Ultrastructural characterization of ICC

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More than one hundred years ago, a Spanish neuroanatomist, Santiago Ramón y Cajal (1852-1934) described cellular networks associated with the gut nerve. The cells, now known as interstitial cells of Cajal (ICC) were thought to be primitive neurons at that time. Since then ICC have been the subject of histological studies. Since the era of electron microscopy (1960-), ultrastructural identification of ICC have been attempted by several investigators. Morphological studies have suggested the roles of ICC. A recent breakthrough in the ICC research was triggered by the novel hypothesis proposed by Thuneberg (1982), suggesting that ICC act as pacemakers of gut movement. This hypothesis greatly stimulated morphological and physiological studies of ICC.

Although there were some controversy arised from animal species or organs, the feature of ICC has been unveiled. ICC possessed ultrastrucural features of smooth muscle cells and “connective tissue cells” (including fibroblast), however, they were clearly distinguished from smooth muscle and fibroblast. So some researchers considered ICC as “hybrid cells”, but some researchers who regarded their muscle-like features as important considered ICC as “myoid cells”. Recently, Torihashi et al. (1997) suggested that ICC associated with the myenteric plexus derived from common precursors of longitudinal smooth muscle cells. At present, most of the ICC’ists accept that ICC are myoid cells.

The finding of a receptor tyrosine kinase, c-KIT in ICC was the second breakthrough in this field. ICC specifically express c-KIT and signaling via c-KIT is important in the development and maintenance of ICC. Based on these findings, c-KIT became accepted as the most reliable marker for ICC. c-KIT immunohistochemistry clearly depict the distribution of ICC at the light microscopic level and it made easy to analyze ICC in normal and pathological conditions. In addition, c-KIT immunohistochemistry paves the way for new ICC researches in various organs besides the gut.

In this lecture, the progress of morphological study of ICC will be introduced.

Reference: