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Study on correlation between liver ultrasonic appearance of patients with chronic hepatitis B and cirrhosis and hydrothorax

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Abstract. – OBJECTIVE: The aim of this study is to analyze the correlation between liver ultrasonic quantitative detection indexes of patients with chronic hepatitis B and cirrhosis and hepatic hydrothorax.

PATIENTS AND METHODS: We selected 56 cases of patients with chronic hepatitis B and cirrhosis combined with hepatic hydrothorax in our hospital from March 2013 to March 2015. Also, we selected 63 cases of patients with cirrhosis without hepatic hydrothorax at the same time. The comparison of liver ultrasonic ...tative detection indexes and positions, ...ties and proportions of hepatic hydrotho... of patients in these two groups was conducte...

RESULTS: In compare to the index of li... size and the level of ALP in tw...ups, the... were not significant differenc...5). In th... observation group, the dia...r of ...al vein, the blood flow velocity ...portal ve... and the level of serum albumin ...ficant... in comparison to th...so... ...p (p<...). For patients with h...thora... both sides of the observation ...p, the dia... of portal vein, blood flow ...y of portal ... and level of serum albu... s...antly decre...ed while comparing to ...e pati...with hydrothorax in right (p<0... The volum... hydrothorax was negati... related to the ...eter of portal vein, ...d flow ...elocity of portal vein and the leve... serum ...umin, while the proportion of hyd...rax... not r...ted to the diameter of porta... ...e blo...ow velocity of portal ... and ...vel o...rum albumin.

CONCLU... ...e liver ultrasonic quantitati... detectio...exes of patients with chronic h...atitis B and cirrhosis, diameter of portal v... ...velocity of portal vein and level ...erum ...umin might be related to the vol...e of hepatic hydrothorax.

Key...ords:
Chronic hepatitis B, Cirrhosis, Liver ultrasound, Hepatic hydrothorax.

...roduction

We investigated t...onic hepatitis B and cir... the stage of ...mpensation, which o... has mass ascites with or without hy...thorax (refe...o "hepatic hydrothorax")[1]. ...t of the pre...us studies were mainly fo...c... on the c...lation between ascites and hep...f...ons or ultrasonic liver appeara... or simply observation of the po...ition, volume and quality of hepatic hydrotho... There were few studies about the correla...on ...ween liver ultrasonic quantitative detection indexes of patients with chronic hepatitis B and cirrhosis and hepatic hydrothorax. Once hepatic hydrothorax is formed, it causes more risk than ascites[6], and it easily leads to chest tightness, shortness of breath, cough and other symptoms. It can be confused with lung and heart diseases, which brings trouble to clinical diagnosis and treatment[7]. Therefore, it is really important to judge the correlation between hepatic hydrothorax and cirrhosis. We analyzed the correlation between liver ultrasonic quantitative detection indexes of patients with chronic hepatitis B and cirrhosis and hepatic hydrothorax.

Patients and Methods

Patients

56 cases of patients with chronic hepatitis B and cirrhosis combined with hepatic hydrothorax in the Digestive Department of our hospital were selected from March 2013 to March 2015. For observation group, 63 cases of patients with cirrhosis without hepatic hydrothorax were also selected at the same time. Exclusion

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criteria was non-hepatitis B cirrhosis, severe cirrhosis in the stage of decompensation, hepatic encephalopathy, non-hepatic hydrothorax (cardiogenic hydrothorax, pulmonary hydrothorax, etc.), pregnancy, infection, autoimmune diseases, severe dysfunctions of heart, liver, kidney and other internal organs, intolerance of ultrasonic examination and thoracentesis, poor compliance and refusal of this study. This study was passed by Ethnics Committee in our hospital and obtained informed consent rights of patients and their families. In the observation groups, there were 33 males and 23 females, aging from 42 to 77, with an average of 56.8±12.3. The disease duration of cirrhosis was from 3 months to 5 years, with an average of 2.4±1.1 years. In the control group, there were 39 males and 24 females, aging from 39 to 78, with an average of 57.4±11.6. The disease duration of cirrhosis was from 2 months to 8 years, with an average of 2.7±1.5 years. The comparison of gender, age and disease duration in these two groups was not statistically significant ($p>0.05$).

Methods

The liver ultrasonic quantitative detecti[on] indexes were observed[2]. MindryDC-7 color [u]sound instrument and convex array probe w[as] used in the abdomen with the f[re]cy of 2.[0]-5.0 MHz. The dorsal positio[n] [g]eral decubitus position was taken [as] measur[ed] the maximum vertical distance o[f] fifth o[n] right as the anteropost[erio]r [di]ameter of the left lobe of the liver. Th[e] thickne[ss] left lobe and the section of lo[ng] diameter m[ea]surement by the sagittal lo[ng]itudinal section o[f] lobe of the liver pa[ss]ing ab[dom]inal aorta was measured. Fur[the]r, the maxi[mum] distance between anterior [and] posterior left [lobe] of the liver as the th[ick]ness o[f] left lobe (including caudate lob[e] as me[asur]ed, and the coated position of supe[rior] and infe[rior] left lobe which was paralle[l] to the medi[an] line of the body as the diam[eter] of [the] lobe was also measured. Th[e] position [for] measuring the diameter of main por[tal] vein and blood flow velocity was main p[ortion] to the ventral inferior vein. After obtaining a longitudinal section of ventral inferior vein, the measuring point was placed in [the] intima of the vascular wall; its vertical dimension was measured and the diameter of the portal vein was obtained. Color Doppler Flow Imaging (CDFI) and power Doppler imaging was started to observe the condition of blood flow of portal vein. Pulse Doppler was used to collect samples from the center of the portal vein, the acoustic beam was adjusted [to] angle of blood flow direction <6[0°] and [the] blood flow velocity was measu[red]. The measurements were carried out wh[en] patients hold breath in the end of inspiration. [Each] measurements have been complete[d] by one pe[rson] and measurements were rep[eated] for 3 times [to] average value. The in[ner] of the [left] of the l[iver] was equal to the ant[erio]steri[or] diameter of the right lobe of the l[iver], [the] of the [left] lobe of the liver and [the] g diam[eter] of the [left] lobe of the liver. Th[e] values of al[anine]notransferase an[d] albumin of [the] patients were recorded, [w]hen th[ey] were admitted into the laboratory of our hospita[l] the same time.

[Du]ration, volume [and] proportion of hepatic hydrothorax was evaluated. MindrayDC-7 color ultrasoun[d] instrument (Indianapolis, IN, [USA]) was used [and] use convex array probe in a[bdo]men with [fre]quency of 2.0-5.0 MHz. In the [supine] position, anterior axillary line, midline and [posterior] axillary line of the back and the fifth to tenth intercostal space of linea [scapularis] was scanned. After detecting liquid [dark] ent area, the upper and lower boundary, right and left distribution range of hydrothorax in crosscut, slit, oblique cutting and other anatomical positions and the depth to body surface were measured. The laboratory test has been adopted by the thoracic puncture.

Evaluation Indexes

The liver ultrasonic quantitative detection indexes including the index of the size of the liver, diameter of portal vein and blood flow velocity of portal vein of patients in these two groups were measured. The laboratory indexes included alanine aminotransferase alkaline phosphatased (ALP) and serum albumin, the position, volume and proportion of hepatic hydrothorax and potential correlation of them.

Statistical Analysis

SPSS 19.0 statistical software (SPSS Inc., Chicago, IL, USA) was used to analyze data. The data was presented as mean ± standard deviation and *t*-test was adopted while comparing between groups. The cases or percentage was used to indicate enumeration data; the χ^2 test was adopted for comparing between groups. $p<0.05$ was considered as statistically significant.

Results

Comparison of Liver Ultrasonic Quantitative Detection Indexes and Laboratory Indexes

While comparing the index of liver size and ALP level, the differences were not statistically significant ($p>0.05$). In the observation group, the diameter of portal vein, blood flow velocity in portal vein and serum albumin levels were significantly lower than those in the control group ($p<0.05$) (Table I).

Comparison of Position, Volume and Proportion of Hepatic Hydrothorax of Patients in the Observation Group

Among 56 cases of patients in the observation group, there were 37 cases of right-sided hydrothorax (66.1%) and 19 cases of bilateral hydrothorax. The volume of hydrothorax was 100-2500 ml with an average of 1356.7±78.9 ml. The volume of left-sided hydrothorax was 50-1600 ml with an average of 756.4 ± 42.3 ml. The proportion of right-sided hydrothorax was 1.008-1.027 with an average of 1.015±0.004; the proportion of left-sided hydrothorax was 1.[illegible]-1.012 with an average of 1.007±0.002. The comparison of the index of liver size and ALP levels in patients with right-sided hydrothorax and patients with bilateral hydrothorax was not statistically significant ($p<0.05$). The volume of hydrothorax was negatively correlated with the diameter of portal vein, blood flow velocity in portal vein and the level of serum albumin, and the proportion of hydrothorax was positively correlated with the diameter of portal vein, blood flow velocity of portal vein and level of serum albumin.

Discussion

Hepatic hydrothorax is usually secondary to chronic cirrhosis in the stage of decompensation, and the incidence reaches 10.5%[8]. It leads to portal hypertension, the extensive fibrosis or cirrhosis in the pseudo-lobular and portal area causes obstruction from the portal vein and hepatic vein to inferior caval vein, the opening of communicating branch of vein and capillary network, and increase of liquid leaking from blood capillary to the thoracic cavity. Also with hepatic edema, swelling of liver capsular and an increase of liquid which is directly penetrating to the pleural cavity by passing diaphragm, hydrothorax is formed[9]. Second is hypoproteinemia in cirrhosis stage of decompensation, total serum protein especially albumin level decreased to reduce plasma colloid osmotic pressure, also the interstitial space increased; therefore the hydrothorax increased[10]. Third is because of hepatic lymphatic return and the obstruction of venous return indirectly causes the increase of lymph circulation, which its thoracic duct load increase its pressure. Because of intrathoracic negative pressure, lymph penetrates into pleural cavity, and the proportion was slightly higher than transudate[11].

The liver ultrasonic examination has the advantages of non-invasive, repeating, convenient etc. It can clearly exhibit hepatic morphology, envelope, tissues, blood flow and others and reflect disease progress. Therefore, it is usually the first choice for examinations of liver diseases in the clinic[12]. The collapse of hepatic lobule, the formation of diffuse fibrous septa and nodular hyperplasia of liver parenchyma in cirrhosis lead to tortuosity and decrease of the portal vein. The mechanical obstruction of portal vein flow and the increase of portal venous resistance[13]. As the liver fibrosis aggravates, the diameter of portal vein narrows gradually and the blood flow velocity reduces[14]. The slowdown of the blood flow velocity of portal vein reflects that portal venous resistance has been increased and liver dysfunction is more serious[15].

We found that comparison of the index of liver size and ALP levels in these two groups was not statistically significant. In the observation

Table Comparison of liver ultrasonic quantitative detection indexes and laboratory indexes.

	Index of liver size (cm)	Diameter of portal vein (cm)	Blood flow velocity of portal vein (cm/s)	ALP (U/L)	Serum albumin (g/L)
Control	21.5±1.3	1.6±0.3	19.7±3.8	75.4±6.6	57.8±5.6
Observation	21.8±1.4	0.8±0.2	12.6±3.2	76.9±5.3	35.4±4.2
t	0.527	4.512	4.127	1.027	5.106
p	0.614	0.038	0.041	0.934	0.034

group, the diameter of the portal vein, the blood flow in the portal vein and serum albumin levels decreased significantly in comparison to the control group. When comparing patients with bilateral hydrothorax and patients with right-sided hydrothorax in the observation group, the results were similar. The volume of hydrothorax was negatively correlated to the diameter of the portal vein, the blood flow velocity in portal vein and serum albumin levels, while the proportion of hydrothorax was not related to them.

Conclusions

Among liver ultrasonic quantitative detection indexes of patients, the diameter of portal vein, the blood flow velocity in portal vein and serum albumin levels might be related to the volume and proportion of hepatic hydrothorax.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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