CASE REPORT

The phrenic ganglion in man

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During educational dissections we observed a phrenic ganglion on the nerve of the phrenic artery originating from the upper pole of the right coeliac ganglion, which accompanied the right inferior phrenic artery on a female cadaver at the age of 34. In our case the left coeliac ganglion, the inferior phrenic artery, the right and left greater, lesser and least splanchnic nerves were present and normal. However, the left nerve of the phrenic artery and the phrenic ganglion were absent.

We consider that this rarely reported neural formation may be of importance for anatomists and clinicians.

key words: human anatomy, unilateral phrenic ganglion

INTRODUCTION

The source and distribution of fibres, the anatomical connections, variations and formation of the coeliac ganglion in the abdomen have been reported previously. The major part of the autonomic system in the abdomen is the coeliac ganglion and its plexus. Many studies have already been performed on the anatomy of the coeliac ganglion and its connections [5, 9, 10]. However, these studies have not provided detailed information about the phrenic ganglion and its nerve. In general, the nerve of the inferior phrenic artery (or nerve of the phrenic artery) and a small phrenic ganglion may exist on both the right and the left sides of human body [11]. However, the phrenic ganglion may not be present in every case. When a phrenic ganglion is present, it is found on the course of the nerve of the phrenic artery. When there are anomalies in the origin and course of the phrenic artery, the phrenic ganglion and the nerve of the phrenic artery tend to follow its origin and course [2, 6]. It has been noted that the phrenic ganglion and the nerve of the phrenic artery are sympathetic. Some researchers have reported that the phrenic ganglion and the nerve of the phrenic artery form a potential source of extraphrenic innervation of the diaphragm, which is important for surgery and anaesthesia of the diaphragm [3, 8].

CASE REPORT

We observed a phrenic ganglion and a nerve of the phrenic artery during the dissection of a 34-year-old female cadaver. The nerve of the phrenic artery arose from the right upper pole of the coeliac ganglion, coursed upwards and crossed the right inferior phrenic artery obliquely from its anterior surface. During its course the nerve of the phrenic artery accompanied the anterior branch of the right inferior phrenic artery (Fig. 1A).

The phrenic ganglion was observed on the right nerve of the phrenic artery at the level of T10–11, over the right crus of diaphragm. It was located 40 mm above the coeliac ganglion, covered by connective tissue. The length of the nerve of the phrenic artery was 72 mm. The distance between the coeliac ganglion and the point where the nerve crossed the artery obliquely was 20 mm. The phrenic ganglion was coneshaped and its length, width and thickness were $5 \times 4 \times 2$ mm respectively. The right coeliac ganglion was quadrangular-shaped. The abdominal lengths of right and left splanchnic nerves were 8 mm and 7 mm respectively (Fig. 1B).

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DISCUSSION

The formation and anatomical variations of the coeliac ganglion and its plexus have aroused a lot of interest among anatomists and clinicians [5, 9, 10]. However, anatomical textbooks and literature, do not give detailed information about the unilateral or bilateral formation, frequency, function and anaesthesia of the phrenic ganglion and the nerve of the phrenic artery [1–6, 9, 11].

The posterior branch of the right phrenic nerve passes through the caval opening and distributes largely on the abdominal surface of the diaphragm. Some authors have reported that the subperitoneal branches of the nerve of the phrenic artery distribute accompanying the inferior phrenic vessels and that along these vessels they communicate with the phrenic sympathetic plexus [3, 7].

We observed a nerve of the phrenic artery and its ganglion accompanying the right inferior phrenic artery. There was some communication between the phrenic ganglion and the posterior branches of the right phrenic nerve. It is unknown whether these communicating fibres originate from the phrenic ganglion and reach to the posterior branches of the phrenic nerve or they originate from the posterior branches of the phrenic nerve and reach to the phrenic ganglion. According to the general concept, the nerve of the phrenic artery and its ganglion are vasomotor.

Hidayet [3] reported that the diaphragm may receive some fibres from the phrenic ganglion. These fibres may be responsible for uncontrollable spasms of the diaphragm (i.e. hiccoughs). During the waking period respiration continues voluntarily. However, in sleeping it continues involuntarily. It may be a reasonable interpretation that paroxysmal contraction of the diaphragm may be due to autonomic influences on the diaphragmatic musculature. If the phrenic ganglion and the nerve of the phrenic artery play a role in the

Figure 1. The nerve of the right inferior phrenic artery and its ganglion in man. A. A right phrenic ganglion; B. Isolated view of the phrenic ganglion and related structures. RCG — right coeliac ganglion, GSN — greater splanchnic nerve, RC — right crus of diaphragm, SG — suprarenal gland, NPA — nerve of the inferior phrenic artery, RIPA — right inferior phrenic artery, PG — phrenic ganglion, PB — posterior branches of the right phrenic nerve descending into the crural region.
extraphrenic innervation of diaphragm, the existence of this communications may be of importance for surgical incisions and anaesthesia of the diaphragm.

As a conclusion, we believe that it may be important to investigate the phrenic ganglion and its communication fibres microscopically.

REFERENCES