Outcomes of root canal treatment in patients with autoimmune disease: a retrospective case-control study

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**A Master's Thesis Submitted
to the Department of Dentistry
and the Graduate School of Yonsei University
in partial fulfillment of the
requirements for the degree of
Master of Dental Science**

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June 2025

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June 2025

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ABSTRACT

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Aim: The purpose of this case–control study was to compare the outcome of nonsurgical root canal treatment (RCT) in patients with autoimmune diseases (AD) with the outcome in patients without AD. The results of the endodontic treatment in AD patients were also compared at the level of AD subgroups; inflammatory bowel disease (IBD), rheumatoid arthritis (RA) and psoriasis (Ps)

Methodology: Patients who diagnosed AD and received RCT at the Veterans Health Service Medical Center from January 2010 to December 2022 formed the target population. The outcome of RCT was evaluated at least a one-year period and the maximum follow-up was also recorded. 203 patients (317 teeth) with AD were investigated and the control group included 203 patients (312 teeth) without AD. Three types of dental radiographic images were used to determine the periapical status of the teeth and periapical index score (PAI score). Additional variables investigated included patient's socio-demographic characteristics. The chi-square test and logistic regression analysis were used to evaluate the correlation between AD and the success rate of the nonsurgical endodontic treatment.

Results: The success rate was 73.72% in AD patients and 69.43% in control (p = 0.268). Patients with IBD showed only significance at the risk of being affected by apical periodontitis (AP) (p = 0.025). Multivariate logistic regression analysis indicated that tooth type, the presence of preoperative apical lesions, and the quality of root canal filling were significant factors influencing the outcome of RCT. Comparing the 1-year and long-term outcomes, all three conditions - IBD, RA, and Ps - showed a similar trend of decreased success rates, although the differences were not statistically significant.

Conclusions: Patients with IBD exhibited lower success rates in nonsurgical endodontic treatment compared to controls and other autoimmune diseases, although IBD was not a significant factor in logistic regression analysis. Further research is needed to understand the interaction between the ADs and their impact on the AP.

Key words : autoimmune disease, systemic disease, inflammatory bowel disease, rheumatoid arthritis, psoriasis, apical periodontitis, root canal treatment, clinical outcome

1. Introduction

Apical periodontitis (AP) is a chronic inflammatory condition in the oral cavity that involves the destruction and resorption of alveolar bone (Kakehashi et al., 1965; Yamasaki et al., 1994). Marginal periodontitis and apical periodontitis are both long-term oral infections. They share similar characteristics, such as a polymicrobial etiology—primarily involving anaerobic bacteria—and a host inflammatory response, accompanied by elevated cytokine levels both locally and systemically (Caplan et al., 2006). Marginal periodontitis has been associated with systemic conditions such as diabetes mellitus(DM) and cardiovascular disease (CVD) ((Polak & Shapira, 2018, Lockhart et al., 2012). Given the similarities in pathogenic mechanisms, a potential correlation between AP and systemic diseases may also be plausible.

Autoimmune diseases (AD) encompass a diverse group of disorders with varying clinical manifestations, yet they share a common etiology in the form of self-reactive immune response (Wang et al., 2015). According to The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), the global prevalence of AD has been increasing (Temporal trends in the prevalence of autoimmune diseases from 1990 to 2019). Inflammatory Bowel Diseases (IBD) encompass chronic, immune-mediated inflammatory conditions of the gastrointestinal tract, primarily categorized into Ulcerative colitis and Crohn's disease (Baumgart & Carding, 2007). IBD emerges when the equilibrium between proinflammatory and anti-inflammatory pathways is disturbed (Pastorelli et al., 2010; Piras et al., 2017). Rheumatoid Arthritis (RA) is a persistent autoimmune condition affecting the joints, marked by pain, inflammation, and progressive tissue destruction (Smolen et al., 2020). The exact pathogenesis of RA remains unclear, yet it is believed to be mediated by multiple interacting factors, including autoimmunity, infectious agents, and genetic factors (McInnes & Schett, 2011). Furthermore, psoriasis (Ps) is characterized as a chronic inflammatory disorder

predominantly affecting the cutaneous tissue (Raychaudhuri & Gross, 2000), strongly linked to genetic susceptibility and autoimmune traits (Harden et al., 2015). In recent years, growing interest has emerged regarding the relationship between apical periodontitis and systemic disease, leading to the development of the concept of endodontic medicine (Laukkanen et al., 2019).

Despite the increasing trend of autoimmune diseases, there is a lack of clear evidence reporting a correlation between AD and dental diseases. Previous investigations into systemic diseases in the context of endodontic treatment outcomes have predominantly concentrated on tooth survival rather than the process of apical healing (Laukkanen et al., 2019). There were no previous studies comparing patients with and without autoimmune diseases in the light of root canal treatment (RCT) outcomes. Therefore, this present study focused on the association with the AD and AP at the level of clinical outcomes. This study aims to compare the outcomes of nonsurgical RCT in patients with AD - IBD, RA and Ps - with the outcome in patients not affected by AD. The null hypothesis is: there is no difference in the outcomes of RCT regardless of the patient group.

2. Material & Methods

2.1. Ethical considerations

An evaluation was conducted of the medical and dental records of patients who attended the medical and dental clinics at the Veterans Health Service Medical Center (Seoul, South Korea) for a dental evaluation from January 2010 to December 2022. The personal data were electronically anonymized prior to analysis. Given that only fully anonymized retrospective data were utilized, this study was a non-interventional clinical trial conducted under a standardized non-experimental

protocol. Accordingly, Institutional Review Board (IRB) approval was officially obtained (IRB file No. 2025-03-001).

2.2. Data collection & Case selection

2.2.1. The study group (with autoimmune disease)

Patients who diagnosed AD and received RCT at the Veterans Health Service Medical Center from January 2010 to December 2022 formed the target population. The study consisted of both males and females who were diagnosed with AD, such as IBD, RA, or Ps. A total of 203 participants with 317 teeth were included in the AD study group. This patient group was further divided into three subgroups based on the specific disease: IBD (n = 147), RA (n = 73), and Ps (n = 97). Table 1 shows descriptive names of diagnosis of the autoimmune disease.

The inclusion and exclusion criteria were as follows:

- Inclusion Criteria:

  Patients who diagnosed autoimmune disease at the any medical departments at the Veterans Health Service Medical Center (Seoul, South Korea) from January 2010 to December 2022

  Teeth that underwent primary nonsurgical RCT, with no history of previous endodontic treatment.

  Teeth with sufficient follow-up data (minimum 1-year post-treatment).

- Exclusion Criteria:

  Teeth extracted for non-endodontic reasons within the follow-up period.

Table 1. The list of diagnosis in the autoimmune diseases

disease	diagnosis
Inflammatory Bowel Disease	Inflammatory bowel disease
	Ulcerative colitis with pancoilitis
	Ulcerative colitis with proctitis
	Ulcerative colitis
	Ulcerative coilitis, unspecified
	Crohn's disease of small intestine (mild, moderate, severe)
	Crohn's disease of small intestine, unspecified
	Crohn's disease of small intestine (mild, moderate, severe)
	Crohn's disease of large intestine, unspecified
	Crohn's disease. Unspecified
Rheumatoid Arthritis	Other seropositive rheumatoid arthritis
	Rheumatoid arthritis with involvement of other organs and systems
	Mild other specified rheumatoid arthritis, multiple sites
	Moderate other specified rheumatoid arthritis, multiple sites
	Severe other specified rheumatoid arthritis, multiple sites
	Unspecified other specified rheumatoid arthritis, multiple sites
Psoriasis	Psoriasis
	Mild psoriasis vulgaris
	Moderate psoriasis vulgaris
	Severe psoriasis vulgaris
	Psoriasis vulgaris

2.1.2. The control group (without autoimmune disease)

A total of 14,572 patients with 15,489 teeth were included in the total control group (Table 2). Due to the impracticality of reviewing the large volume of data from patients treated during the same period, a propensity score matching (PSM) approach was employed to establish a representative control group. The type of tooth was recorded as molars or premolars or incisors. The type of arch was recorded as maxilla or mandible. Considering that preferred materials and first-line treatment options may evolve over time, treatment dates were matched across groups to minimize temporal bias. The final control group was established through a second propensity score matching that

incorporated exclusion criteria and follow-up period as matching variables.

The inclusion and exclusion criteria were as follows:

- Inclusion Criteria:

  Patients underwent primary RCT and having representative variable matching to those of the study group; age, gender, arch type, tooth type, timing of the treatment.

  Teeth with sufficient follow-up data (minimum 1-year post-treatment).

- Exclusion Criteria:

  Teeth extracted for non-endodontic reasons within the follow-up period.

2.1.3 Data collection

All identifiable personal information was anonymized, and the data was stored on restricted computers accessible only to the researchers in charge. Medical and dental histories of patients were collected from electronic records containing demographic details such as age, gender, medical background, and specific information on autoimmune diseases. Medical records were reviewed to collect data. Patient medical history and diagnostic information were documented on forms and encoded into the computer system. To acquire valid information of tooth from the dental record, the measurable dental radiographs and the clinical data were used. Additionally, the following parameters were evaluated: the number of teeth located in the dental arches, the date of root canal filling, whether the case involved primary endodontic treatment or retreatment, the quality of canal filling, the presence or absence of a preoperative periapical lesion, the date of dental radiograph record closest to the one-year mark post-treatment, the type of dental radiographs taken at the one-year mark, the most recent date of dental radiograph record, the type of dental radiographs taken at

the most recent visit.

2.3. Treatment protocol

The primary endodontic treatments were performed by endodontists and dental resident specializing in endodontics. While the treatments generally adhered to the guidelines outlined in the American Association of Endodontists' (AAE) Guide to Clinical Endodontics, they were not strictly bound to a single protocol. All procedures were carried out under rubber dam isolation to prevent saliva contamination. The root canal apex was located using an electronic apex locator (Root ZX, Root ZX II by Morita, Japan), with the working length confirmed through both electronic apex locator (EAL) readings and periapical radiographs. The apical third was prepared using Profile NiTi files (Dentsply Tulsa Dental, OK, USA), the rotary Race Evo instrument system (FKG Dentaire SA, La Chaux-de-Fonds, Switzerland), and ProTaper NiTi files (Dentsply Tulsa Dental, Tulsa). Sodium hypochlorite (2.5-5%) was the primary irrigant, and in some cases, EDTA (17% ethylenediamine-tetra-acetic acid) or 2% chlorhexidine gluconate were used optionally. Calcium hydroxide paste (Calcipex II, Nishika, Tokyo, Japan) was applied as an intracanal medicament between appointments. Root canals were filled with gutta-percha, along with either an epoxy resin-based sealer (AH-26, AH-26 Plus, Dentsply Sirona, York, PA, USA), a calcium hydroxide-based sealer (Sealapex, Kerr, Orange, CA, USA), or a zinc oxide-eugenol-based sealer (Tubli-seal, Kerr, Orange, CA, USA), using a technique selected by the operator.

2.4. Radiographic evaluation

All radiographs were digital. Dental radiographs were assessed using Trophy DICOM software

(version 6.4; Carestream Dental, Croissy-Beaubourg, France) on a 15-inch HP monitor, with brightness and contrast adjusted as required to ensure optimal image evaluation.

Periapical conditions were independently assessed by two examiners using the Periapical Index (PAI) scoring system, as described by Ørstavik et al (Orstavik et al., 1986). The evaluation was carried out by a postgraduate student in endodontics (S. L.) and a endodontic specialist (S. K.). To minimize bias, the examiners were blinded to group allocation and were unaware of whether each radiograph correspond to the study or control group. If there were discrepancies in the radiographic evaluation, the two examiners reached a consensus through discussions.

The Periapical Index (PAI) is a 5-point ordinal scale used to assess periapical status, with a score of 1 representing a healthy state and a score of 5 indicating severe apical periodontitis with signs of exacerbation. The guidelines for scoring cases using the PAI are as follows: 1) Identify the reference radiograph that most closely matches the periapical area under study and assign its score to the relevant root. 2) In cases of uncertainty, the higher score should be applied. 3) For teeth with multiple roots, the final score is determined based on the root with the highest severity. 4) Scoring was performed on every tooth. Results were categorized as either successful (PAI 1 or 2) or unsuccessful (PAI 3 to 5). The success rate represented the percentage of cases with a successful outcome.

As this study is a retrospective non-interventional study, the radiographic image closest to the 1-year mark was selected, with the 1-year point after the canal filled date serving as the reference. For long-term outcome assessment, the most recent radiographic image record that could be followed up was evaluated. Three types of dental radiographic tomography were screened: full panoramic radiographs, periapical radiographs (PA), and cone-beam computed tomography (CBCT). (1) Full panoramic radiographs; When the status of apical tissue is sufficiently evident and clear to be

diagnosed from a panoramic radiograph, it is selected to assess at a PAI score level of 1, 4, or 5. (2) PA, CBCT; Considering that PA and CBCT provide more detailed and measurable information about the periapical status, these imaging techniques are given predominance in the selection hierarchy. When several types of radiographs are taken in close proximity, the image offering the most enhanced resolution is identified for evaluation. Both CBCT and PA have authority for the assessment of PAI scores ranging from 1 to 5.

2.5. Statistical analysis

Data collected for AD patients and controls were entered into an Excel spreadsheet for comparison. Additionally, comparisons were performed between the AD subgroups: IBD, RA, and Ps. Statistical analysis of all data was performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., NY, USA). To assess the impact of the identified factors on the success rate, chi-square tests using generalized estimation equations (GEE) were employed. Additionally, multivariable logistic regression analysis was performed to evaluate factors influencing the success rate of RCT in the study population. The significance level was established at 5% ($\alpha = 0.05$). Odds ratios (OR) and 95% confidence intervals (CI) were obtained.

3. Results

3.1. Demographic data of the study

After application of a PSM system and exclusion criteria, the study included a total of 406 patients (203 in AD group and 203 in the control group) and 629 teeth (317 in AD group and 312 in the control group). Among the patients, 40 were female (9.85%) and 366 were male (90.15%). At the tooth level, 573 male teeth (91.09%) and 56 female teeth (8.91%) were involved. The mean age of the participants adjusting the number of teeth was 72.03 years, with a range of 69 to 76 years. The study group consisted of 317 teeth, while the control group comprised 312 teeth. Of the teeth, 147 (23.19%) were associated with IBD, 73 (11.51%) with RA, and 97 (15.3%) with Ps. Panoramic radiographs constituted the majority among the three radiographic modalities assessed. Preoperative periapical lesions were observed in 33% of the control group and 37% of the study group. A quality of root canal fillings was observed adequate in most cases.

Table 2. The demographic information of the study

	Total control, N (%)	control, N (%)	AD, N (%)
Patient	14,572	203 (50)	203 (50)
Teeth	15,489	312 (49.2)	317 (50.8)
IBD			147 (46.4)
RA			73 (23.0)
Ps			97 (30.6)
Gender			
Male	11,122 (76.6)	285 (91.4)	288 (90.9)
Female	3,450 (23.4)	27 (8.6)	29 (9.1)
Age	77.68 ± 8.01	71.88 ± 8.02	72.18 ± 6.20
Radiographs at 1-year			
Panorama		243 (77.9)	163 (51.4)
PA		34 (10.9)	71 (22.4)
CBCT		35 (11.2)	83 (26.2)

Radiographs at long-term			
Panorama		227 (72.8)	181 (57.1)
PA		55 (17.6)	54 (17.0)
CBCT		30 (9.6)	82 (25.9)
Tooth type			
Maxillary incisors	2,537 (16.4)	53 (17.0)	48 (15.1)
Maxillary premolars	2,447 (15.8)	42 (13.5)	43 (13.6)
Maxillary molars	3,094 (20.0)	62 (19.9)	65 (20.5)
Mandibular incisors	1,829 (11.8)	30 (9.6)	46 (14.5)
Mandibular premolars	2,262 (14.6)	59 (18.9)	47 (14.8)
Mandibular molars	3,320 (21.4)	66 (21.1)	68 (21.6)
Presence of preoperative periapical lesion			
		105 (33.7)	129 (40.7)
IBD			59 (40.1)
RA			26 (35.6)
Ps			44 (45.4)
Quality of canal filling			
Just		302 (96.8)	299 (94.3)
Underfilling		9 (2.9)	14 (4.4)
Overfilling		1 (0.3)	4 (1.3)

3.2. Evaluation of 1-year success rate

Table 3 presents the 1-year success rate of RCT in the study. Root canal treatment showed a 1-year success rate of 73.72% for controls and 69.43% for the AD group. No significant difference was observed between the two groups. Within the AD patient group, the success rates were 64.63% for IBD, 75.34% for RA, and 73.20% for Ps. The success rate for the IBD group was the only one that demonstrated a statistically significant difference when compared with the control group ($p = 0.025$).

Table 3. 1-Year success rate of root canal treatment in the study

	Success, N (%)	Failure N (%)	Total	p-value
control	230 (73.72)	82 (26.28)	312(100)	
AD	221 (69.43)	96 (30.57)	317(100)	0.268
IBD	95 (64.63)	52 (35.37)	147	0.025 *
RA	55 (75.34)	18 (24.66)	73	0.49
Ps	71 (73.20)	26 (26.80)	97	0.50
Total	451 (71.57)	178 (28.43)		

3.3. Evaluation of long-term success rate

To analyze long-term evaluation, the most recent dental clinic visit was recorded and evaluated. The observation period of each group was statistically calibrated to make a relevant comparison. Table 4 shows the long-term success rate of RCT in the sample. The mean observation duration was approximately 50 months (1593.03 ± 1073.35 days), corresponding to nearly 4 years. The long-term success rates of RCT for the control group and the autoimmune disease (AD) group were 66.03% and 61.51%, respectively (p = 0.207). Additionally, no significant difference was found among the three autoimmune disease subgroups (IBD = 59.18%; RA = 67.12%; Ps = 60.2%).

Table 4. Long-term success rate of root canal treatment in the study

	Success, N (%)	Failure, N (%)	Total	p-value
control	206(66.03)	106(33.97)	312(100)	
AD	195(61.51)	122(38.49)	317(100)	0.207
IBD	87 (59.18)	60 (40.81)	147	0.125
RA	49 (67.12)	24 (32.88)	73	0.66
Ps	59 (60.82)	38 (39.18)	97	0.96
Total	401 (71.57)	228 (28.43)		

Mean observation duration 1593.03 ± 1073.35 days

3.4. Factors affecting success rate

A multivariable logistic regression analysis was performed to identify the factors affecting the 1-year success rate. The findings, presented in Table 5, indicate that the tooth type (OR, 1.12; 95% CI, 1.011-1.239; p = 0.029), presence of apical lesion (OR, 3.182; 95% CI, 2.228-4.544; p = 0.000) and quality of canal filling (OR, 1.833; 95% CI, 0.954-3.521; p = 0.069) showed a positive correlation with the success of RCT.

Table 5. Results of logistic regression analysis of factors affecting 1-Year success rate

		B	p value	Exp (B)
Step 1	Age	0.005	0.706	1.005
	Sex	-0.156	0.618	0.810
	Tooth type	0.114	0.029	1.121
	AD	-0.126	0.882	0.882
	Lesion	1.143	0.000	3.137
	Quality of filling	0.585	0.080	1.796
	Constant	-1.945	0.044	0.143
Step 8	Tooth type	0.113	0.029 *	1.120
	Lesion	1.158	0.000 *	3.182
	Quality of filling	0.606	0.069 *	1.833
	Constant	-1.797	0.000	0.166

3.5. A comparison of the success rates at 1 year and long-term

Figure 1 shows success rate at 1 year and long-term for control group and each autoimmune disease. Compared to the 1-year results, a similar decreasing trend in long-term outcomes was observed. The success rate in the control group declined from 73.72% at 1 year to 66.03% at long-term follow-up. In patients with IBD, the success rate showed a decline of approximately 5%, from

64.63% at 1 year to 59.18% over the long-term follow-up period. In RA patients, the success rate at 1 year was 75.34%, which declined by approximately 8% to 67.12% over the long-term follow-up period. Similarly, patients with Ps showed a decrease in success rate from 73.20% at 1 year to 60.82% in the long-term follow-up. However, there were no statistically significant differences observed between these values.

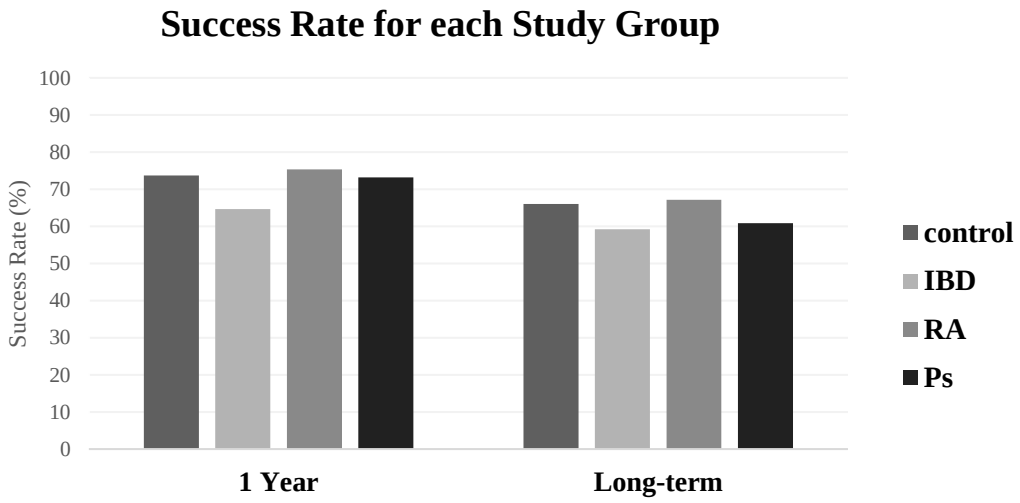

Figure 1. A comparison of the success rates at 1 year and long-term

4. Discussion

The objective of this study was to explore whether autoimmune diseases affect the success of root canal treatment. The null hypothesis tested – that there is no difference in RCT outcomes between control subjects and AD patients – was partially rejected. The result showed a positive relationship with the AP and IBD group (comparing the control) when measured at 1-year post-treatment. The other type of AD groups (RA, Ps) in this study showed no association between the prevalence of AP when evaluated at the 1-year time point. In long-term outcome, there was no association found with any of the 3 diseases. However, logistic regression analysis indicated the presence of lesions, quality of root canal filling, and tooth location as significant factors, while any other autoimmune diseases were excluded.

Systemic health factors could potentially impact the success of RCT. The success rate of autoimmune disease was slightly lower than the patient without autoimmune disease, although this difference was not significant. Several reports have explored the association between RCT outcomes and ADs. Given the involvement of similar immune cells, it is hypothesized that AP may be associated with AD. In the animal study, a decline in leukocyte levels was observed in immunosuppressed groups. Given their weakened immunity, they are more prone to opportunistic infections, which could result in more severe consequences (Waterman et al., 1998). Previous studies have established links between specific types of AD, such as RA, autoimmune hepatitis/nephritis, IBD, and the development of AP (Barta, 2020; Guerrero-Girones et al., 2021).

1-year outcomes of RCT shows APs are more frequent in IBD patients. This finding generally is in accordance with previous reports addressing an association with IBD. Piras et al. reported that patients with IBD showed a higher prevalence of AP and increased PAI scores, particularly among

female patients (Piras et al., 2017). Similarly, Poyato-Borrego et al. observed that individuals with IBD were nearly six times more likely to develop AP than healthy controls (Poyato-Borrego et al., 2021). In both studies AP was more frequent in endodontically treated teeth of patients with IBD compared to healthy individuals at the time of examination, irrespective of the duration since treatment. In addition, a case-control study indicated that patients with IBD underwent root canal fillings approximately four times more often than those without the disease. These findings suggest that IBD could be a contributing risk factor for chronic inflammatory oral diseases such as periodontal disease and apical periodontitis (Poyato-Borrego et al., 2020). In contrast, Segura-Sampedro et al. found no notable difference in the occurrence of AP between individuals with IBD and control subjects (Segura-Sampedro et al., 2022). Therefore, more research into the etiology and risk factors of IBD is needed.

Both AP and AD are chronic inflammatory conditions that follow overlapping inflammatory mechanisms. During the development of AP, both the innate and adaptive immune systems contribute significantly, with particular emphasis on CD4+ T lymphocytes. Th1 cells produce interferon-gamma (IFN-γ) and tumor necrosis factor-alpha (TNF-α), which stimulate macrophage microbicidal functions and promote cell-mediated immunity against intracellular pathogens. In contrast, Th2 cells release cytokines such as interleukin (IL)-4, IL-5, and IL-13, which activate mast cells, eosinophils, and basophils, thereby regulating humoral immune responses (Wei et al., 2021). A sustained periapical immune response promotes osteoclast differentiation and inhibits osteogenesis, triggering and initiating periapical bone resorption. The imbalance between osteoclastogenesis and osteogenesis is the consequence of a combination of factors, with persistent bone destruction eventually evolving into chronic AP (Wen et al., 2024).

Ulcerative colitis is identified as a Th2 type immune disease, marked by increased expression of

IL-5, while Crohn's disease is considered a Th1 immune disease, characterized by elevated levels of IFN-γ, IL-12, and TNF-α (Poyato-Borrego et al., 2020). Apical periodontitis involves both types of immune responses. Initially, Th1 cells activate osteoclasts via the nuclear factor kappa B ligand (RANKL), leading to the characteristic destruction of periapical bone. To fully understand impact of each disease and make causality clear, cross-disciplinary collaboration between endodontists and immunologists is crucial.

The long-term outcomes indicate that any of the diseases (IBD, RA, Ps) do not demonstrate statistical significance. The mean observation duration for long-term outcomes was approximately 50 months. While IBD may have negatively affected the outcome at the one-year mark, its impact appears to diminish as time progresses. Generally, it takes at least 4 months for radiographic changes to become noticeable assuming a healthy adult with active bone metabolism. Considering the decreased rate of bone regeneration, this implies that it may take more than a year to confirm radiographic healing in IBD patients.

Also, a general trend of decreased success rates of RCT was observed in the long-term outcomes compared to the 1-year results. While the current findings did not reach statistical significance, the outcome may become significant with a larger sample size and an extended follow-up period. Because the study population was confined to patients with the condition, the results may be influenced by as few as one or two cases.

The current study has some limitations. First, some relevant factors that might affect the periapical status and the systemic conditions —such as socioeconomic status and prescribed medications— were not taken into account. These factors could act as confounding factors. Since biologic medications (ex. Denosumab) can influence the immune system, further research is needed to

explore how these medications may affect treatment outcomes in the future. Second, there is a risk of biased results about the periapical conditions provided in the insufficient information from the full panoramic radiographs. Though the full panoramic radiographs exhibit superimposed or distorted images than PA and CBCT, they were involved in this study to make adequate number of subjects. Due to the limited number of AD patients, this was an expedient measure to increase the sample size as much as possible. Third, the patient population focused on specific gender and age groups. Due to the characteristics of the healthcare institution, the target population was inevitably biased, but they were mitigated as much as possible through PSM.

This study was designed and implemented with patients from a Veterans Health Service Medical Center (Seoul, South Korea). The investigation into the association between autoimmune diseases and endodontic treatment outcomes presents inherent challenges. Accurate analysis requires that patients receive both medical and dental care within the same medical institution. The acquisition of an adequate sample size is often limited by challenges related to patient follow-up. As a central healthcare institution for national veterans, the hospital benefits from a highly loyal patient population with a strong tendency for regular visits. Furthermore, both medical and dental records are comprehensively documented and readily accessible, facilitating data integration and enabling the feasibility of this study. The distinct advantage of providing integrated medical and dental services within a single institution allowed for the collection of a sufficiently large sample size, representing a major strength of the present study.

5. Conclusion

The success rate of nonsurgical root canal treatment was lower in patients diagnosed with IBD compared to controls and those with other autoimmune conditions (RA, Ps), suggesting that the altered immune system associated with IBD is involved in the progression of apical periodontitis. However, IBD was not found to be significant in the logistic regression analysis. In the logistic regression analysis, tooth type, the presence of preoperative apical lesions, and the quality of root canal filling were identified as significant factors influencing the outcome of RCT. Understanding the relationship between host susceptibility to inflammatory conditions and the influence of autoimmune diseases on the development of apical periodontitis could facilitate the development of novel treatment strategies for AP. In light of the several limitations of this study and considering the growing population with autoimmune disease, it is important to formalize an appropriate endodontic treatment protocol for patients with AD.

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Abstract in Korean

자가면역 질환을 가진 환자에서의 근관치료 결과:

후향적 환자-대조군 연구

목적: 이 후향적 사례 대조군 연구의 목적은 자가면역질환(AD) 환자와 비자가면역질환 환자에서 비수술적 근관치료 결과를 비교하는 것이다. 또한 비수술적 근관치료의 성공율은 AD 환자의 하위 그룹인 염증성 장질환(IBD), 류마티스 관절염(RA), 건선(Ps) 수준에서 비교되었다.

방법: 2010년 1월부터 2022년 12월까지 보훈공단 중앙보훈병원에서 AD 진단을 받고 RCT를 받은 환자들이 연구 대상이 되었다. RCT 결과는 최소 1년 이상의 기간에 평가되었으며, 최대 추적 기간도 기록되었다. 자가면역질환(AD) 환자 203명(317개 치아)을 조사하였고, 대조군은 자가면역질환이 없는 환자 203명(312개 치아)이 포함되었다. 치아의 치근단 상태와 치근단 지수(PAI 점수)를 확인하기 위해 3종류의 치과 방사선 이미지를 사용했다. 추가적으로 조사된 변수로는 환자의 사회적 및 인구학적 특성이 포함되었다. 카이제곱 검정과 로지스틱 회귀 분석을 사용하여 AD와 근관치료 성공율과의 상관관계를 평가했다.

결과: 근관치료 성공율은 AD 환자에서 73.72%, 대조군에서 69.43%로 나타났다($p = 0.268$). IBD 환자에서만 치근단 치주염 (AP) 발생 위험과 관련하여 통계적 유의성이 확인되었다($p = 0.025$). 다변량 로지스틱 회귀분석 결과, 근관치료 결과에 유의

미한 영향을 미치는 인자로 치아 유형, 술전 치근단 병변의 여부, 근관 충전의 질이 확인되었다. 1년 결과와 장기간 결과를 비교한 결과, IBD, RA, Ps 세 질환 모두에서 성공률이 감소하는 유사한 경향이 관찰되었으나, 통계적 유의성은 확인되지 않았다.

결론: IBD 환자에서 비수술적 근관치료의 성공률이 대조군 및 다른 자가면역질환 환자에 비해 낮게 나타났으나, 로지스틱 회귀분석에서는 IBD가 유의한 인자로 밝혀지지 않았다. AD과 치근단 치주염의 상호작용 및 그 영향에 대해 보다 심층적인 연구가 필요하다.

핵심되는 말 : 자가면역질환, 전신질환, 염증성 장 질환, 류마티스 관절염, 건선, 치근단치주염, 근관치료, 임상결과