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Concentrations of Immunoglobulin E in Patients with Chronic Periapical Lesions

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Ten milliliters of whole blood were withdrawn from 30 patients with one or more chronic periapical lesions measuring 10 × 10 mm or larger on radiographs taken before root canal therapy. Also, blood was withdrawn from 32 patients with known allergies (positive controls) and 30 individuals with no known allergies and no periapical or periodontal lesions (negative controls). The sera of the three groups were tested for the concentrations of circulating IgE by a radioimmunoassay. When the mean levels of circulating IgE in the sera of the experimental group were compared with those of the control groups, no significant difference was found between the experimental group and the negative control group. However, a significant statistical difference was found between the mean levels of circulating IgE in patients with known allergies and those of patients with or without periapical lesions. The results suggest that chronic periapical lesions are localized and do not elevate the levels of circulating IgE significantly.

Immunological assays on the sera of patients with signs and symptoms, i.e. pain, swelling, fever, and malaise, of acute apical abscesses have shown elevated levels of IgE (1, 2). Recently, Nevins et al. (3) measured the levels of serum IgE in patients with chronic periapical lesions and also found an increased IgE formation in these patients. In a quantitative study, we compared the serum concentrations of circulating immune complexes, immunoglobulins G and M, and the C3 complement component in patients with large periapical lesions and no clinical symptoms, and compared these values with those of a control group and found no statistical difference between the two groups (4). However, the levels of IgE were not measured in these patients.

When comparing the studies on the levels of IgE in patients with acute apical abscesses (1, 2) with the study of Nevins et al. (3) in patients with chronic lesions, it appears that the levels of IgE are elevated and are not related to the chronicity or acuteness of these lesions. Because we had not measured the levels of IgE in patients with chronic periapical lesions in our previous investigation (4) and because the data by Nevins et al. (3) indicated that the levels of IgE have no apparent relationship with the status of these lesions, we studied the levels of concentration of circulating IgE in patients with chronic periapical lesions.

MATERIALS AND METHODS

The experimental group consisted of 30 patients who came to the Department of Endodontics at Loma Linda University School of Dentistry for root canal treatment. The patients had no known systemic disease, no periodontal disease, and no history of allergic reactions to medications or other immunogens. The patients included in this study had no clinical symptoms and one or more chronic periapical lesions measuring 10 × 10 mm or larger on radiographs taken before root canal treatment. Lack of clinical symptoms and presence of radiolucency on radiographs were the two criteria used to designate a lesion as chronic periapical pathosis. The negative control group consisted of 30 faculty members, graduate students, and personnel who also had no known systemic diseases or allergic reactions, no periapical lesions, and no periodontal diseases. In addition, 32 patients with known allergic reactions, but no periapical or periodontal diseases, were included as positive control group.

Informed consent from all of the participants was obtained after the nature and purpose of the investigation, the procedures to be followed, and the risks and discomforts involved were explained. Ten milliliters of whole blood was withdrawn from the endodontic patients on their first appointments. The patients were informed that if their initial levels of IgE were significantly higher than those of the control group, they might be asked to donate another 10 ml of whole blood on their return 12 months later for evaluation of root canal treatment. Ten milliliters of whole blood were also withdrawn from each participant in the control groups.

The blood samples of the experimental and control groups were clotted and the sera were separated. The sera from the three groups were aliquoted, designated with a code number, and frozen at −30°C. The sera

were tested in a double-blind manner for the levels of IgE.

The concentrations of circulating IgE were measured by a radioimmunoassay according to the methods of Ishizaka et al. (5) and Johansson and Bennich (6). In this assay, IgE-specific antibody binds to ^{125}I-labeled IgE, the radioactive tracer. Serum samples were mixed with a constant amount of labeled IgE and primary antiserum and incubated for 4 h at 37°C. During incubation, the unlabeled IgE competed with the radiolabeled IgE for binding sites on the primary antibody. Bound and unbound fractions separate with the addition of a fixed quantity of a second antibody. Following a second incubation period of 1 h at room temperature, the IgE-bound antibody complexes were separated from the unbound IgE in a centrifuge. Each sample was tested twice and the concentrations were measured in International Units per 1 ml of IgE (IU/1 ml). Student's *t* test was used for statistical analysis of the results obtained from the experimental as well as the control groups.

RESULTS

The means and standard deviations of IgE levels in the sera of subjects with and without chronic periapical lesions and those of patients with known allergies are shown in Table 1. As shown in Fig. 1, there is a wide distribution of the levels of concentration of IgE in the three test groups. When the mean levels of circulating IgE in sera of patients with known allergies (positive control) were compared with those of subjects with and without periapical lesions (negative controls), significant statistical differences were observed ($p = 0.002$ and 0.004, respectively). However, there was no statistical difference between the mean values of patients with chronic periapical lesions and those of the control normal volunteers.

DISCUSSION

Studies have shown that the root canal system in human beings and experimental animals can act as a pathway for egress of potential antigens into periapical tissues (7–11). Egress of potential antigens can elicit nonspecific inflammatory reactions as well as specific immunological reactions. Presence of various classes of immunoglobulins and immunocompetent cells in human periapical lesions indicate that these lesions are developed as a defensive mechanism to wall off the deletrious effects of potential pathogens. The lack of a significant difference between the levels of IgE in sera of patients with chronic periapical lesions and those of volunteers without these lesions indicate that chronic periapical lesions are localized phenomena. Our results are in contrast with the findings of Nevins et al. (3). The difference between our findings and theirs could mainly be due to differences in the sizes of periapical lesions tested in the two studies. Their periapical lesions were much smaller than ours and it is possible that large lesions are better walled off than the smaller lesions. Furthermore, most of the patients in their study had IgE levels which were comparable to those of the controls. However, 6 of their 20 patients had high levels of IgE in their sera, which may have shifted the mean values considerably.

Several studies have attempted to correlate the importance of serum immunoglobulin levels to clinical symptoms, with statistical significance being found for some antibacterial immunoglobulin levels and periodontal disease (12–14). IgE levels have been examined in endodontic patients (1), suggesting that IgE already bound to mast cells could be cross-linked by endotoxin. This can initiate an immediate hypersensitivity reaction produced by Gram-negative bacteria found in the periapical lesion. Nasal carriage of *Staphylococcus aureus* and serum antistaphylococcal IgE antibodies in atopic dermititus was found to be statistically associated (15). With this in mind, however, our failure to find significantly different serum levels of IgE in the patients with chronic apical abcesses and the normal controls lead us to suggest that increased examination of these parameters needs to be done before any definite conclusions can be made between serum IgE levels and the possible role these may play in the development of the apical lesions. Based on findings from this study and another study (4), it appears that in contrast to

TABLE 1. The means and standard deviations of IgE levels in sera of normal subjects, patients with periapical lesions, and individuals with known allergies

Group	No. of Patients	IU/ml
Normal	30	74.5 ± 68.4
Chronic periapical	30	62.3 ± 63.8
Allergy controls	32	259.8 ± 317.6

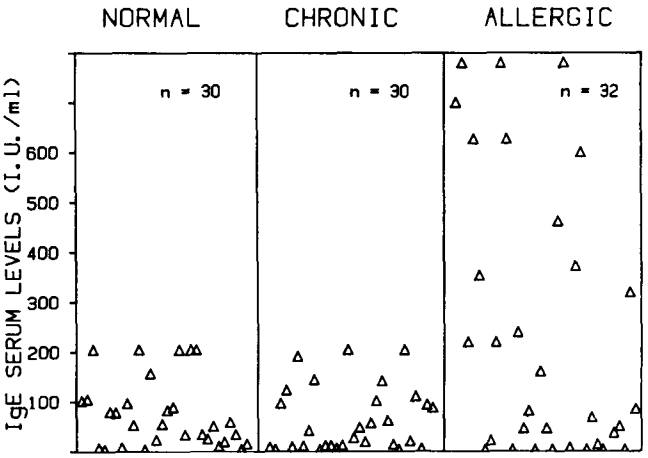

FIG 1. Distribution of the levels of concentrations of IgE in sera (IU/ml) of normal subjects, patients with periapical lesions, and individuals with known allergies.

acute apical abscesses, chronic periapical lesions are well capsulated and are localized reactions.

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References

1. Svetcov SD, DeAngelo JE, McNamara I, Nevins AJ. Serum immunoglobulin levels and bacterial flora in subjects with acute oro-facial swellings. J Endodon 1983;9:233–5.

2. Kettering JD, Torabinejad M. Concentrations of immune complexes, IgG, IgM, IgE, and C3 in patients with acute apical abscesses. J Endodon 1984;10:417–21.

3. Nevins AJ, Levine SL, Faltlowicz-Gayer Y, Svetcov S. Sensitization via IgE-mediated mechanism in patients with chronic periapical lesions. J Endodon 1985;11:228–30.

4. Torabinejad M, Theofilopoulos AN, Kettering JD, Bakland LK. Quantitation of circulating immune complexes, immunoglobulins G and M and C3 complement in patients with large periapical lesions. Oral Surg 1983;55:186–90.

5. Ishizaka K, Ishizaka T, Hornbrook M. Physio-chemical properties of human reagenic antibody. IV. Presence of a unique immunoglobulin as a carrier or reagenic activity. J Immunol 1966;97:75–85.

6. Johansson SGO, Bennich H. A new class of immunoglobulin in human serum. Immunology 1968;14:265–72.

7. Pirila V, Rantanen AV. Root canal treatment with Bacitracin-Neomycin as a cause of flare-up of allergic eczema. Oral Surg 1960;13:589–93.

8. Fox J, Moodnick RM. Systemic reaction of polyantibiotic root canal dressing. NY State Dent J 1964;30:282–3.

9. Barnes GW, Langeland K. Antibody formation in primates following introduction of antigens into the root canal. J Dent Res 1966;45:1111–4.

10. Feiglin B, Reade PC. The distribution of ^{14}C leucine and ^{85}Sr labeled microspheres from rat incisor root canals. Oral Surg 1979;47:277–81.

11. Torabinejad M, Kiger RD. Experimentally induced alterations in periapical tissues of the Cat. J Dent Res 1980;59:87–96.

12. Chung CP, Nisengard RJ, Slats J, Genco RJ. Bacterial IgG and IgM antibody titers in acute necrotizing ulcerative gingivitis. J Periodontol 1983;54:557–62.

13. Naito Y, Okuda K, Takazoe I, Watanabe H, Ishikawa I. The relationship between serum IgG levels to subgingival gram-negative bacteria and degree of periodontal destruction. J Dent Res 1985;64:1306–10.

14. Genco RJ, Slats J. Host responses in periodontal disease. J Dent Res 1984;63:441–51.

15. Falanga V, Campbell DE, Leyden JJ, Douglas SD. Nasal carriage of *S. aureus* and antistaphylococcal IgE antibodies in atopic dermititis. J Clin Microbiol 1985;22:452–4.