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A comparison of the anatomical structure of odontoblasts and the connective tissue fibres in relation to the age of the patient

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The aim of this work was to study the structure of dental pulp (mainly the connective tissue fibre and odontoblasts) during the active production of dentine in relation to the age of the patient. The pulps of the teeth extracted for orthodontic reasons from a population of 10–50 year-olds were investigated with the help of a transmission electron microscope (TEM) and a scanning electron microscope (SEM). Condensation of the small collagen fibres and fibrils around the morphotic elements of the dental pulp were found more often in the elderly patients.

key words: odontoblasts; fibres, age of the patient, TEM, SEM

INTRODUCTION

The formation and function of dentin are very well controlled biological processes, in which correlation between the cellular and extracellular processes takes place. The highly complicated spatial structure of the cells, fibres, and extracellular ground substance in the area of the predentine and dentin-pulp border has hindered understanding of many of details of the structure and function of the teeth. Although this cannot be demonstrated by the use of light microscopy, studies carried out with the use of the scanning electron microscope, in contrast, cause the structure of the odontoblasts and fine fibres to become visible.

The intention of the work was to study the structure of dental pulp, mainly the connective tissue fibres and odontoblasts, during the active production of dentine in relation to the age of the patient.

MATERIAL AND METHODS

Teeth extracted for orthodontic reasons and unerupted teeth from patients of 10–17 and 45–56 years old were used for the investigations. Studies were done with the use of a Jeol transmission electron microscope (TEM) and a Phillips scanning electron microscope (SEM). Teeth for the TEM investigations were cut and their pulp was fixed in 2% glutardialdehyde in cacodylate buffer and then in osmium tetroxide, contrasted with lead citrate and uranyl acetate, dehydrated and embedded in epoxy resin (EPON 812 with DDSA and MNA). For SEM studies the fixed teeth were frozen in liquid nitrogen. Pulp was dehydrated through the critical point and covered with gold and platinum [1].

RESULTS AND DISCUSSION

The extracellular matrix between the odontoblasts in the teeth of young people was composed of a loose layer of collagen fibres. The elements of newly created collagen fibrils were present (Fig. 1: age of patient — 14 years). There is some controversy as to whether what are known as von Korff fibres occur in the formation of primary dentin [3, 5, 7]. The von Korff fibres appear in the bundles of collagen fibrils com-

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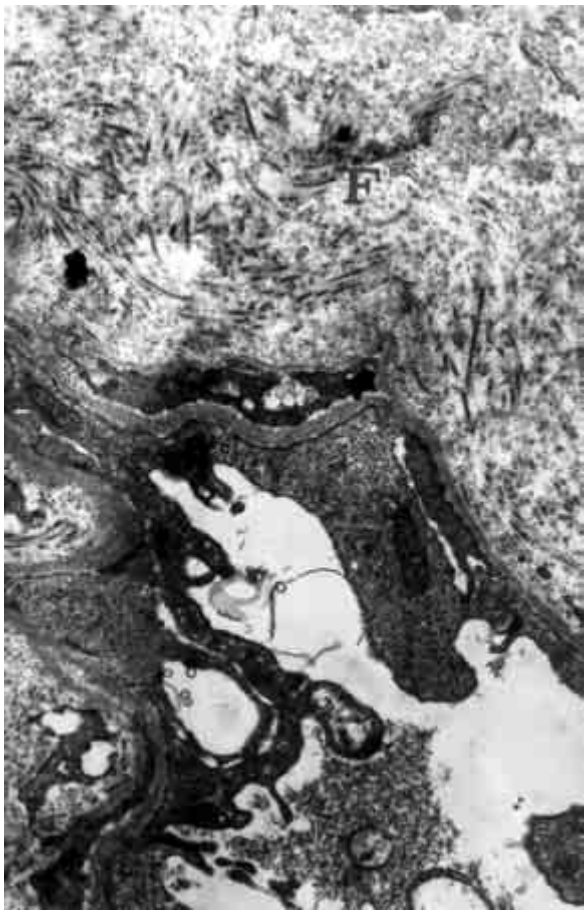

Figure 1. Part of the odontoblast, surrounded by the extracellular matrix; F — collagen fibres; TEM, magn. 20,000 ×.

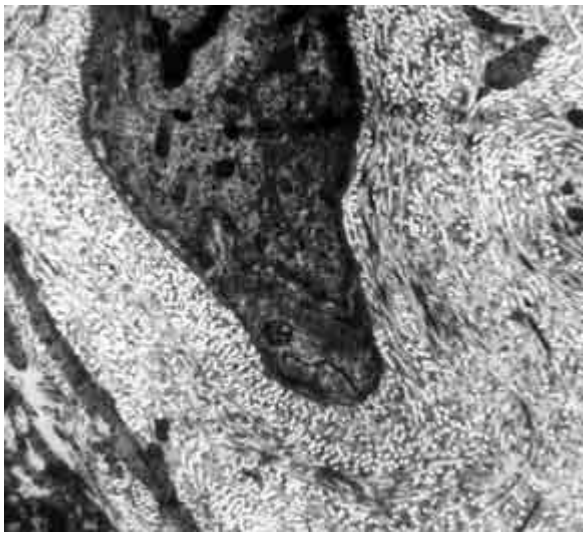

Figure 2. Part of the odontoblast; TEM, magn. 10,000 ×.

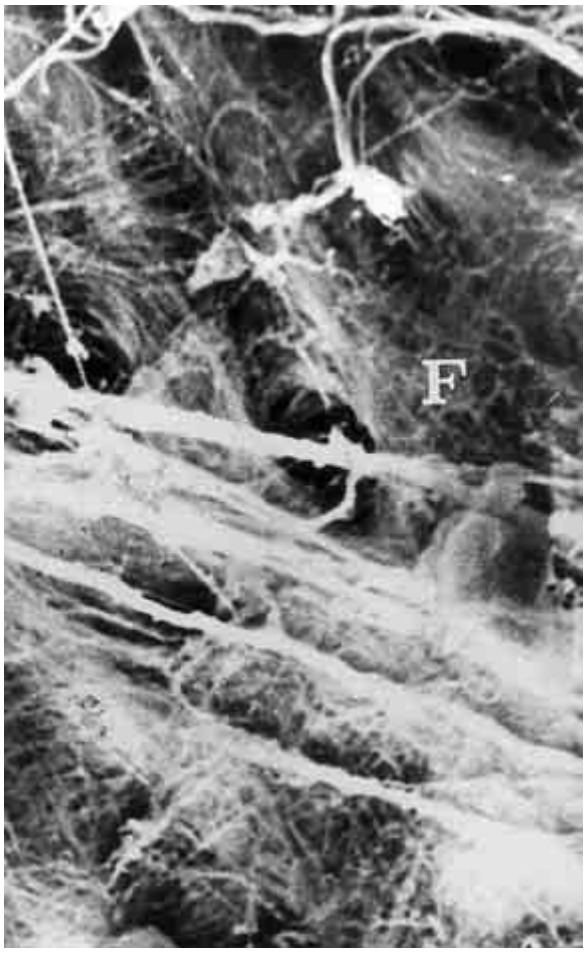

Figure 3. F — collagen fibres; SEM, magn. 2,000 ×.

ing from the pulp, passing between the odontoblasts and fanning out to form the fibrous matrix of the dentin [2, 6]. In the TEM study the symptoms of increased secretion of odontoblasts were found in young people. The distinct boundary between condensed and loose chromatin in the odontoblast nuclei suggests an intensive transcription process. Well-developed ergastoplasmic reticulum in the cytoplasm of odontoblasts as well as electron-dense substance inside the tubules suggest the intensification of the translation processes [4]. The presence of the mitochondria in the orthodox state is evidence of intensification of the secretory activity of the odontoblasts.

However, in the teeth of patients older then 40 years condensation of the collagen fibres appears (Fig. 2: TEM, age of patient — 50 years). Elements of the newly produced collagen fibres are present between the odontoblasts. The small fibrils connected to the flakes form the external structure of the odontoblasts (Fig. 3: SEM, age of patient — 48 years). The connective tissue fibres are also present (Fig. 4: SEM, age of patient — 48 years).

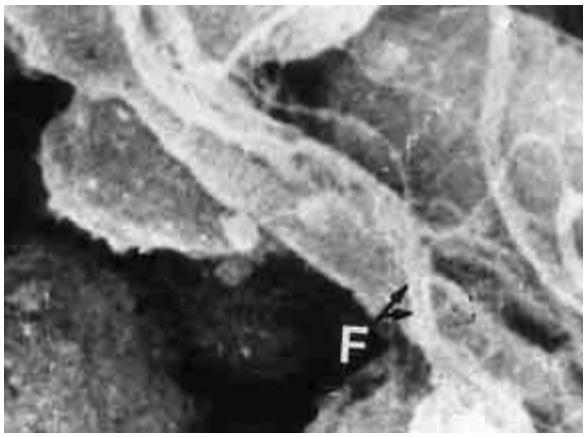

Figure 4. Dental pulp with the odontoblast; F — collagen fibres; SEM, magn. 5,000 ×.

CONCLUSIONS

Condensation of the small collagen fibres and fibrils around the morphotic elements of the dental pulp can be found more often in elderly patients.

ACKNOWLEDGEMENTS

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