

Characteristic of unique tubular structures believed to be meridian line from abdominal wall

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Abstract: We could isolate unique tubular structures from the abdominal wall of rabbit where the traditional meridian lines are located. Hematoxylin-eosin stained section of the duct showed unique tubular structures along which rod shaped nuclei were distributed as broken-line stripes, which is a typical characteristic of Bonghan duct. Cryosection of the duct stained with toluidine blue showed many lines of the rod shaped nuclei.

Key words: tubular structures, meridian line, Bonghan duct, cryosection, rod shaped nuclei

1. Introduction

In the early 1960's the North Korean scholar Bong Han Kim showed the anatomical entity of the acupoints, and explained the meridian system as the concrete tubular structure through which the liquid containing small granules flow (1,2). Bong Han Kim even showed that meridian lines are not confined to under the skin as traditionally believed, but is ubiquitous. They exist inside blood vessel (intravascular Bonghan duct), outside blood vessel (extravascular Bonghan duct), along the surface of internal organ or inside peritonea (intra-extravascular Bonghan duct), and along the central and peripheral nervous system (neural Bonghan duct). Kim and Kong (3) reviewed Bonghan theory.

Although Kim's researches were met with many

skepticism, it has not been seriously pursued by other researchers, mainly because he had not given detailed description of the techniques. The only research which supported Bonghan theory was by Fujihara (4) in Japan until the end of 20th century. However, recently, Soh and his research team published many data demonstrating the presence of ductal lines inside blood vessel and lymphatic vessel called as 'primo' (5), both of which are mentioned as 'intravascular Bonghan duct' in Bonghan theory. We also isolated Bonghan duct from various sources. Bonghan was also isolated from the surface of organ (6) and from the abdominal wall (7). The tubular structure of Bonghan duct consisting of 3 different levels of layers was suggested.

In this article we isolated Bonghan duct from the membrane from abdominal wall where the traditional meridian lines are located. Their properties will be discussed.

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2. Material and Methods

Animals

Female New Zealand White rabbit weighing 2-2.5 kg were used. Ether was used as anesthesia. However, general anesthetic techniques are applicable.

Light microscopy

Isolated ducts were fixed in 10% neutral buffered formalin, dehydrated through a graded series of ethanol, and embedded in paraplast (Polyscience, USA). The paraffin block was cut by microtome (Richert-Jung, USA), stained with hematoxylin-eosin, and observed under the light microscope (Olympus, Japan).

Cryostatate was obtained by embedding with OCT compound. Microsection of 5 μ m were cut with a freezing microtome and stained with toluidine blue.

3. Results and Discussion

Skin is the place where the traditional meridian lines are located. The ducts believed to be meridian line were obtained from the abdominal wall just below the skin (Fig. 1). The fiber-like structures could be directly observed inside the membrane. Isolated structures were very elastic, and shrinks very easily once cut. They were fixed and stained.

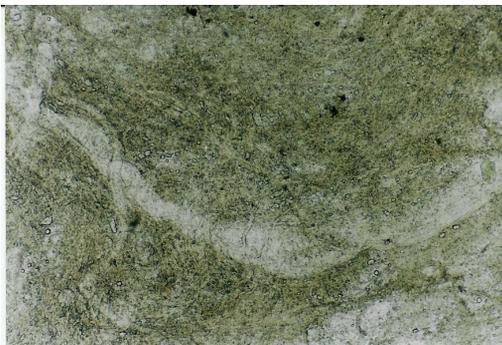


Fig. 1 Bonghan ducts observed from the membrane below the abdominal wall.

The longitudinal and cross section of the fiber-like structures after hematoxylin-eosin stain confirms the existence of tubular structure which are different from blood or lymphatic vessel (Fig. 2 & Fig. 3). According to Bonghan theory, Bonghan duct was formed of a bundle of tubules though which the small granules flow (1, 2).

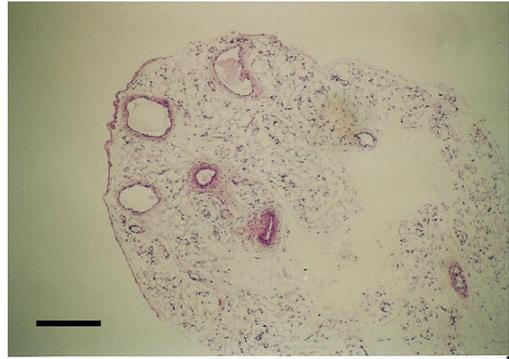


Fig. 2 Cross section of Bonghan duct.
Scale bar=200 μ m.

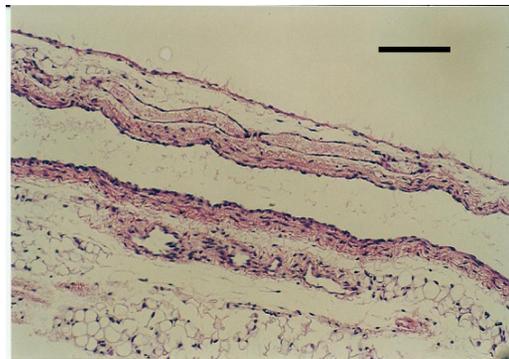


Fig. 3 Longitudinal section of Bonghan duct.
Scale bar=50 μ m.

Cross section shows that the isolated duct from the abdominal wall was formed of a bundle of tubules locating outside the Bonghan duct (Fig. 2), leaving inside the duct empty. The diameter of the duct was about 100 μ m, which matches that of Bonghan theory. Longitudinal section of the tubular structure shows the presence of the rod

shaped endothelial nuclei as broken line stripes at the internal surface of tubular structure, which is a typical characteristic of Bonghan duct (**Fig. 3**).

After removing connective tissues, they could be further purified (**Fig. 4**). Cryosection of the duct stained with toluidine blue also showed many lines of the rod shaped nuclei distributed as broken-line stripes (**Fig. 5**), which confirms the identity of the isolated duct as Bonghan duct.

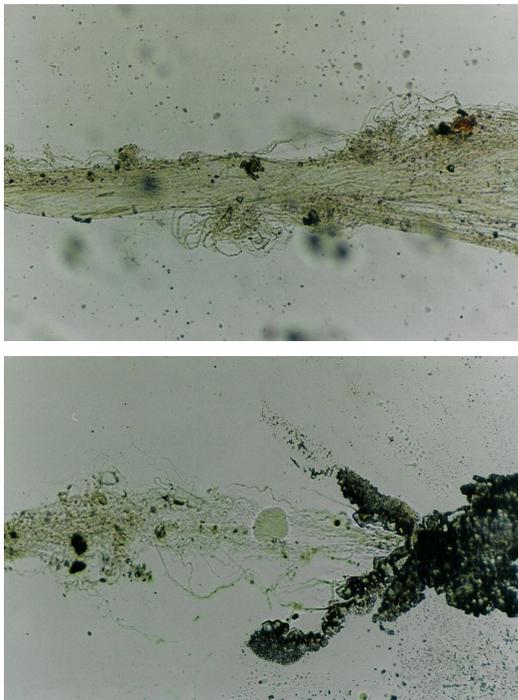


Fig. 4 Isolation of the Bonghan duct by removing the connective tissues.

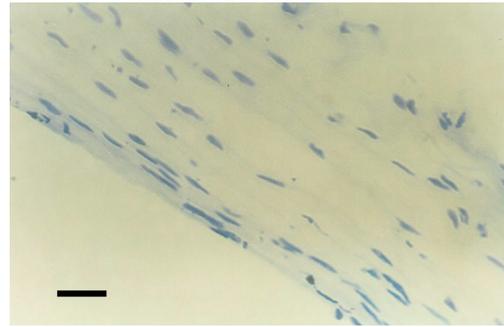


Fig. 5 Frozen section of isolated Bonghan duct.
Scale bar=20µm.

Present investigation suggests that the ductal system isolated from the abdominal wall where the traditional meridian line located might be the Bonghan duct.

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