—Photogravure—

Autophagy by Podocytes in Renal Biopsy Specimens

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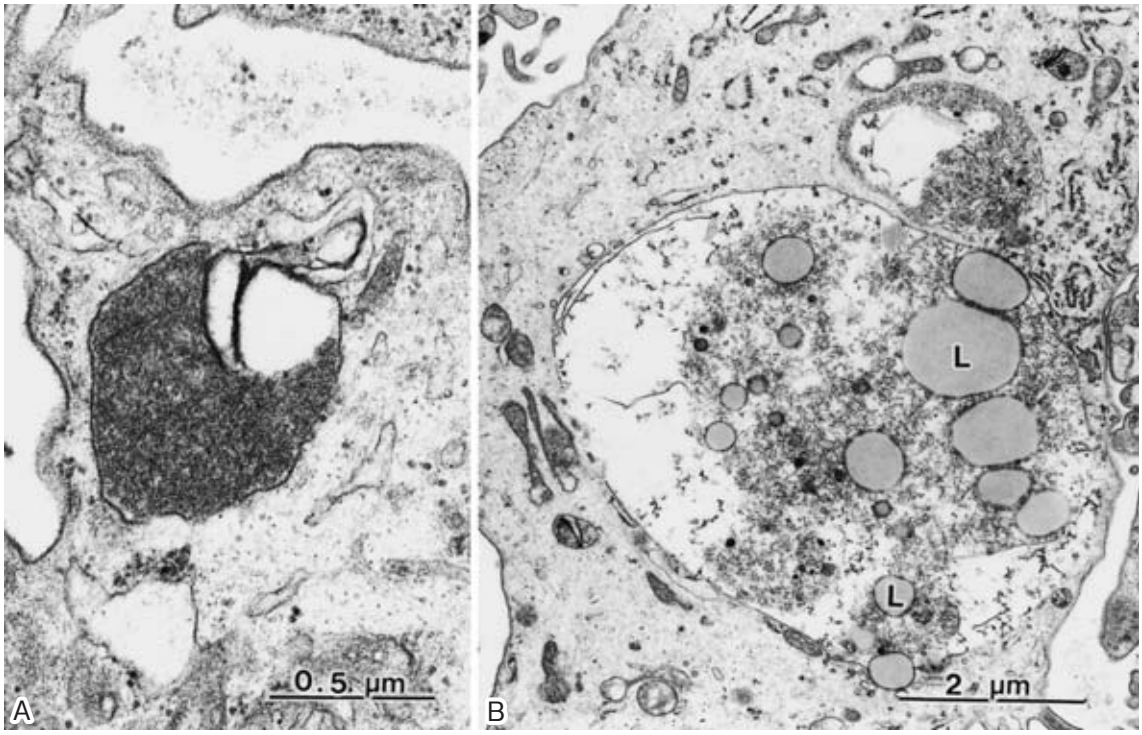

Fig. 1

Autophagy, a process of bulk protein degradation and organelle turnover, is induced under starvation conditions in yeast and plays an important role in developmental processes and human diseases[1]. Autophagy is a nonapoptotic form of programmed cell death[2]. Disturbances in autophagy and programmed cell death may lead to cancer and several degenerative diseases in humans[3].

During the routine ultrastructual examination of renal biopsy, specimens we found two types of autophagy in podocytes[4]. The presence of autophagy in patients with renal disease might represent a change in physiological conditions to prevent podocyte damage. Of the renal diseases with autophagy in podocytes, type I autophagy was found in 10% of cases and type II autophagy in the remaining 90% of cases. The presence of type I autophagy was not clearly correlated with age, sex, or pathological diagnosis. However, many cases of type I autophagy were associated with a long history of treatments for renal disease[4]. Thus, the appearance of type I autophagy might suggest a poor prognosis.

Protein and lipid clearance were greater in type II autophagy than in type I autophagy. However, whether type I autophagy evolves into type II autophagy or whether a mutation in the autophagy gene occurs is unclear.

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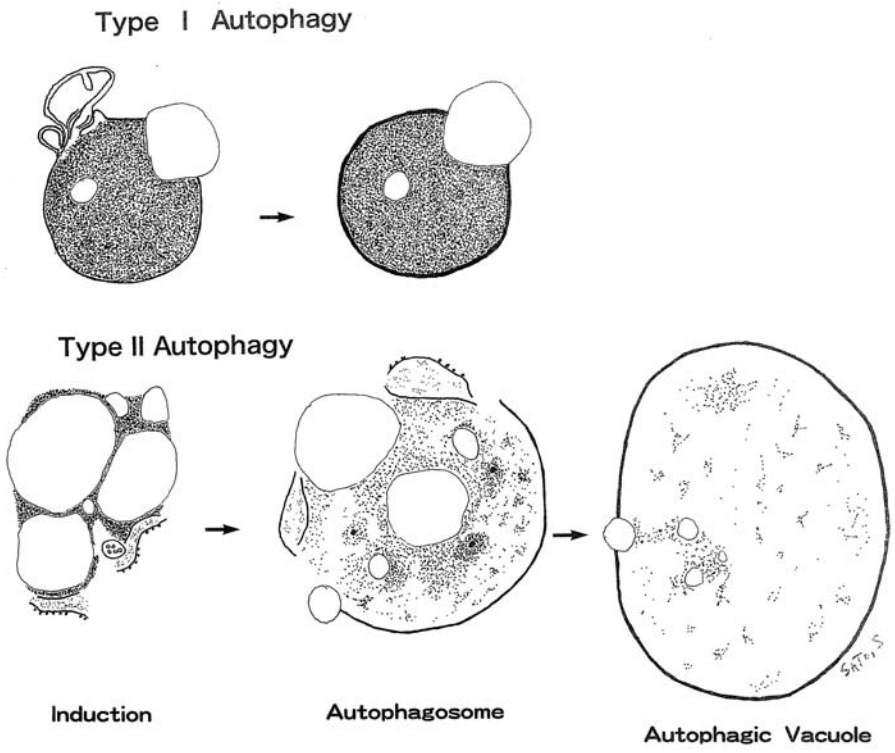

Fig. 2

Fig. 1A Type I autophagy showed condensed ribosomes with limiting membranes.

Fig. 1B Type II autophagy. Autophagosomes showed dispersed ribosomes and many lipid droplets (L) without complete limiting membranes.

Fig. 2 Diagram of type I and type II autophagy formations in podocytes in human renal diseases.

Type I Autophagy: At induction, many ribosomes aggregated and formed condensed ribosome areas. The limiting membranes are formed by a unit membrane of degenerated mitochondria. Finally, the thickness of the limiting membranes increases from 5～6 nm to 8～10 nm.

Type II Autophagy: At induction, many ribosomes and lipid droplets aggregated, first forming areas of condensed ribosomes. Next, the rough endoplasmic reticulum is connected to the condensed ribosome area. Formation of autophagosomes and protein and lipid conjugation are evident. Finally, the limiting membrane increases in thickness from 5～6 nm to 8～10 nm and forms autophagic vacuoles.

References

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