LYSOMES AND LIPID INCLUSIONS IN THE OXYNTIC CELLS IN CHRONIC GASTRITIS

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Endoscopic biopsy specimens taken from the mucous membrane of the stump of the resected stomach of 40 patients with various postgastrectomy complications were studied by electron microscopy. Numerous electron-dense inclusions, consisting of cytolysosomes or secondary lysosomes, were found in the cytoplasm of the oxyntic cells in chronic gastritis. Primary lysosomes were also found in the oxyntic cells in the region of the neck of the fundal glands. The oxyntic cells had an increased content of lipid droplets and spherical bodies.

The morphology and function of the lysosomes in cells of various organs have recently attracted considerable attention [8, 14, 19]. However, the lysosomes of oxyntic cells remain almost completely unstudied, for only one investigation of these structures, in the gastric mucous membrane of the hamster [20] exists in the literature. Lysosomes in the oxyntic cells of the human stomach have not been studied. In their description of the ultrastructure of the oxyntic cells in the gastric mucosa of man and animals, investigators have merely mentioned that lysosomes are present in the cytoplasm. In most papers the term "lysosome" is not used at all; it is replaced by expressions such as "microbodies" and "mycelin figures" [13, 17], or "dense bodies" [10, 11, 16]. Helander [11] and Rubin et al. [16] suggest that lysosome-like bodies or dense bodies are lysosomes in different stages of functional activity. The morphology of the lysosomes in the oxyntic cells has not been described under pathological conditions.

In chronic gastritis the number of oxyntic cells is reduced. In the light of new information on the important role of lysosomes in physiological and pathological involution [5, 6, 7, 8], the study of the morphology of "intracellular digestion" in the oxyntic cells is definitely interesting.

The object of the present investigation was to study the morphology of lysosomes and other inclusions of the oxyntic cells in chronic gastritis.

EXPERIMENTAL METHOD

The gastric stump in patients treated by operation for peptic ulcer was used as the test object. Material obtained by endoscopic biopsy from 40 patients during gastroscopy, performed by Yu. V. Vasil'ev, was studied. Pieces of mucosa in each case were excised from two places (near to and 3-5 cm from the gastroenterostomy). Histological investigation of the same objects showed that atrophy was nearly always well-marked in the region of the gastroenterostomy (L. I. Aruin). Different forms of chronic gastritis were found in the stump. In six cases (with peptic ulcers of the jejunum) the mucous membrane of the stump was normal in structure.

After fixation in 1% osmic acid solution in phosphate or veronal-acetate buffer for 2 h at 4°C, the stomach tissue was dehydrated in alcohols of increasing concentration and embedded in Epon-812. Ultrathin

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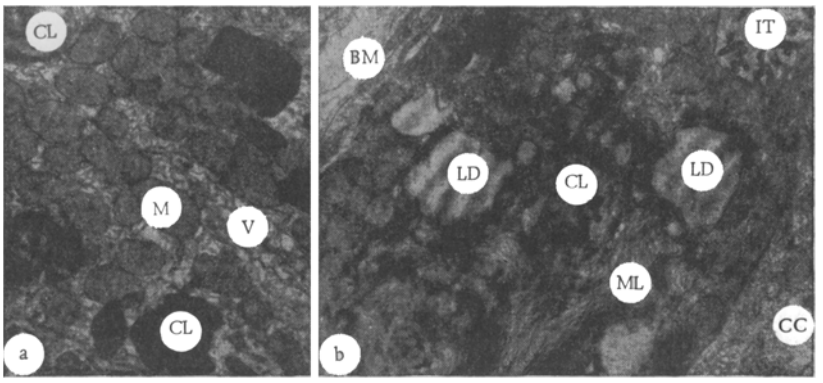

Fig. 1. Cytolysosomes of oxyntic cells in chronic gastritis: a) CL) cytolysosomes; M) mitochondria, V) vacuoles of the smooth endoplasmic reticulum, 15,000 ×; b) picture of autolysis, cytolysosome occupies nearly all of the cell; BM) basement membrane; LD) lipid drop; IT) intracellular tubule; CC) chief cell; ML) myelin figures of cytolysosome (CL), 10,000 ×.

sections were cut on an LKB ultratome, shadow-cast with uranyl acetate and/or lead [15], and studied in the UEMB-100 V electronmicroscope.

EXPERIMENTAL RESULTS

Electron-dense inclusions of various shapes, measuring from 0.5 to 2 μ in diameter (Fig. 1a), with the usual type of limiting membrane, were found in the cytoplasm of the oxyntic cells. More or less densely packed myelin figures, lipid drops, and granular and amorphous substances of different electron-density (Fig. 1b) could be seen in them. Sometimes vacuoles with a finely granular matrix, containing well-preserved organelles (Fig. 2a), were seen in the oxyntic cells. According to results obtained by many investigators [4, 10, 3, 9, 20], these cytoplasmic inclusions are products of autophagia and subsequent autolysis of lipoprotein, they contain all the lysosomal enzymes, and with respect to their functions they can be described as secondary lysosomes, autophagic vacuoles, or cytolysosomes. The residual products of proteolysis may differ widely, depending on the nature of the substance undergoing lysis and the phase at which the process is stopped by fixation. This accounts for structural differences between the cytolysosomes [4, 2, 5].

The number of oxyntic cells containing cytolysosomes was directly proportional to the severity of the mucosal lesion in chronic gastritis. In atrophic gastritis, cytolysosomes were found in the cytoplasm of most oxyntic cells. In any form of chronic gastritis, the number and size of the cytolysosomes in each cell depended on its position in the fundal gland. Histochemical examination of these objects (L. I. Aruin) revealed increased acid phosphatase activity in the oxyntic cells in the region of the fundus of the glands in chronic gastritis. In the same place there were oxyntic cells whose cytoplasm was almost completely replaced by an enormous cytolysosome (Fig. 1b). In the neck of the fundal glands, few cytolysosomes were seen, and sometimes there were none. In some cases primary lysosomes with pale, granular contents were found. The ultrastructural changes in the oxyntic cells were always accompanied by powerful development of cytolysosomes. On the other hand, often when large autophagic vacuoles were present, the remaining organelles were completely intact. In all degenerative processes in the oxyntic cells, lysosomes evidently play an important role as the response reaction to the onset of cellular toxemia. The presence of autophagic vacuoles in an unchanged cell reflects processes of involution during its aging [7, 8], and in chronic gastritis these are evidently much more marked. The fact that the cytolysosomes are most highly developed in the oxyntic cells in the floor of the fundal glands indicates that they have finished their life cycle in that place, and that the main mechanism of their death is autolysis. Some investigators [1, 18] have observed large numbers of cytolysosomes in the oxyntic cells of the normal mucous membrane. Under normal conditions lysosomes evidently play the dominant role in involution of the oxyntic cells.

In chronic gastritis the oxyntic cells have an increased content of lipid droplets, sometimes reaching 2 μ in diameter (Fig. 2b). Such inclusions are evidently the ultrastructural reflection of lipophanerosis,

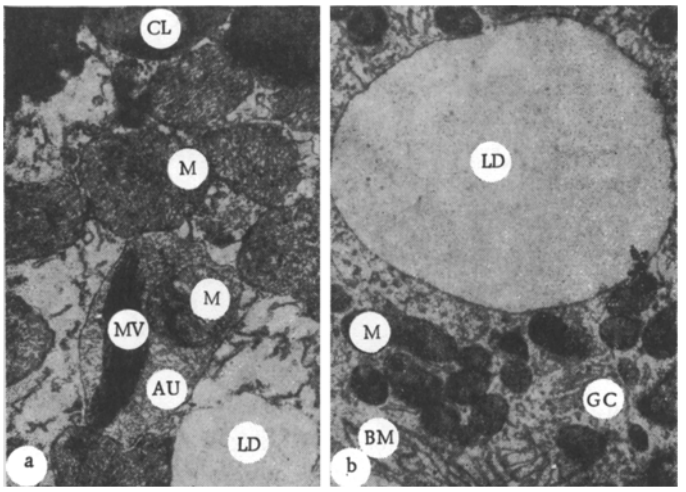

Fig. 2. Oxyntic cell in chronic gastritis: a) AV – autophagic vacuole containing preserved mitochondrion (M) and myelin figures (ML), 25,000×; B) LD – large lipid drop; GC – Golgi complex, 8000×. Remainder of legend as in Fig. 1.

which takes place more rapidly in the presence of increased destruction of the lipoproteins of the cytoplasm [6, 7].

Spherical bodies with a dense core and thin limiting membrane, measuring 0.1-0.2 μ, are frequently found in oxyntic cells. Their appearance can be regarded as a reaction of many tissues to outside interference [12]. Rubin et al. [16] described such inclusions in the oxyntic cells of the normal human mucous membrane.

It can accordingly be concluded that the electron-dense inclusions in the cytoplasm of the oxyntic cells in chronic gastritis are secondary lysosomes or cytolysosomes. The lysosomes play an important role in physiological involution of the oxyntic cells under normal conditions and in chronic gastritis. In the latter case the oxyntic cells have an increased content of lipid droplets and spherical bodies.

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