bile duct in sonographic imaging, and considering age, gender, body mass index and addiction status of the person; the findings need to be adapted to the clinical situation.

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Conflict of Interest: None declared

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