

---

# Influence of the Technical Quality of Root Filling on Periapical Health (One-year Results)

---

**Rasmutė Manelienė,  
Irena Balčiūnienė**

*Stomatological Clinic of  
Vilnius University,  
Žalgirio 115,  
LT-2600 Vilnius, Lithuania*

The purpose of the study was to evaluate a possible relationship between the technical quality of root canal filling and the periapical status of endodontically treated teeth. 180 teeth of practically healthy patients, affected by the apical periodontitis, were treated endodontically. The root canals were filled by the lateral condensation technique. To evaluate the technical quality of root canal filling in the radiographs, there were applied criteria based on the filling quality score (1, 2, 3, 4): score 1 – overfilled (16.98%), score 2 – up to the radiographic apex (22.01%), score 3 – >2 mm from the radiographic apex (10.69%), score 4 – 2 mm from the radiographic apex (50.31%). After 12 months 159 teeth treated endodontically were re-examined. The standards of the radiographic criteria, which characterize the efficacy of endodontic treatment, were applied to describe the outcome of the treatment prognosis: success, uncertain, and failure. After 12 months, the index values of the apical periodontitis healing were: “success” – 74.2%, “uncertain” – 17.6%, and “failure” – 8.2%. Conclusion: the technical quality of root canal filling did not have any impact on the healing outcome of apical periodontitis after a period of 12 months.

**Key words:** apical periodontitis, root canal filling, technical quality, radiographic apex

---

## INTRODUCTION

Results of endodontic treatment have long since been analysed in many North American and European countries. Various factors that can have an impact on successful treatment are checked. In some populations the endodontic status of teeth is studied, as endodontic treatment is still intensive (1). For example according to Swedish data, on average 4.5 teeth per patient and for 45 percent of patients even 5 and more teeth are treated endodontically (2). Endodontic treatment is also related with the problem of apical periodontitis. It is also thoroughly analysed, and numerous epidemiological studies are being performed for evaluation of apical periodontitis prevalence. In Scandinavian countries this index varies between 30 and 60 percent and increases with age (3). Similar data are published from the Netherlands, Switzerland and the USA (4–6). According to recent data from Portugal, the prevalence of apical periodontitis in the 30–39-year group is slightly lower – up to 30 percent (7). Data on the prevalence of apical periodontitis in Eastern Europe are scarce. According to the results obtained in Vilnius, apical periodontitis among the 30–39-year population is diagnosed in 70 percent, while in Scandina-

via in 40 percent in the same age group (8). Among 35–44 year-old patients, apical periodontitis is diagnosed in 82 percent among those with former endodontic treatment (8). Thus, the disease is very frequent in this age group in Lithuania, and endodontic treatment does not warrant success. Such a high frequency of the disease urges to search for the causes of such a high morbidity and the ways to decrease it. Concerning the results of endodontic treatment, it is important to know the factors that can influence the outcome. These are patient's age, general status of his/her health, initial diagnosis of the tooth under treatment, peculiarities of the morphology of the canal of the root, quality of chemo-mechanical root canal preparation, microbiological status of the root canal, clinical complications, materials and methods of root canal filling, technical complications. Such a wide range of factors explains the results of studies which indicate that the successful outcome of endodontic treatment can be expected in 40 to 95 percent of all cases (9). Data on the incidence of apical periodontitis among the inhabitants of Vilnius are available (8); however, we still lack data on the remote outcome of treatment of apical periodontitis and on the factors that may

have an impact on it. Thus, the purpose of this study was to evaluate the significance of several factors (diameter of the periodontal lesion before the beginning of the endodontic treatment, patient's age, sex, technical quality of the root canal filling) on the results of apical periodontitis treatment after 12 months.

## MATERIALS AND METHODS

Patients who agreed to participate after arrival to the endodontologist in Stomatological Clinic of Vilnius University were included into the study. The patients were sampled into age groups as follows: group I – 7–15 years; II – 16–30 years; III – 31–50 years; IV – 51–70 years. In total, 180 teeth damaged by apical periodontitis were treated in this study. As not all patients arrived for checkout after 12 months, the further analysis was performed on only 159 teeth. For each patient it was explained that teeth with apical periodontitis would be treated endodontically, and the quality of root canal filling would be evaluated by control X-ray immediately after procedure and after 12 months.

Disregarding the patient's sex, age and peculiarities of teeth, their root canals were cleaned and formed using the standardized method of "box" (*i.e.* root apex is reached with instruments of all sizes) (10). Rubber dam and endodontic files (Maillefer) were used for the preparation of root canal in each case.

The working length of the canal was determined by admitting into it a flexible endodontic file No. 15 under radiological control (11). For the cleaning and shaping of the canal, a preparation of ethylenediaminetetraacetic acid (*RC-prep*) pushed into the canal with a working endodontic file was used. Subsequently, the canal was washed with 2.5 percent of sodium hypochlorite (NaOCl) solution and filled with gutta-percha by lateral condensation, using the patented eugenol zinc oxide paste *Roth Root Canal Cement*. "Master" cones were selected from standard ones and "accessory" cones from non-standard gutta-percha ones. For gutta-percha condensation, A, B, C, D (*Maillefer*) spreaders were used. Parallel X-ray after canal filling was taken. Endodontic cavity was filled with 4 mm eugenol zinc oxide cement (*i.e.* *IRM*). Patients were informed that this was not the final filling and that after 12 months he/she would be recalled for check up, even in case of absence of any clinical symptoms.

### Sequence of endodontic treatment

All teeth were treated during three visits. At the first visit, the endodontic cavity was cleaned, canals

identified, their working length determined, initial chemomechanic cleansing and shaping performed. Each canal was alternately washed with 2.5 percent NaOCl solution and EDTA preparation and dried with paper plugs of corresponding size. The endodontic cavity till the next visit was temporarily filled with *IRM* cement.

The second visit was appointed after 5–7 days. During the second visit, the root canal was repeatedly cleaned chemomechanically and shaped, *i.e.* it was finally cleaned and shaped according to the standard method of "box". During all procedure the canal was abundantly washed with 2.5 percent NaOCl solution and EDTA preparation and dried with paper plugs. Till the next visit, the canal was left empty, and the endodontic cavity filled with *IRM* cement.

The patient was requested for the third visit after 5–7 days. This time, after a proper washing of the canal with 2.5 percent NaOCl solution and drying with paper plugs, the "master" gutta-percha cone was selected and pushed into the canal; X-ray was taken to check if the cone was selected and the canal prepared properly. Subsequently, the canal was filled by lateral condensation and parallel X-ray taken immediately. The endodontic cavity before final filling or a prosthesis of tooth was temporarily filled with *IRM* cement.

For almost all patients a non-steroid anti-inflammatory drug (Ibuprofen or Motrin) 0.4 g 3 times per day for 4–5 days was prescribed.

The patients were recalled for checkup after 12 months, as the observation data of one year are most informative of results of treatment (12, 13).

### Radiological method of study

The following X-rays were taken: initial (before treatment), for determination of working length, with adjusted "master" cone, immediately after filling the root, and after 12 months. Seeking to support the shortest standardized duration of exposition, radiography was performed using an *Endo-Pro* film holder, a conic tube regulating the direction of rays, and *Kodak Ektaspeed* film (size 3 × 4). Films were developed manually by the same technician. Radiographs were evaluated in the dark on a light screen under double magnification.

For diagnosis of apical periodontitis, the method of E. White (1992) for evaluation of the radiological picture of periapical tissues was used (14). For radiological evaluation of the technical quality of root canal filling, criteria on a 4-score scale were employed:

score 1 – 1 mm and more of filling material is in surrounding periapical tissues

score 2 – filling material is at the level of radiological apex of the root

score 3 – filling material reaches more than 2 mm up to the radiological apex of the root

score 4 – filling material reaches approximately 2 mm up to the radiological apex of the root.

For evaluation of successful endodontic treatment, two radiograms were analysed: initial (before treatment) and after 12 months. For the prognosis of healing, standard radiological criteria describing the effectiveness of endodontic treatment were used (10, 16):

success – contour and width of periodontal ligament are normal, no periradicular radiolucency

uncertain – periodontal ligament around the apex of double width, no periradicular radiolucency

failure – periradicular radiolucency is slightly decreased, of the same size or even increased comparing with the status before treatment.

For statistical analysis, the Spearman correlation coefficient and  $\chi^2$  values were used. Significance level  $p = 0.05$  was selected. The Spearman correlation coefficient and  $\chi^2$  values enable to prove the influence of statistically separate factors on the result.

## RESULTS AND DISCUSSION

Epidemiological surveys have proved the direct dependency between the technical quality of canal filling and diagnosed apical periodontitis. Now the question is: Was the bad technical quality caused by insufficient knowledge, use of improper materials, lack of clinical skills or economic conditions? Thus it is very important to evaluate the technical quality of filling. In epidemiological and clinical studies this factor is considered as the most important for the successful endodontic treatment. In our study, technical quality of the root canal filling was evaluated in grades according to radiological data (10, 16). The distribution of cases by age groups is presented in Table 1.

Data from Table 1 suggest that in 80 cases (50.31 percent) the technical quality of filling was evalua-

ted as score 4, and this could be a good prognostic sign. Several clinical studies in the USA and Scandinavian countries state that prognosis of endodontic treatment directly depends on the canal filling quality, and their range of good quality fillings is only from 38 to 42 percent (6, 17).

If the canal is filled insufficiently, *i.e.* filling material is not pushed further than 2 mm down to the radiological apex of the root, the incidence of unsatisfactory results is higher than if the canal is filled up to the radiological apex (18). In our sample, in 22.01 percent of cases the canal was filled up to the radiological apex, and in 10.69 percent the filling was insufficient (filling material didn't reach the radiological apex). Considering literature data, one could expect that the prognosis of endodontic treatment in 22.01 percent will be beneficial.

The probability of good prognosis is low if the canal is overfilled and filling material is pushed out through the apex, as it irritates the tissues and the apex is not closed completely (19). Complications of endodontic procedures: in 42 percent of cases apex of the root is damaged by instruments, in 35 percent filling material is pushed through the apex of the root, and in 3 percent other complications that have an impact on the healing of apical periodontitis (20). In 27 teeth of our patients (16.98 percent) there also were complications, as filling material was pushed behind the apex of the root more than 1 mm (see Table 1), thus apical periodontitis should heal worse.

In our study, healing of apical periodontitis was evaluated attributing it to the categories of "failure", "uncertain" and "success", and data on the dependency of the results of apical periodontitis healing upon technical quality of root canal filling are presented in Table 2. The results are statistically unreliable, as the Spearman correlation coefficient  $r = 0.035$ ,  $p = 0.67$ , and  $\chi^2$  value 7.326,  $p = 0.29$ . Such results prove that the outcome of endodontic treatment does not depend on the technical quality of the root canal filling. In this case, the result of endodontic treatment was not evaluated according to the age group.

Patient group	Age, years	Number of teeth in the group	Number of teeth according to technical quality of filling							
			Score 1		Score 2		Score 3		Score 4	
			n	%	n	%	n	%	n	%
I	7–15	24	4	16.7	4	16.7	2	8.3	14	58.3
II	16–30	42	6	14.6	13	29.4	7	17.0	16	39.0
III	31–50	66	12	18.18	13	19.7	4	6.06	37	56.06
IV	51–70	27	5	18.6	5	18.6	4	14.8	13	48.0
Total		159	27	16.98	35	22.01	17	10.69	80	50.31

We have presented results of observations of one year duration. Probably after two or three years the outcome would look different. Moreover, healing as well as development of apical periodontitis is a dynamic process of a certain duration and depending on the individual capability of tissues to regenerate. After a very short observation period healing of apical periodontitis can be characterised only according to disappearance of certain clinical symptoms (13). The majority of scholars after six months evaluate a decrease of the periapical lesion diameter (21, 22), but such a period is too short for the objective evaluation of the results of endodontic treatment (23). For evaluation of endodontic treatment results, the index of periapical tissues (PAI) is proposed, which is determined according to radiological changes around the root apex.

In our study, the diameter of each periapical lesion was measured on a radiograph before treatment and after 12 months. The average values for each age group are presented in Table 3. If the diameter of periapical lesion decreases, it is very probable that the result of endodontic treatment will be good. Statistical analysis of data from all age groups demonstrates that the diameter of periapical lesion decreased significantly ( $p < 0.05$ ) during 12 months after treatment. Although the decrease is most significant in the first age group (from 4.92 to 0.67 mm), still it is not possible to consider it as complete healing. A decrease of the pathological focus enables only to prognosticate that the process of healing is in progress. Discussion considering the

terms “healing” and “complete healing” is continuing. Complete healing can be determined only after a certain time period after endodontic treatment. This period is different according to different authors (from 6 months to 4–5 years). According to data of those authors who studied the influence of the periapical lesion diameter before treatment, better prognosis can be expected if this diameter is 2–5 mm (24). As the averages of our cases fell into this interval, it is justifiable to expect that the prognosis of apical periodontitis healing will be better than in the case of the average value over 5 mm. Other authors rejected the hypothesis about the dependence between the diameter of periapical lesion and prognosis of apical periodontitis (9, 25).

Results of endodontic treatment of our patients according to age groups are presented in Table 4. The values of the Spearman correlation coefficient and reliability in all age groups were insignificant: correlation coefficients between 0.03 and 0.14, significance levels 0.21–0.82 ( $p < 0.05$ ). According to  $\chi^2$  value, in all the four age groups neither technical quality of filling nor the initial diameter of pathological focus had any influence for the results of endodontic treatment after 12 months ( $p < 0.05$ ). It is possible that in young age the good healing result was conditioned by a high regenerative ability of tissues, but for older patients (over 60 years) this ability is significantly lower (26). However, our data show that the healing of apical periodontitis is good enough also in the fourth age group, where it was evaluated as “success” in 70.4 percent of cases. Ot-

Table 2. Dependency of results of apical periodontitis healing upon technical quality of canal filling

Technical quality of canal filling	Healing results						
	Failure		Uncertain		Success		Pooled
	n	%	n	%	n	%	
Score 1	3	11.11	5	18.52	19	70.37	27
Score 2	1	2.86	8	22.86	26	74.28	35
Score 3	2	11.76	5	29.41	10	58.82	17
Score 4	7	8.75	10	12.50	63	78.75	80
Total	13	8.18	28	17.61	118	74.21	159

Table 3. Difference in the diameter of periapical lesion before treatment and after 12 months

Patient groups	Age, years	Number of periapical lesions	Average diameter of periapical lesions, mm			
			Before treatment		12 months after treatment	
			n	SD	n	SD
I	7–15	24	4.92	3.61	0.67	1.05
II	16–30	42	5.61	4.79	1.05	1.83
III	31–50	66	4.32	2.31	0.95	1.69
IV	51–70	27	3.96	2.12	0.89	1.51

Table 4. Results of apical periodontitis treatment in age groups

Healing results	Evaluation of healing results in age groups							
	7-15 years		16-30 years		31-50 years		51-70 years	
	n	%	n	%	n	%	n	%
Failure	1	4.1	1	2.4	8	12.2	3	11.1
Uncertain	6	25.0	8	19.0	9	13.6	5	18.5
Success	17	70.8	33	78.6	49	74.2	19	70.4
Total	24	100	42	100	66	100	27	100

Table 5. Distribution of apical periodontitis healing results according to patient sex and the technical quality of canal filling

Result of healing	Technical quality of canal filling											
	Females						Males					
	Score 1	Score 2	Score 3	Score 4	Pooled	%	Score 1	Score 2	Score 3	Score 4	Pooled	%
Failure	3	0	1	2	6	6.59	0	0	1	5	6	8.82
Uncertain	3	4	2	8	17	18.68	2	4	3	2	11	16.18
Success	12	19	4	33	68	74.73	7	7	6	31	51	75
Total	18	23	7	43	91	100	9	11	10	28	68	100

her authors who established a good prognosis (81 percent) in this age group attributed it to the use of microcirculation-improving, blood-liquefying medicines and vasodilators which improve regeneration of tissues damaged by apical periodontitis (27).

As data of Table 5 demonstrate, results of apical periodontitis healing do not depend on patient's sex and technical quality of filling. Our data show that prognosis of "success" is similar among females and males: 75.00 and 74.73 percent, respectively. In 1993 K. Peterson, after an analogous analysis, argued categorically that sex had no influence on the endodontal status of teeth, but data from Finland by K. T. Soikkonen denied the prevailing opinion (2, 28).

Thus, neither the technical quality of canal filling, nor patient's age or sex had any impact on the results of healing of apical periodontitis after 12 months (Figure). We have chosen 12 months as a period of evaluation and at the moment have no data on the further dynamics of healing. The peak of healing takes place during the first years after treatment: clinical symptoms disappear in 89 percent of cases, thus the patient is considered completely healed, although the periapical lesion around the apex of the root could still be present (29). After two years, the value of the complete healing index is even higher, and more cases occur where periapical lesion disappears completely (9). So, our results after two years should change, and the number of "success" cases should be not 118, but by 28 cases more. These 28 cases are our "uncertain" results, and for the period longer than 12 months the-

se foci of apical periodontitis should disappear. Sometimes it takes 4 to 5 years for a periapical lesion to heal completely (13). As we have chosen a period of 12 months for evaluation of healing results, only 118 cases of treatment (74.2 percent) were considered as healed completely.

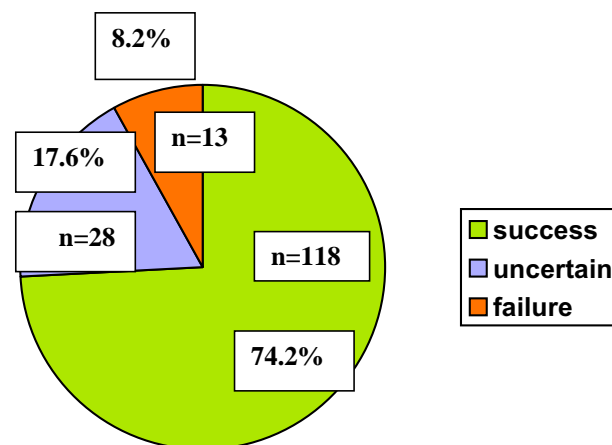


Figure. Distribution of apical periodontitis healing results after 12 months

### CONCLUSIONS

1. The outcome of apical periodontitis healing did not depend upon the technical quality of filling after 12 months:

a) in 70.4 percent of cases "success" of healing was found when the technical quality of filling was evaluated as score 1;

b) in 78.7 percent of cases “success” of healing was found when the technical quality of filling was evaluated as score 4.

1. After 12 months, the value of “success” in healing of apical periodontitis was evaluated in 74.2 percent, “uncertain” 17.6 percent, “failure” in 8.2 percent of all cases.

2. The result of apical periodontitis healing did not depend on patient’s age and sex, as statistical analysis revealed no significant differences.

Received 20 September 2001

Accepted 12 December 2001

## References

- Hugoson A, Kock G, Bergendal T, Hallonsten AL, Laurell L, Lundgren D, Nyman JE. Oral health of individuals aged 3–80 years in Jönköping, Sweden, in 1973 and 1983. II. A review of clinical and radiographic findings. *Swed Dental J*. 1986; 10: 175–94.
- Petersson K, Lewin B, Häkansson J, Olsson B, Wennberg A. Endodontic status and suggested treatment in a population requiring substantial dental care. *Endodont Dent Traumatol* 1991; 7: 189–95.
- Eriksen HM. Endodontology – epidemiologic considerations. *Endodont Dent Traumatol* 1991; 7: 189–95.
- Imfeld TN. Prevalence and quality of endodontic treatment in an elderly urban population of Switzerland. *J Endodontics* 1991; 17: 604–7.
- De Cleen MJH, Schulers AHB, Weselnik PR, Wu M-K. Periapical status and prevalence of endodontic treatment in an adult Dutch population. *Int Endodontic J* 1993; 26: 112–9.
- Buckley M, Spängberg LSW. The prevalence and technical quality of endodontic treatment in an American subpopulation. *Oral Surgery, Oral Medicine, Oral Pathology* 1995; 79: 92–100.
- Margues MD, Moreira B, Eriksen HM. Prevalence of apical periodontitis and results of endodontic treatment in an adult Portuguese population. *Int Endodontic J* 1998; 31: 161–5.
- Sidaravičius B, Aleksejūnienė J, Eriksen HM. Endodontic treatment and prevalence of apical periodontitis in an adult population of Vilnius, Lithuania. *Endodont Dent Traumatol* 1999; 15: 210–5.
- Sjögren U, Häglund B, Sundqvist G, Wing K. Factors affecting the long-term results of endodontic treatment. *J Endodontics* 1990; 16: 498–504.
- Kerekes K, Tronstad L. Long-term results of endodontic treatment performed with a standardized technique. *J Endodontics* 1979; 5: 83–90.
- Forsberg J, Halse A. Radiographic simulation of a periapical lesion comparing the paralleling and bisecting – angle techniques. *Int Endodontic J* 1994; 27: 133–8.
- Eriksen HM, Ørstavik D, Kerekes R. Healing of apical periodontitis after endodontic treatment using three different root canal sealers. *Endodont Dent Traumatol* 1988; 4: 114–7.
- Ørstavik D. Time – course and risk analyses of the development and healing of chronic apical periodontitis in man. *Int Endodontic J* 1996; 29: 150–5.
- Whaites E, Cawson RA. *Essentials of Dental Radiography and Radiology*. Churchill Livingstone, Edinburgh 1992: 59–78, 185–94.
- Häkansson J. Adult dental health 1988. *Br Dental J* 1978; 168: 279–81.
- Strindberg LZ. The dependence of the results of pulp therapy on certain factors. An analytical study based on radiographic and clinical follow-up examinations. Dissertation. *Acta Odontologica Scandinavica*. 1956; 14: 1–74.
- Ray HA, Trope M. Periapical status of endodontically treated teeth in relation to the technical quality of the root filling and the coronal restoration. *Int Endodontic J* 1995; 28: 12–8.
- Eriksen HM, Berset GP, Hansen BF, Bjertness E. Changes in endodontic status 1973–1993 among 35-year-olds in Oslo, Norway. *Int Endodontic J* 1995; 28: 129–32.
- Barbakov FH, Cleaton-Jones P, Friedman D. An evaluation of 566 cases of root canal therapy in general dental practice. *J Endodontics* 1980; 6: 456–60.
- Smith CS, Setchell DJ, Harty FJ. Factors influencing the success of conventional root canal therapy – a five-year retrospective study. *Int Endodontic J* 1993; 26: 321–33.
- Allen RK, Newton CW, Brown CE. A statistical analysis of surgical and nonsurgical endodontic retreatment cases. *J Endodontics* 1989; 15: 261–6.
- Friedman S, Löst C, Zarrabian M, Trope M. Evolution of success and failure after endodontic therapy using glass ionomer cement sealer. *J Endodontics* 1995; 21: 384–90.
- Ingle JI, Beveridge EE, Glick DH, Weichman JA. *Modern Endodontic Therapy*. Endodontics. 4th ed. 1994; Baltimore, Williams and Wilkins: 27–53.
- Sundqvist G, Figdor D, Persson S, Sjögren U. Microbiologic analysis of teeth with failed endodontic treatment and the outcome of conservative retreatment. *Oral Surgery, Oral Medicine, Oral Pathology* 1998; 85: 86–93.
- Sjögren U, Figdor D, Persson S, Sundqvist G. Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. *Int Endodontic J* 1997; 30: 297–306.
- Grossman LJ, Shepard LI, Pearsson LA. Roentgenologic and clinical evaluation of endodontically treated teeth. *Oral Surgery* 1964; 17: 368–74.
- Smith CS, Serchell DJ, Harty FJ. Factors influencing the success of conventional root canal therapy – a five-year retrospective study. *Int Endodontic J* 1993; 26: 321–33.
- Soikkonen KT. Endodontically treated teeth and periapical findings in the elderly. *Int Endodontic J* 1995; 28: 200–3.

29. Reit C. Decision strategies in endodontics: on the design of a recall program. *Endodont Dent Traumatol* 1987; 3: 233–9.

**R. Manelienė, I. Balčiūnienė**

**ŠAKNIES KANALO TECHNINĖS UŽPLOMBAVIMO KOKYBĖS ĮTAKA PERIPIKALINIŲ ŽIDINIŲ GIJIMUI (VIENERIŲ METŲ REZULTATAI)**

**S a n t r a u k a**

Šios studijos tikslas buvo įvertinti endodontiškai gydytų dantų periapikalinės būklės ryšį su technine kanalo užplombavimo kokybe, lytimi, amžiumi. Po 12 mėnesių praktiškai sveikiems pacientams, kuriems diagnozuotas viršūninis periodontitas, buvo gydyta endodontiškai 180 dantų. Šaknų kanalai plombuoti gutaperčia šoninės kondensacijos metodu. Radiologiškai įvertinant techninę kanalo užplombavi-

mo kokybę naudoti kriterijai, pagal kuriuos užplombavimo kokybę vertinta keturiais balais: 1 balas – perplombavimas (16,98%), 2 balai – sulig radiologine šaknies viršūne (22,01%), 3 balai –>2 mm iki radiologinės šaknies viršūnės (10,69%), 4 balai – 2 mm iki radiologinės šaknies viršūnės (50,31%). Po 12 mėnesių pakartotinai buvo patikrinta 159 endodontiškai gydyti dantys. Gijimo prognozei apibūdinti pasinaudota radiologinių kriterijų, nusakančių endodontinio gydymo veiksmingumą, standartu: „gera“, „abejotina“, „bloga“. Po 12 mėnesių viršūninio periodontito gijimo prognozė įvertinta: „gerai“ – 74,2 %, „abejotina“ – 17,6%, ir „blogai“ – 8,2%.

Išvada: techninė kanalo užplombavimo kokybė, lytis ir amžius neturėjo įtakos viršūninio periodontito gijimui po 12 mėnesių.

**Raktažodžiai:** viršūninis periodontitas, šaknies kanalo plombavimas, techninė kokybė, radiologinė viršūnė