

Ultrastructure of mass of floccular substance in the parathyroid gland of golden hamster

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Summary. Mass of floccular substance was observed in the parathyroid glands of fetal, newborn and infantile golden hamsters. Mass composed of floccular substances was spherical with no limiting membrane around it. It was located near the nucleus and the Golgi area, but was also observed in the peripheral cytoplasm. No cell organelles were detected within area of mass.

Key words: Floccular substance, Parathyroid gland, Ultrastructure, Golden hamster

Introduction

Much work has been published on the ultrastructure of the parathyroid gland (Isono et al., 1990). However, intracytoplasmic masses composed of floccular substances in the parathyroid gland have never been reported. Recently, focal hyperplasia of intracytoplasmic filaments was described in the parathyroid gland of dog treated with nalidixic acid (Yasuda et al., 1983) and Mallory body-like inclusion was demonstrated in the parathyroid gland of dog exposed to ozone inhalation (Atwal and Pemsingh, 1984).

We happened to observe masses of floccular substance in the chief cells of the parathyroid glands of fetal, newborn and infantile golden hamsters under normal conditions. This study presents the ultrastructural features of these masses.

Materials and methods

Fifteen-day-old golden hamster fetuses and 1-, 5-, 10-, 15-, 20- and 25-day-old golden hamsters of both sexes of 5 each were used in this study. The parathyroid glands of all groups were removed under sodium

pentobarbital anesthesia. The glands were immersed in a mixture of 2.5% glutaraldehyde and 2% OsO₄ in Millonig's buffer at pH 7.4 for 1 hour, dehydrated through increasing concentrations of acetone, and embedded in Epon 812. Thin sections were cut on a Porter-Blum Mt-1 ultramicrotome, stained with uranyl acetate and lead salts, and examined in a Hitachi H-700 H electron microscope.

In each golden hamster from the 7 groups, 20 micrographs at a final magnification of 12,000 were taken of different regions of the parathyroid glands. The number of masses of floccular substance in 100 micrographs from each group was estimated.

Results

The chief cells of the parathyroid glands of 15-day-old golden hamster fetuses contained large lakes of glycogen particles, many lipid droplets, a few secretory granules, relatively abundant free ribosomes and mitochondria, and relatively well-developed Golgi complexes and cisternae of the granular endoplasmic reticulum (Fig. 1). The ultrastructure of the parathyroid glands of 1- and 5-day-old golden hamsters almost resembled that of 15-day-old fetuses except for dilated cisternae of the granular endoplasmic reticulum having floccular substance (Figs. 2, 3). In the chief cells of 10- and 15-day-old golden hamsters, abundant free ribosomes and mitochondria, relatively well-developed Golgi complexes and cisternae of the granular endoplasmic reticulum, a few secretory granules and occasional lipid droplets were present. The chief cells of 20- and 25-day-old golden hamsters contained abundant free ribosomes and mitochondria, well-developed Golgi complexes and cisternae of the granular endoplasmic reticulum, a few secretory granules, occasional large secretory granules and lipid droplets, and many large vacuolar bodies.

The other striking feature was the presence of masses composed of floccular substances (Fig. 1, Inset). These

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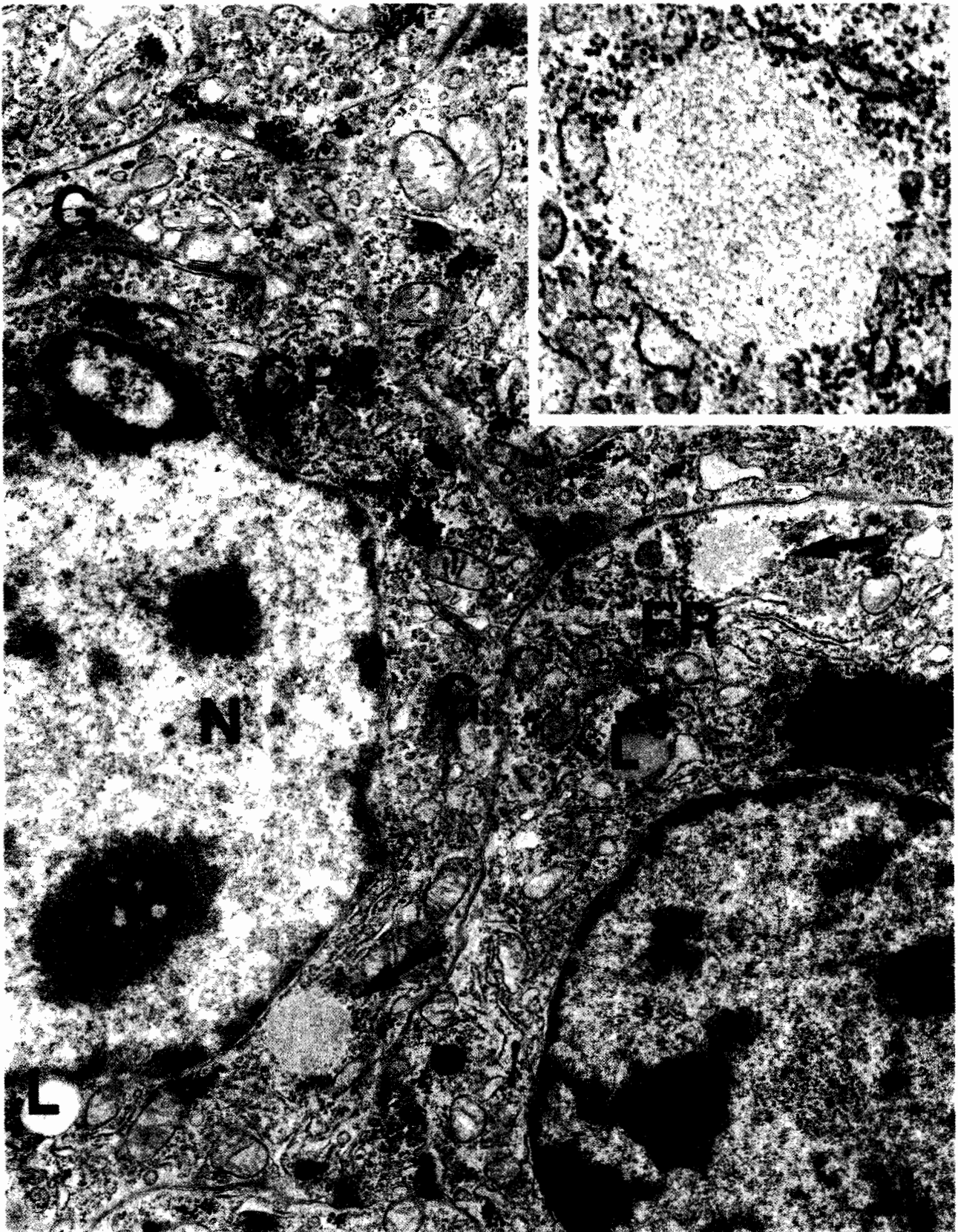


Fig. 1. Parathyroid chief cells from 15-day-old golden hamster fetus. Masses of floccular substance (arrows) are located near nucleus (N) and in the peripheral cytoplasm. Relatively well-developed Golgi complexes (G) and cisternae of the granular endoplasmic reticulum (ER), large lakes of glycogen particles (GP) and many lipid droplets (L) are observed. $\times 18,000$. Inset: Parathyroid chief cells from 5-day-old golden hamster. Mass of floccular substance is round with no limiting membrane. $\times 64,000$



Fig. 2. Parathyroid chief cell from 5-day-old golden hamster. Mass of floccular substance (asterisk) is located near relatively well-developed Golgi area (G). $\times 40,000$

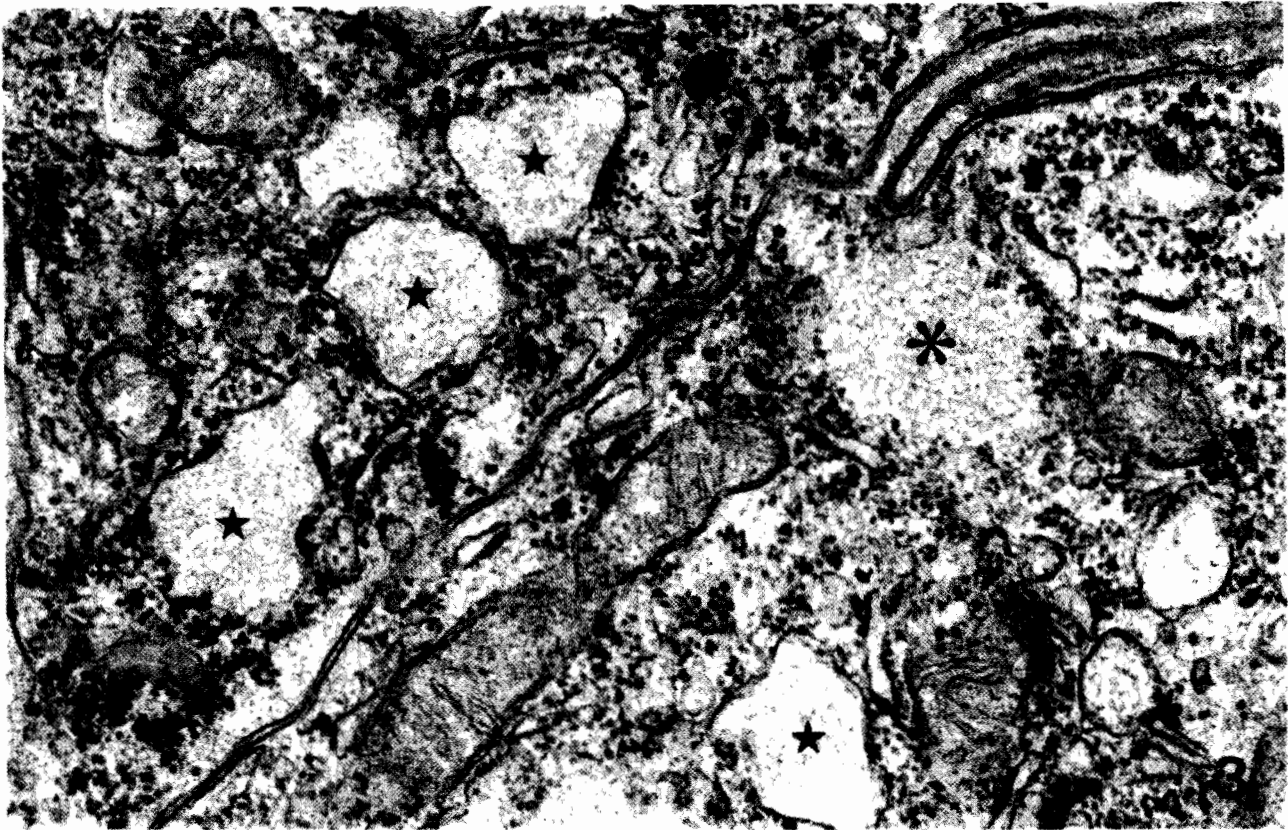


Fig. 3. Parathyroid chief cells from 5-day-old golden hamster. Floccular substances constituting mass (asterisk) resemble those which are observed in dilated cisternae of the granular endoplasmic reticulum (star). $\times 54,000$

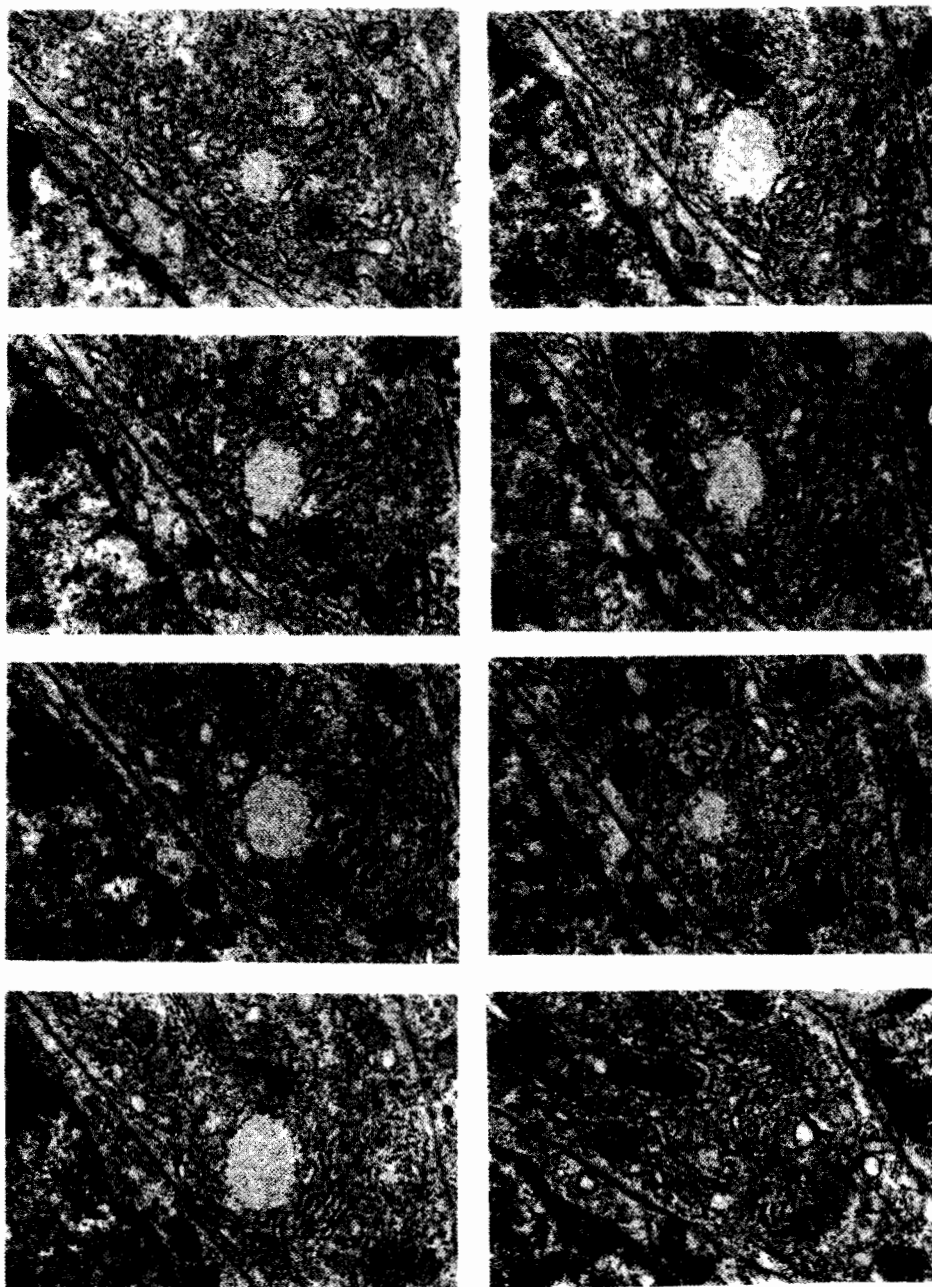


Fig. 4. Parathyroid chief cells from 5-day-old golden hamster. Micrographs (4a-4h) of thin sections at intervals of about 800 Å. Showing spherical mass which is not enclosed by a limiting membrane. $\times 12,000$

The number of the masses of floccular substance in 100 micrographs of the parathyroid glands of 15-day-old fetuses, and 1-, 5-, 10-, 15-, 20- and 25-day-old golden hamsters was 2, 17, 10, 1, 4, 0 and 0, respectively.

Discussion

Focal hyperplasia of intracytoplasmic filaments of 100 Å in diameter is observed in the parathyroid gland of dog treated with nalidixic acid (Yasuda et al., 1983). Mallory body-like inclusion accompanied by accumulation of filaments 150 Å in diameter is present in the parathyroid gland of dog exposed to ozone inhalation (Atwal and Pemsingh, 1984).

Our study presented for the first time intracytoplasmic spherical masses composed of floccular substances in the parathyroid glands of golden hamsters under normal conditions. In addition, these spherical masses were not enclosed by a limiting membrane and in the area with floccular substances cell organelles were not observed. Similar findings have been observed in filamentous hyperplasia (Yasuda et al., 1983) and Mallory body-like inclusion (Atwal and Pemsingh, 1984) in the parathyroid gland of the dog under experimental conditions.

masses were round with no limiting membrane around them and measured approximately 500-1,200 nm in diameter (Figs. 1-3). They were located near the nucleus (Fig. 1) and the Golgi area (Fig. 2), but were also observed in the peripheral cytoplasm (Figs. 1, 3). The floccular substances constituting these masses resembled those which were observed in dilated cisternae of the granular endoplasmic reticulum (Fig. 3). No cell organelles were detected within the area of the masses (Figs. 1-3).

In micrographs of thin sections at intervals of about 800 Å, the masses composed of floccular substances were spherical and were not enclosed by a limiting membrane (Fig. 4).

In the present study, the masses of floccular substance were observed in the chief cells of the parathyroid glands in 15-day-old golden hamster fetuses and 1-, 5-, 10- and 15-day-old golden hamsters but not in 20- and 25-day-old animals. These masses are not present in the parathyroid gland of 1-month-old to 18-month-old golden hamsters (Isono et al., 1990). These facts indicate that the masses of floccular substance occur in a hypofunctional condition of the parathyroid glands in fetal, newborn and infantile golden hamsters. Yasuda et al. (1983) reported that focal hyperplasia of intracytoplasmic filaments was closely associated with a hypofunctional state. We

consider that there is a relationship between the occurrence of the masses of floccular substance and aging in the parathyroid gland of golden hamster.

Yasuda et al. (1983) demonstrated in the parathyroid of nalidixic acid-treated dogs hyperplasia of intracytoplasmic filaments was attributable to disturbed degradation in filamentous components. Atwal and Pemsingh (1984) reported that in the parathyroid gland of ozone-treated dogs most of the cell organelles were displaced to the peripheral zone of Mallory body-like inclusion. In addition, Roy (1978) described that in the pituitary gland from patients with acromegaly, filamentous masses arose from degeneration of granular endoplasmic reticulum and Golgi complex. Meierheney et al. (1981) speculated that in hepatic nodules of mice Mallory body was formed as a result of the degeneration of cell organelles. In the present study, the floccular substances constituting the masses resembled those which were observed in dilated cisternae of the granular endoplasmic reticulum. Although from the above observation it is difficult to know the mechanism of formation of the mass of floccular substance in the parathyroid gland, we suggest that the mass may be

derived from cisternae of the granular endoplasmic reticulum. However, additional study is required to clarify the origin of the mass of floccular substance in the parathyroid gland of golden hamster.

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