EUROPEAN ENDODONTIC JOURNAL

ORIGINAL ARTICLE

Association between Rheumatoid Arthritis and Apical Periodontitis: A Cross-sectional Study

Ertuğrul KARATAŞ, Ayhan KUL, Ebru TEPECİK

ABSTRACT

Objective: The present cross-sectional study aimed to investigate possible association between Rheumatoid Arthritis (RA) and Apical Periodontitis (AP).

Methods: In table one it is mentioned 48 patients diagnosed with RA were included in the experimental group. Another 48 healthy age- and gender-matched participants who reported no history of any systemic disease were selected to form the control group. All the patients were examined radiographically and clinically to diagnose the presence of AP. The following data was recorded for all patients; the number of teeth present, the number of teeth with AP, the number of patients with AP, the number of patients with root canal treated teeth (RCT) and the number of patients with RCT+AP. The chi-square test and logistic regression analysis were used to determine the possible association between RA and AP.

Results: A total of 1026 teeth were examined in the RA group and 45 of them was diagnosed as AP. In the control group, 1025 teeth were examined and 21 teeth were diagnosed as AP. It was found that the prevalence of teeth with AP (4.3%) was significantly higher in the RA group than the control (2%) (odds ratio [OR]=2.193, P=0.003). Logistic regression analysis showed that RA is significantly associated with AP.

Conclusion: It can be concluded that patients with RA can be more prone to develop AP.

Keywords: Rheumatoid arthritis, apical periodontitis

HIGHLIGHTS

- This is the first study revealed that patients with Rheumatoid Arthritis can be more prone to develop Apical Periodontitis.

INTRODUCTION

Rheumatoid arthritis (RA) is the most common form of inflammatory joint diseases affecting 1% of the world population. It is a chronic inflammatory disorder and is characterized by pain, stiffness, swelling, and progressive joint destruction (1). The exact mechanism of RA is still unknown but it is probably caused by a combination of infectious agents, autoimmunity and genetics (2).

In RA, it is well known that there is a continual expression of cytokines such as tumor necrosis factor α, ınterleukin-1 and interleukin-6 by macrophages (3). These cytokines may induce bone resorption and play a pro-inflammatory role in apical periodontitis (AP) (4-6). Additionally, it has been revealed that there is a link between increased systemic levels of inflammatory cytokines and AP (7). Although, several studies have revealed an association between RA and periodontitis (8-10), there is no evidence suggesting that there is an association between RA and AP. Previously, Jalali et al (11) conducted a retrospective study and compared the prevalence of periapical rarefying osteitis in the case of RA and control patients. They reported that there was no statistically significant difference between RA and control patients in terms of the prevalence of periapical rarefying osteitis. However, the association between RA and AP is still unclear since the authors evaluated radiographs to diagnose periapical rarefying osteitis, and did not undertake any clinical examination to diagnose AP. Therefore, in the present cross-sectional study, the aim was to investigate a possible association between RA and AP. The null hypothesis was that there would be no association between RA and AP.

MATERIALS AND METHODS

The sample size calculation was performed based on the data of a previous study that evaluated the prevalence of RA and periapical rarefying osteitis (11) with an effect size of 0.1, error of al-

Please cite this article as: Karataş E, Kul A, Tepecik E. Association between Rheumatoid Arthritis and Apical Periodontitis: A Cross-sectional Study. Eur Endod J 2020; 2: 155-8

From the Department of Endodontics (E.K. ✉ dtertu@windowslive.com, E.T.) Faculty of Dentistry, Atatürk University, Erzurum, Turkey; Department of Physical Medicine and Rehabilitation, (A.K.) Medical Faculty of Atatürk University Erzurum, Turkey

Received 30 September 2019, Accepted 03 December 2019

Published online: 22 July 2020
DOI 10.14744/eej.2019.52824

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

pha=0.05, and a power of 0.8. Calculation revealed that 1283 teeth is sufficient for 2 groups. To increase statistical power, 2051 teeth were included to the study.

Ethical approval of the present pair-matched cross-sectional study was obtained from the ethical committee of the Faculty of Dentistry (A. University) (10.1/2018). Fifty patients diagnosed with RA, receiving treatment at the Rheumatology Clinic, without any history of systemic disease except RA, ranging from 18-65 years of age were included in the experimental group. Another 50 healthy age- and gender-matched participants who reported no history of any systemic diseases were selected to form the control group.

All patients were examined radiographically and clinically to diagnose the presence of AP. All types of apical periodontitis (symptomatic apical periodontitis, asymptomatic apical periodontitis, chronic apical abscess and acute apical abscess) was defined as AP. All periapical radiographic images were taken by the same system (Planmeca Promax, Helsinki, Finland). One endodontist and one experienced dentist, who were blinded to the groups, analyzed the digital panoramic radiographs. In case of disagreement between observers, an additional analysis by both the researcher. After radiographic analysis, a clinical examination was also performed for all patients and the teeth diagnosed with AP were examined clinically (using pulp sensibility, percussion and palpation tests) by the endodontist to confirm the presence of AP. The following data was recorded for all patients; the number of teeth present, the number of teeth with AP, the number of patients with AP, the number of patients with root canal treated teeth (RCT) and the number of patients with RCT+AP.

The periapical index (PAI) was used to evaluate the periapical status. The teeth with normal periapical structure or with small changes in bone structure were categorized as healthy (PAI 1 and 2). The teeth with a widened periodontal ligament, periodontitis with a well-defined radiolucent area and/or severe periodontitis with exacerbating features (PAI 3, 4 and 5) were categorized as teeth with periapical pathology (12). The PAI score for multirooted teeth was determined by the highest score of all roots (13).

The chi-square test and logistic regression analysis were used to determine the possible association between RA and AP. The Student t test was used to compare the age variable between the groups. The statistical analysis was conducted using IBM® SPSS® Statistics 20 software (IBM SPSS Inc., Chicago, IL, USA) at a significance level of 5% (P=0.05).

RESULTS

A total of ninety-six patients with 2051 teeth were evaluated (Table 1). A total of 1.026 teeth were examined in the RA group and 45 of them was diagnosed as AP. In the control group, 1.025 teeth were examined and 21 teeth were diagnosed as AP. It was found that the prevalence of teeth with AP (4.3%) was significantly higher in the RA group than in the control group (2%) (odds ratio [OR]=2.193, P=0.003).

Logistic regression analysis showed that RA is significantly associated with AP. The prevalence of AP in at least 1 tooth was higher in the RA group (47.9%) than in the control (29.7%) (OR=3.087, P=0.027). This may indicate that AP is more likely in patients with RA than in the control subjects. At least 1 root canal treated tooth was found in 16 (33.3%) and 20 (41.7%) of

TABLE 1. Distribution of the analyzed variables in patients with rheumatoid arthritis and control group

	Rheumatoid arthritis	Control	P value	Odds ratio
N				
Patients	48	48	-	-
Teeth	1026	1025		
Mean age	47.69±10.6	47.19±10.7	0.82	-
Gender			-	-
Female	33	33	-	-
Male	15	15	-	-
Smoking habit				
Present	13 (27.1%)	10 (20.8%)	0.321	1.655
Absent	35 (72.9%)	38 (79.2%)		
Number of teeth with AP, n (%)			0.003	2.193
Present	45 (4.3%)	21 (2%)		
Absent	981 (95.7%)	1004 (98%)		
Patients with AP n (%)			0.027	3.087
Present	23 (47.9%)	14 (29.7%)		
Absent	25 (52.1%)	34 (70.3%)		
Patients with RCT, n (%)			0.538	0.733
Present	16 (33.3%)	20 (41.7%)		
Absent	32 (66.7%)	38 (58.3%)		
Patients with RCT+AP, n (%)			0.375	0.473
Present	5 (10.4%)	6 (12.5%)		
Absent	43 (89.6%)	42 (87.5%)		

Patients with AP, at least 1 tooth with apical periodontitis (Absent/Present); Patients with RCT, at least 1 root canal treated tooth (Absent/Present); Patients with RCT+AP, at least 1 root canal treated tooth with apical periodontitis (Absent/Present). Values in bold indicate statistical significance at P<0.05. AP: Apical periodontitis, RCT: Root canal treated teeth

RA and control patients, respectively. The prevalence of one or more root canal treated teeth between the RA and the AP groups did not show any statistically significant difference (P>0.05). At least 1 root canal treated tooth with AP was found in 5 (10.4%) and 6 (12.5%) of the RA and the AP patients, respectively. The difference between the groups in terms of the prevalence of one or more root canal treated teeth with AP was not statistically significant (P>0.05). There was no statistically significant association between smoking habits and the presence of AP (P>0.05).

DISCUSSION

Literature shows positive relationship between RA and periodontitis (9, 14, 15). Since AP shares similar microbiota and cytokine profiles with chronic periodontitis (16, 17), the present cross-sectional study aimed to evaluate the possible association between the RA and AP. The result of the study showed that there was a statistically significant association between RA and AP. Thus the null hypothesis was rejected.

The RA is characterized by the increased production of proinflammatory cytokines such as interlokin-1, interlokin-6, interlokin-17 and tumor necrosis factor alpha (18). These cytokines are predominant in the pathobiology of both RA and AP. The similar pathobiology of both diseases could explain the significant association between them. Additionally, the progression of both diseases include bone resorption process through the activation of the receptor activator of nuclear factor kB (18). Moreover, it has been reported that there is a positive correlation between the presence of the Immunoglobulin G rheumatoid factor in periapical lesions and rheumatoid disease (19). Another possible explanation is that the drugs used in the treatment of RA have an immunosuppressive effect which makes patients with RA predisposed to AP (20).

Previously, association between RA and periapical rarefying osteitis has been studied, and it has been reported that there is no association between periapical rarefying osteitis and RA (11). This is inconsistent with the result of the present study. This may be attributed to the difference in the methodology of the studies. In the present study, all patients were examined radiographically and clinically to diagnose the presence of AP. In contrast, the previous study used radiographs to diagnose teeth with periapical rarefying osteitis (11). Periapical rarefying osteitis could be associated with the presence of AP. However, without clinical confirmation, a radiographic examination may not be enough to diagnose AP. This is because radiographic changes in cancellous bone cannot be detected until the bone loss reach the cortical plate (21). Thus, in the previous study, it is possible that some of the teeth with periapical rarefying osteitis may not have been diagnosed.

In the present study, there were several confounding factors that may affect the results. Previously it has been reported that health conditions significantly affect the healing of AP (22). Therefore, in the present study, patients without any history of systemic disease except RA were included. Additionally, it is well known that age and gender does not influence the outcome (23). However, to obtain standardization between the groups, an age and gender matched study design was performed. A limitation of the present study could be that, the oral hygiene of the patients that may affect the number of teeth with AP was not evaluated. Previously, it has been reported that the incidence of AP development is higher for patients with periodontal disease compared with patients without periodontal disease (24). Another limitation of the present was that the quality of root canal filling or coronal restoration were not evaluated. The quality of root canal filling and coronal restoration can influence the outcome of root canal treatment (25). However, according to the result of the present study, there was no significant difference between the groups in terms of the number of patients with RCT+AP. Therefore, the impact of the quality of root canal filling and coronal restoration on the outcome of RCT did not differ for both groups.

CONCLUSION

According to the results of the present study, RA is significantly associated with an increased prevalence of AP. Patients with RA can be more prone to develop AP. However, RA did not affect the response to root canal treatment because there was no significant difference between the RA and control groups in terms of RCT teeth with AP.

Disclosures

Acknowledgements: The authors declare that they have no conflict of interest. No sources of funding were used to assist in the preparation of this paper.

Conflict of interest: There is no any conflict of interest.

Ethics Committee Approval: Ethical approval of the present pair-matched cross-sectional study was obtained from the ethical committee of the Faculty of Dentistry (A. University) (10.1/2018).

Peer-review: Externally peer-reviewed.

Financial Disclosure: There is no any financial support.

Authorship contributions: Concept – E.K.; Design – E.K., A.K.; Supervision – E.K., A.K.; Funding - None; Materials - None; Data collection &/or processing – E.T., A.K.; Analysis and/or interpretation – E.K.; Literature search – E.K.; Writing – E.K.; Critical Review – E.K., A.K.

REFERENCES

1. Tak PP, Bresnihan B. The pathogenesis and prevention of joint damage in rheumatoid arthritis: advances from synovial biopsy and tissue analysis. Arthritis Rheum 2000; 43(12):2619–33. [CrossRef]
2. Little JW, Falace DA, Miller CS, Rhodus NL. Rheumatologic and connective tissue disorders. In: Dental Management of the Medically Compromised Patient. Mosby: 2013. p. 320–46. [CrossRef]
3. Gierut A, Perlman H, Pope RM. Innate immunity and rheumatoid arthritis. Rheum Dis Clin North Am 2010; 36(2):271–96. [CrossRef]
4. Márton IJ, Kiss C. Overlapping protective and destructive regulatory pathways in apical periodontitis. J Endod 2014; 40(2):155–63. [CrossRef]
5. Yang NY, Zhou Y, Zhao HY, Liu XY, Sun Z, Shang JJ. Increased interleukin 1α and interleukin 1β expression is involved in the progression of periapical lesions in primary teeth. BMC Oral Health 2018; 18(1):124. [CrossRef]
6. Azuma MM, Samuel RO, Gomes-Filho JE, Dezan-Junior E, Cintra LT. The role of IL-6 on apical periodontitis: a systematic review. Int Endod J 2014; 47(7):615–21. [CrossRef]
7. Gomes MS, Blattner TC, Sant'Ana Filho M, Grecca FS, Hugo FN, Fouad AF, et al. Can apical periodontitis modify systemic levels of inflammatory markers? A systematic review and meta-analysis. J Endod 2013; 39(10):1205–17. [CrossRef]
8. Joseph R, Rajappan S, Nath SG, Paul BJ. Association between chronic periodontitis and rheumatoid arthritis: a hospital-based case-control study. Rheumatol Int 2013; 33(1):103–9. [CrossRef]

9. Mercado F, Marshall RI, Klestov AC, Bartold PM. Is there a relationship between rheumatoid arthritis and periodontal disease? J Clin Periodontol 2000; 27(4):267–72. [CrossRef]
10. Käber UR, Michel A, Bolten WW, Gleissner C, Dehne F, Willershausen-Zönnchen B. Risk for periodontal disease in patients with longstanding rheumatoid arthritis. Arthritis & Rheumatism 1997; 40(12):2248–51. [CrossRef]
11. Jalali P, Glickman GN, Schneiderman ED, Schweitzer JL. Prevalence of Periapical Rarefying Osteitis in Patients with Rheumatoid Arthritis. J Endod 2017; 43(7):1093–6. [CrossRef]
12. Orstavik D, Kerekes K, Eriksen HM. The periapical index: a scoring system for radiographic assessment of apical periodontitis. Endod Dent Traumatol 1986; 2(1):20–34. [CrossRef]
13. López-López J, Jané-Salas E, Estrugo-Devesa A, Velasco-Ortega E, Martín-González J, Segura-Egea JJ. Periapical and endodontic status of type 2 diabetic patients in Catalonia, Spain: a cross-sectional study. J Endod 2011; 37(5):598–601. [CrossRef]
14. Zhang DZ, Zhong DY, Deng J, Wang JB. Relationship between periodontal disease and rheumatoid arthritis. [Article in Chinese]. Hua Xi Kou Qiang Yi Xue Za Zhi 2005; 23(6):498–501.
15. Jung ES, Choi YY, Lee KH. Relationship between rheumatoid arthritis and periodontal disease in Korean adults: Data from the Sixth Korea National Health and Nutrition Examination Survey, 2013 to 2015. J Periodontol 2019; 90(4):350–7. [CrossRef]
16. Vidal F, Fontes TV, Marques TV, Gonçalves LS. Association between apical periodontitis lesions and plasmatic levels of C-reactive protein, interleukin 6 and fibrinogen in hypertensive patients. Int Endod J 2016; 49(12):1107–15. [CrossRef]
17. Trope M, Tronstad L, Rosenberg ES, Listgarten M. Darkfield microscopy as a diagnostic aid in differentiating exudates from endodontic and periodontal abscesses. J Endod 1988; 14(1):35–8. [CrossRef]
18. Cotti E, Schirru E, Acquas E, Usai P. An overview on biologic medications and their possible role in apical periodontitis. J Endod 2014; 40(12):1902–11.
19. Malmström M, Jokinen EJ. Free rheumatoid factor in dental periapical lesions and gingivae of patients with rheumatoid disease. Scand J Rheumatol 1975; 4(3):121–4. [CrossRef]
20. Koczan D, Drynda S, Hecker M, Drynda A, Guthke R, Kekow J, et al. Molecular discrimination of responders and nonresponders to anti-TNF alpha therapy in rheumatoid arthritis by etanercept. Arthritis Res Ther 2008; 10(3):R50. [CrossRef]
21. Bender IB, Seltzer S. Roentgenographic and direct observation of experimental lesions in bone: I. 1961. J Endod 2003; 29(11):702–6. [CrossRef]
22. Fouad AF, Burleson J. The effect of diabetes mellitus on endodontic treatment outcome: data from an electronic patient record. J Am Dent Assoc 2003; 134(1):43–51. [CrossRef]
23. Marending M, Peters OA, Zehnder M. Factors affecting the outcome of orthograde root canal therapy in a general dentistry hospital practice. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005; 99(1):119–24.
24. Ruiz XF, Duran-Sindreu F, Shemesh H, Garcia Font M, Valles M, Roig Cayon M, et al. Development of Periapical Lesions in Endodontically Treated Teeth with and without Periodontal Involvement: A Retrospective Cohort Study. J Endod 2017; 43(8):1246–9. [CrossRef]
25. Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of primary root canal treatment: systematic review of the literature - Part 2. Influence of clinical factors. Int Endod J 2008; 41(1):6–31.