

A STUDY ON MAST CELL IN DENTAL GRANULOMAS

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齒根端肉芽腫의 組織肥胖細胞에 關한 研究

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柳 泰 英

.....> 國文抄錄 <.....

組織肥胖細胞에 對한 病理는 過敏症, 炎症, 腫瘍等에 關聯하여 많은 研究가 進行되고있다. 齒科臨床에서 흔히 觀察되는 齒根端肉芽腫은 慢性炎症病巢로서 新生肉芽組織의 增殖, 上皮의 出現等은 囊腫, 珐瑯芽細胞腫, 上皮癌等으로 移行될 運命을 暗示할수 있다. 著者는 拔牙後 齒根端에 附着된 齒根端肉芽腫 80例를 組織肥胖細胞 觀察을 위한 Toluidine blue 染色과 組織學的 觀察을 위한 H-E 染色을 실시하여 齒根端肉芽腫에서 組織肥胖細胞의 出現과 分布를 研究하고 病理組織學的 觀察을 하였다.

- 1) 齒根端肉芽腫에 있어서 組織學的 特性에따르는 上皮增殖, 纖維組織增殖, 石灰化된例에서 組織肥胖細胞 平均出現數와 全齒根端肉芽腫의 肥胖細胞平均出現數는 別差異가없었으나 小膿瘍腔을 形成한 例에서는 相當한 肥胖細胞의 數의 增加를 보였다.
- 2) 炎症細胞浸潤度와의 關係에 있어서는 淋巴球와 形質細胞의 浸潤이 많을수록 肥胖細胞의 出現은 增加되었다.
- 3) 組織學的 特性에 있어서는 上皮增殖 16例(20%) 小膿瘍腔形成 8例(10%), 纖維組織增殖 6例(7.5%), 石灰化現象 3例(3.75%), cholesterol Cleft, 1例(1.25%)와 기타(57.5%)를 보였다.

INTRODUCTION

Since Ehrlich (1877) applied the word "Mast zellen" in German to a certain connective tissue cells which were large and stuffed with granules from the aspect that these cells would be over nourished, many interests and informations concerning with these mast cells have been developed along with the knowledge about their contents.

It is now well known that heparin, histaminine, hyaluronic acid, and many other various enzymes have been demonstrated in the mast cell which exhibits characteristic staining reaction showing metachromasia at the basic aniline dye²⁾⁴⁾⁵⁾¹⁷⁾.

Mast cells have long been considered to be related with various diseases of connective tissue. The pathology of mast cell in various disease is not clearly demonstrated yet. It is well documented that the number of mast cell decreases in acute inflammation and increases in chronic inflammation²⁾²⁷⁾³⁰⁾. And mast cells have long been studied relating to neoplastic

growth ¹³⁾¹⁶⁾¹⁸⁾³³⁾. A large number of papers regarding mast cells in the oral cavity have been published. Zachrisson (1968) and many others ¹⁾⁷⁾⁸⁾⁹⁾¹⁰⁾¹⁴⁾¹⁵⁾²¹⁾²⁵⁾²⁹⁾ have studied mast cell density in gingiva. Anneroth (1964) and a few ¹⁾⁹⁾³²⁾ observed tissue mast cells in dental pulp.

The author was curious about the presence and distribution of mast cells in the dental granuloma which is considered to have potentiality associating with epithelial proliferation. We know that dental granuloma is a chronic inflammatory lesion and the fate of epithelium in the granuloma is of great interest suggesting a possible change to a cyst, ameloblastoma, and even to a carcinoma.

The basic objective of present study was to assure the presence and distribution of mast cell in dental granulomas. In addition, one aspect of this work was carried out to check the histopathologic patterns of dental granulomas.

MATERIALS AND METHOD

All materials composed of sugical specimens of dental granulomas were obtained from 80 subjects, 41 men and 39 women. in ages from 10 to 60 years.

Tissue specimens which had excised from extraction were directly fixated in the absolute ethyl alcohol, embeded in paraffin, and then sections of 5-7 μ were made. After removal of paraffin, sections were hydrated. These sections were selectvely stained with H-E and 0.5% Toluidine blue aqueous solution. When microscopic inspection shows excessive discoloration in toluidine blue, the sections were washed with distilled water and stained again. Cells were counted in 10 fields using an x 450 magnification.

Not only were normal formed mast cells counted, but also diffuse parts of the cells were counted as a unit cell. The count of mast cells in these dental granulomas were performed randomly excluding necrotic zone.

Table Histopathologic patterns and mast cell count in dental granulomas.

Histologic patterns	Case(%)	Mean No. of mast cells per field
Epithelial proliperation	16(20%)	1.6
Abscess cavity	8(10%)	4.2
Fibrosis	6(7.5%)	2.8
Calcification	3(3.75%)	2.0
Cholesterol cleft	1(1.25%)	3.4
Others	46(57.5%)	2.1
Total granulomas	80	2.3

RESULTS

As represented in table, average mast cell number in selected 80 dental granulomas revealed 2.3 per microscopic field.

No significant changes in mast cell number was observed between the mast cell count in granulomas of epithelial proliferation, fibrosis, calcification, and average mean count of total granulomas. Tissue specimens with abscess cavity demonstrated significant increase in mast cell population. As compared with inflammatory cell infiltration, the more plasma cells and lymphocytes appeared, the more mast cells were counted.

Histologic analysis of total 80 granulomas revealed 16 cases (20%) of epithelial proliferation, 8 case (10%) of abscess cavity, 6 cases (7.5%) of fibrosis, 3(3.75%) cases of calcification, 1 case (1.25%) of cholesterol cleft, and others (57.5%).

DISCUSSION

Staemler (1921) held that mast cells produce mucin for interfibrillar substance of connective tissue. Zachariae (1965) reported that histamine seems to be an important stimulant of connective tissue repair. Asboe-Hansen (1968) noted that no new formation of connective tissue take place without a demonstrable activity of mast cells. As had already been documented by various authors, histamine which is one of mast cell contents increases capillary permeability and smooth muscle constriction. This capillary permeability initiates the immediate tissue response of edema, which is actually regarded as a process of repair, regeneration and organization.

Regarding an increase of water in tissue roles as a mucinous ground substance bounding by the acid mucopolysaccharide, the production of collagen and fibrosis seems to be initiated by mast cells. Though the new connective tissue formation in repair such as in wound healing and in dental granuloma is different, the basic concepts of new tissue formation by pathologic condition would be the same. The present study of the author's shows an increasing tendency of tissue mast cells in the instances of fibrosis (Table).

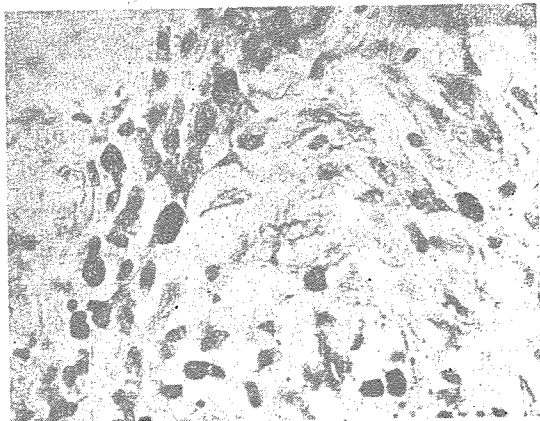


Fig. 1 Toluidine Blue x450

As illustrated in Fig. 1, dense appearance of tissue mast cells in fibroblastic zone seems to support the hypothesis that mast cell initiate collagen formation and fibrosis. Until recently, the origin of mast cells has long been disputed. Asboe-Hansen in autoradiographic study concluded that "Majority of mast cells divided mitotically in the developmental phase of nongranular fibroblastic precursor cells".

The pathology of mast cells in various disease still draws many interests. The role of mast cells in inflammation has been discussed in relation to anaphylatoxin and capillary

permeability which will be discussed later from immunologic aspect. In relation to neoplasia the role played by mast cells has also been discussed by many others.

Goerner (1931), and Fisher (1936) noted that heparin inhibits the growth of tissue and tumors. The hypothesis that mast cell has a defensive capacity in neoplasia by some authors²⁾⁶⁾ subscribed above suggestion. On the contrary, Selven (1943) believed that mast cells assist in infiltrative growth.

Twort (1930) interpreted the mast cells as a purely inflammatory reaction. Though Virchow (1930) defined granuloma as a one of tumors which is made up of granulation tissue, as is widely known today, granuloma is not regarded as a tumor. But enlarged granulation tissue consisting of various histologic features cannot escape from the approval of the new tissue formation.

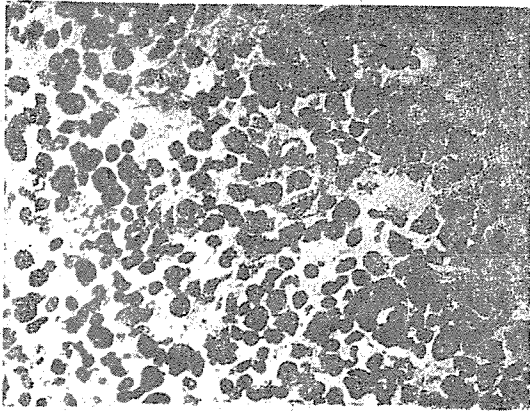


Fig. 2 Toluidine blue×450

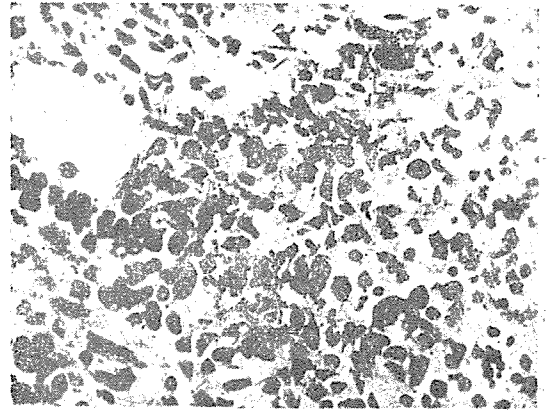
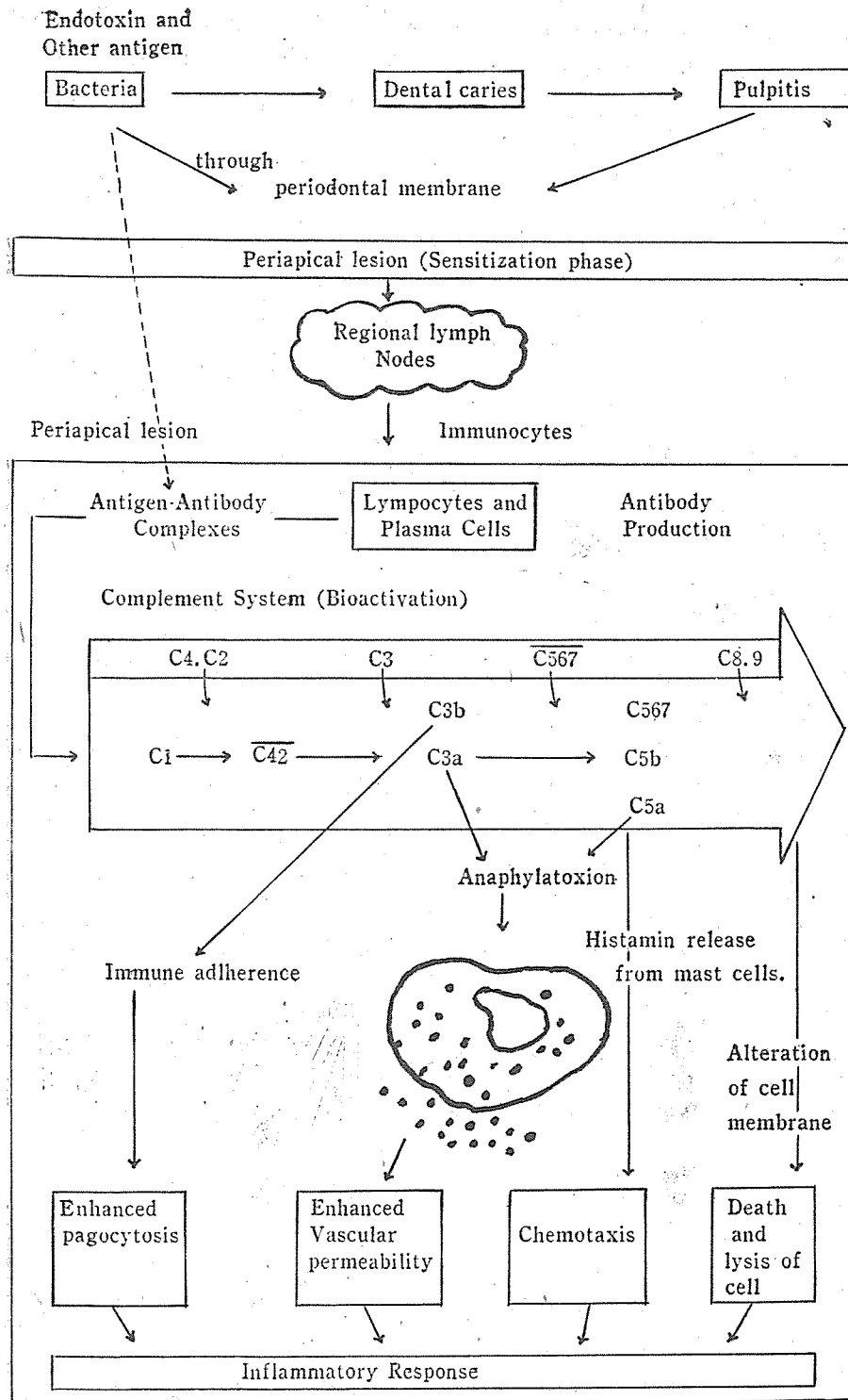


Fig. 3 Toluidine blue×450

The author supposed that mast cell variation in comparison with histologic features in dental granulomas would draw some significances. At the present study of investigation, It does not enough to draw defenite conclusion with regard to mast cell presence in their histologic features, for no significant difference in the value of cell population were observed except the cases with abscess cavity. In the authors opinion, mere inflammatory reaction may vary the mast cell distribution. As illustrated fig2, abundant lymphocytes and plasma cells infiltration accompanied relative increased mast cell density.

Immunologic aspect—It has been stated that mast cell responds to antigenic stimulation by an increase in number. Zandinski (1972) in the study of selected oral lesions, noted the possibility of immunologic cause for the increase of mast cells. Mergenhagen, et al. (1970) described immunologic reaction and periodontal inflammtion. It is well established that dental granuloma is a chronic inflammatory lesion, and lymphocytes and plasma cells are predominating inflammatory cells. As illustrated Fig. 2,3, in cases of varying stages of maturation, lymphocytes and plasma cells infiltration were distiguishing features.

Since these cells are part of the lymphoreticular system in which the immunoglobulins are produced, it is reasonable to conclude that local immune responses occur in these lesions of apical granuloma. Heavy infiltration of lymphocytes and plasma cells in these local inflammatory sites suggest the elaboration of specific antibodies that form antigen antibody complexes.



Schematic representation of possible immunologic reaction in periapical tissue.
 (Cited from immunology, by Joseph A. Bellanti, W.B. Saunders Co., 1971.
 and J.D. Res. suppl. 257-258. 1970.)

The release of antibody from plasma cells accumulated in these local sites requires prior invasion of endotoxin and other antigens. The antigenic components to these periapical sites may proceed by the sequence; dental caries-pulpitis-apical lesion, or through periodontal membrane.

On interaction with antibody, antigen would be altered and may activate immunologic mediator system (complement system). The consequence of complement system activation is known the release of biologically active by-products, that mediate certain aspects of the inflammatory process.³⁾ The functions of complement system and its biologically active products include the immune adherence of platelets, erythrocytes and leukocytes, enhanced phagocytosis, the generation of factors with smooth muscle constricting properties and increased vascular permeability²⁰⁾.

It is well established that phagocytosis, enhanced vascular permeability, chemotaxis, death and lysis of cells in inflammatory response are related with biochemical mediators or effectors of inflammation. The mast cell presence in these local inflammatory response regarding as one of a contributing factors seems to be significant. C3a of the sequential reaction of complement system may have the anaphylatoxin to stimulate mast cells to release histamine and increase capillary permeability.

Supported by this idea, an increase of tissue mast cell population in connection with increased lymphocyte and plasma cell accumulation in the cases of present study can be safely explained.

Histologic analysis-The presence of epithelium in dental granuloma is various by authors. Mconell (1921) reported 30% cases of observed dental gramulomas presented epithelium. Port et al. (1951)²²⁾ reported 23%, Shin (1970) reported 52%.

At the present study, 20% of observed granulomas revealed proliferation of epithelium (Fig.4). It is said that the central liquefaction and degeneration of proliferated epithelium in dental granuloma may initiate cystic change. From the studies of author's, 12% of total 80 granalomas revealed precystic changes.

It tells that long existing periapical granuloma without appropriate treatment may develop to a cyst. Of the remaining cases of epithelial proliferation, cases of marked epithelial proliferation and islands with scanty stromal tissue are considered to suggest possible change to a neoplastic growth.

SUMMARY

The present investigation was undertaken in order to assure the presence and distribution of mast cells in dental granulomas and, in addition, to check the histopathologic features of dental granulomas.

Sugical specimens of 80 dental granulomas excised from extraction were stained sectively with H-E for routine observation of histologic features and toluidine blue for mast cells.

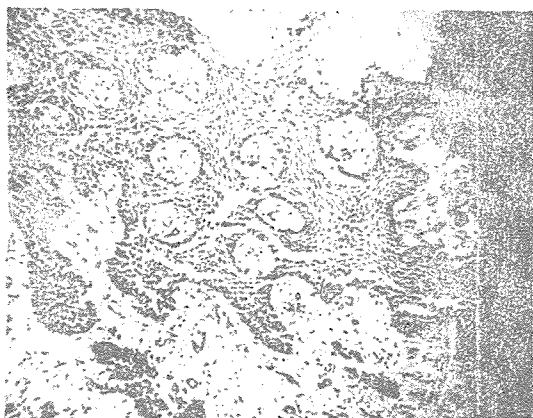


Fig.4 H-E×100

No significant changes in mast cell number was observed between the count in granulomas of epithelial proliferation, fibrosis, calcification and average mean count of total granulomas.

Tissue with abscess cavity demonstrated significant increase in mast cell population.

As compared with inflammatory cell infiltration, the more plasma cells and lymphocytes appeared, the more mast cells were counted.

Histologic analysis of total granulomas revealed 16 cases(20%) of epithelial proliferation, 8 cases(10%) of abscess cavity, 6 cases(7.5%) of fibrosis, 3(3.75%) cases of calcification, 1 case(1.25%) of cholesterol cleft, and others (57.5%).

= Acknowledgement =

The author wishes to express appreciation to associate professor Han Kuk Cho for his kind guidance, to assistant professor Chang Yoon Lim for his valuable criticism and other members of department of Oral Pathology, College of Dentistry, S.N.U. for their help in collecting specimens and fruitful discussions.

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