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The identification of the cystic artery

Sistik arter varyasyonları

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ÖZET: *Safra kesesi arteria cystica tarafından beslenir. Arteria hepatica propria'dan ayrılan ve ductus hepaticus communis'in önünden geçen bu arter, cerrahları yakından ilgilendiren bir çok varyasyona sahiptir. Bu çalışmada safra kesesinin arteriel beslenmesi 75 otopsi ve 50 kadavra üzerinde incelendi. Arter çevre yapılardan ayrılıp gözlendi ve ilişkileri önceki çalışmalarla karşılaştırılabilir sonuçlar alındı.*

Anahtar Kelimeler: **Sistik arter, varyasyon**

SUMMARY: *The gall bladder is supplied by the cystic artery. There are several alternative patterns, however, of great interest to the surgeon, including an cystic artery arising from the arteria hepatica propria and passing anterior to the common hepatic artery. A study of the arterial supply of the gall bladder in 75 autopsies and in 50 cadavers is presented. The arteries were visualized and the relations of the cystic artery were found comperable with previous studies.*

Key Words: **Cystic artery, variation**

THE gall bladder is supplied by the arteria cystica. This branch of the arteria hepatica propria's ramus dexter usually passes posterior to the ductus hepaticus communis and ductus cysticus on its way to the gall bladder. This area is so remarkably variable that there are several patterns. These variations are very important especially for the surgeon (2, 12) because cholecytectomy is the most common intra-abdominal operative procedure (6).

Since Most instances of ductus hepaticus communis injury during cholecystectomy are preceded by uncontrolled hemorrhage from an aberrant arteria cystica or arteria hepatica propria(7, 9). The surgeon must acquaint himself with the varied arterial patterns and attempt to identify them(2, 8, 13). The surgeon usually uses the term of Calot's triangle for the area. Calot's triangle is composed of the arteria cystica, ductus cysticus and ductus hepaticus communis (11, 13).

The main aim of the present study is to investigate the variations of the cystic artery. These variations wil be condensed and presented in our study as a guide to precautions in operative procedures such as cholecystectomy.

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MATERIAL AND METHOD

The study was performed by 75 randomly selected autopsies from Forensic Medicine Council Izmir Group Chairmanship Mortuary Specialization Office and 50 cadavers from the dissection room of the Anatomy Department between 1994 and 1995.

The arteries were visualized and the relations of the arteria cystica with the ductus cysticus were revealed (Fig.6, Fig.7). For each determined group, the percentage was found and compared with the results of previous studies.

RESULTS

In all cases the arteries of the gall bladder were clearly visualized. We studied 75 autopsies and 50 cadavers and we determined eight different groups of cases depending on the origin of the cystic artery.

Group 1: In this group, the cystic artery arose from ramus dexter of the hepatic artery proper. This group might be subdivided into four subgroups according to the relation with the cystic duct:

(a) In Calot's triangle to the right of common hepatic duct: 57.6 % (Fig. 1a)

(b) Crossing in front of the common hepatic duct: 20% (Fig. 1b)

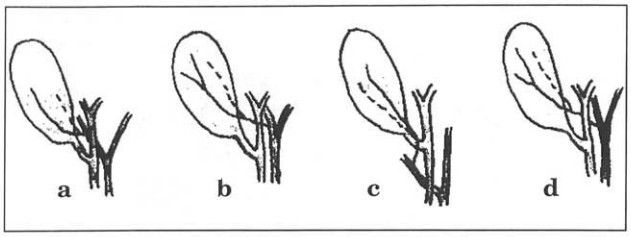

Fig. 1. *Four subgroups of arteria cystica arising from ramus dexter of the arteria hepatica propria.*

(c) Crossing the neck of the gall bladder or ductus cystic duct : 4% (Fig. 1c)

(d) Crossing behind the common hepatic duct: 2.4% (Fig. 1d, Fig.6)

Group 2 : In this group, the cystic artery arose from the left branch of the common hepatic artery crossing in front of the bile duct (ductus choledochus) : 8% (Fig.2)

Group 3 : In this group, the cystic artery arose from the left brunch of the hepatic artery proper (3.2 %) (Fig.3)

Group 4 : In this group, the gall bladder received the arterial blood supply from the point of division of the two branches of the hepatic artery proper (3.2%)(Fig.4)

Group 5 : In this group, two separate cystic arteries arose from the right branch of the hepatic artery proper (1.6 %) (Fig.5).

The number and percentages of the groups in the present study are shown in Table 1.

DISCUSSION

The cystic artery is usually described as a branch arising from ramus dexter of the arteria hepatica propria in Calot's triangle, i.e. the triangle between the ductus hepaticus communis and ductus

Table 1. The number and percentages of the groups.

	No. of cases	%
Group 1a	72	57.6
Group 1b	25	20
Group 1c	5	4
Group 1d	3	2.4
Group 2	10	8
Group 3	4	3.2
Group 4	4	3.2
Group 5	2	1.6

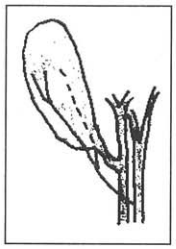

Fig. 2. *Cystic artery arising from the left branch of the common hepatic artery*

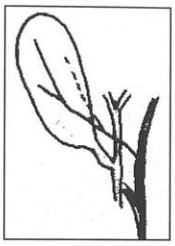

Fig. 3. *Cystic artery arising from the left branch of the hepatic artery proper*

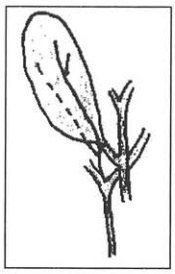

Fig. 4. *Cystic artery arising from the point of the division of the hepatic artery proper*

Fig. 5. *Two separate cystic artery arising from the right branch of the hepatic artery proper*

cysticus. This means that the cystic artery enters the gall bladder after a short course without crossing any important structures (5, 13). Hugh found this pattern in 72% of their patients (7). In our material this pattern was present in only 57.6 % of the cases. Next with a frequency of 20 %, the cystic artery was derived from the right branch of the hepatic proper and crossed in front of the common hepatic artery duct.

Compared to the findings of Daseler, based upon the study of 500 cases, the cystic artery originated in Calot's triangle in 69.8, a frequency somewhat higher than in our material. The next most frequent group in our study (Group 16) is larger than the corresponding group of Daseler, 20% against 13.1 % (3,4,5).

In our material we found that the cystic artery was derived from the common hepatic artery in 8%. Halvorsen found this variant in 10%, Daseler in only 2.2% and Browne in 3,5 % of the cases (3,4,5). In Halvorsen's study there were two different groups arising from the common hepatic artery. In 6 % cases the cystic artery was crossing behind ductus hepaticus communis and in 3 % of cases, it was crossing in front of the common hepatic duct. we did not determine in our material.

In some cases, the origin of the gastroduodenal artery was found (3 % in Halvorsen's study and 2,6 % in Daseler's study) but it was not found in our material(4,5).

The finding of multiple cystic arteries, most often double, is higher in other series than in ours : Daseler 15.6 %, Michels 25%, Browne 21% : Halvorsen 3% and in our material 1.6% (3,4,5).

Fig. 6. *A sample for Group 1(d).*

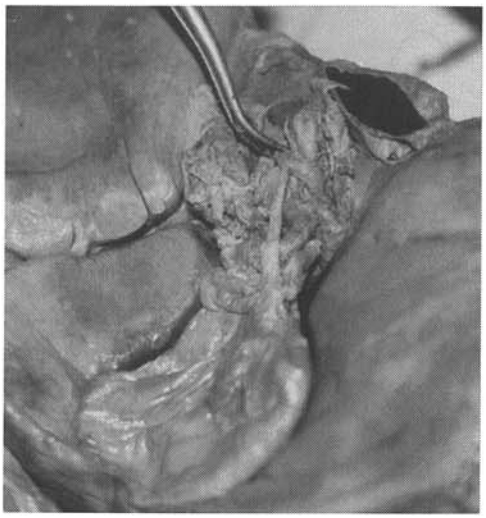

Fig. 7. *A sample for Group 1(b).*

There was a special variant determined by Halvorsen which was not seen in our material where the gall bladder is supplied by small vessels from a larger of the right branch of the hepatic artery proper running between the gall bladder and the liver. This variant might create problems at cholecystectomy. It is of little importance since this was not found in the large series of Browne and Daseler. (3,4,5).

Ata performed 200 laparoscopic cholecystectomies and described the anatomy of the arteria cystica. In this study, several variations were noted and a simplified classification of give types was given to aid the surgeon in identifying that structure (1).

As mentioned above, the groups we determined are similar in present studies. Uncontroled arterial bleeding during cholecystectomy is still a serious problem and may increase the risk of cystic duct damage. Therefore, the identification of the anatomy of the cystic artery is important (1,7,10). Careful idientification of arterial variations should help to reduce the incidence of the cystic duct injuries during cholecystectomy.

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