

# Biting and thermal sensitivity relief of cracked tooth restored by occlusal veneer: A 12-to 24 months prospective clinical study

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## ABSTRACT

**Objectives:** To analyze the relief time and risk factors of biting/thermal sensitivity in cracked tooth (CT) restored using occlusal veneer.

**Methods:** 63 CT were analyzed, and their demographic and clinical data and medical history were collected. Patients were followed-up to examine the relief of thermal/biting sensitivity.

**Results:** The maxillary first molar was the most prevalent ( $N = 25$ , 40%). The number of crack lines on the finish line ranged from 1 to 6 while the number of crack lines through preparation on the finish line from 0 to 4. Pain relief achieved steadily to 52% for thermal and 62% for biting at 1 week to over 90% for each by 3 months and was completely resolved (no pain) for each by 12 months. Painful of lateral percussion was related to a long period of thermal sensitivity ( $\geq 1$  month) after restoration with occlusal veneer. The number of crack lines through preparation on the finish line  $>2$  was correlated with biting sensitivity ( $\geq 1$  month) post-treatment.

**Conclusions:** Most patients ( $>90\%$ ) became asymptomatic of biting and thermal sensitivity within 3 months of CT restored by occlusal veneer. Lateral percussion and the number of crack lines through preparation on the finish line could be significant factors affecting postoperative symptoms.

**Clinical Significance:** Occlusal veneer is an ultrathin restoration and had no need for restricting clinical crown height, which could protect and relief the biting/thermal sensitivity of CT without preventive root canal therapy.

## 1. Introduction

According to American Association of Endodontists (AAE), cracked tooth (CT) was defined as a thin surface disruption of enamel and dentin, and possibly cementum, of unknown depth or extension [1]. The common symptoms of CT were biting and thermal sensitivity [2] which may result in unilateral mastication for patients.

Treatment procedures varied for CT among dentists. In a survey by 171 Australian researchers found that 65% dentists preferred direct cuspal-coverage restoration for CT with mildly cold sensitive, while placing an orthodontic band (37%) in a CT with biting pain [3]. The orthodontic band was a temporary treatment before coronal coverage. Rachel et al. reported that 113 (93%) CT had the reversible pulpitis resolved within 2 months while 9 (7%) required root canal therapy

(RCT) due to irreversible pulpitis or pulp necrosis after orthodontic band [4]. Another study revealed a higher rate (29%) of pulpal complications within 2 years observation using orthodontic band. This may due to the absence of full-coverage restoration [5]. A treatment recommendation from National Dental Practice-Based Research Network Collaborative Group suggested full crown was the most successful treatment for CT, most which presented with biting pain in the 1/3 treated teeth [6]. Krell et al. revealed that 27 out of 127 (21%) CT with reversible pulpitis converted to irreversible pulpitis or necrotic pulp after restoration of complete crown during a 6-year evaluation [7]. The large amount of tooth structure removal might affect the health of pulp. As research indicates that full coverage crown may lead to irreversible pulpitis or pulp necrosis because of mechanical and thermal stimulus of the pulp [8]. Also, patients can experience postoperative sensitivity after

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restoration of complete crown. These complaints might be found to occur in 20 – 30% of 17 patients and last for a long period of time after restoration of a complete crown [9].

Therefore, we hypothesized that CT restored by a cuspal-coverage restoration with minimal preparation may reduce the possibility of biting and thermal sensitivity posttreatment. In this study, 63 CT were enrolled and restored by occlusal veneer. We analyzed the relief time and risk factors of thermal and biting sensitivity posttreatment.

## 2. Materials and methods

### 2.1. Study design

The Research Ethics Committee approved this study (PKUSSIRB-202272008). Informed verbal and written consent were obtained from each patient on enrolment.

Patients were enrolled from March 2021 to June 2022, and prospectively evaluated until May 2023. The inclusion criteria (Table S1) were: (1) those with chief complaint of biting pain; (2) those diagnosed with CT via biting test and crack lines could be observed by dental microscope; (3) the teeth were with normal pulp or reversible pulpitis. The exclusion criteria (Table S1) were: (1) Patient unable to give consent; (2) those who diagnosed with irreversible pulpitis according to Hashem D’s [10] criteria including persistent dull throbbing pain, sharp spontaneous pain, or pain exacerbated by lying down; (3) those who diagnosed with pulp necrosis during this longitudinal prospective study; (4) Tooth with periapical lesion.

We obtained a preliminary patient population by posting recruitment notices for patients with cracked tooth in our stomatology hospitals and coordinating the referral of patients with biting pain by dentists in different departments. Finally, the two experienced endodontists provided the diagnosis, treatment, and recall examination over the study period.

### 2.2. Data collection

During the follow-up period, 63 cracked teeth in 58 patients were investigated in this study. Demographic data (gender, age, location of tooth) were collected. Clinical examinations involving chief complaint, duration of symptoms, cold and percussion test, probing depths, periodontal ligament of apical area, biting test were performed. The visual inspection of the cracks after tooth preparation was detailed and documented, including the number and location of crack lines.

### 2.3. Data collection during follow-up

After occlusal veneer restoration, all the CT were clinically evaluated at the following time, 1 week, 1, 2, 3, 6, 12, 18, and 24 months during the follow-up period. The relief of biting and thermal sensitivity was recorded and analyzed.

### 2.4. Clinical examination and treatment procedure

Biting test and treatment procedure by occlusal veneer including preparation and bonding were described in supplementary files.

### 2.5. Statistical analysis

Statistical software SPSS Version 27 (IBM) was used for statistical analysis. The risk factors of biting and thermal sensitivity were evaluated by cross tabs with Pearson Chi-square. A P value < 0.05 represented statistical significance.

## 3. Results

### 3.1. Demographic features of the patients

The patients’ demographic data were shown in Table 1. There were 28 men (48%) and 30 women (52%) with age ranging from 24 to 69 years old (average = 37.53 years old). A majority of CT occurred in patients between 31 and 49 years old (62%). Most of the CT occurred in the maxilla (80%); the maxillary first molars were the most common (N = 25, 40%), followed by 21 maxillary second molars (34%), 9 mandibular first molars (14%), and 4 maxillary second premolars (6%) and 4 mandibular second molars (6%).

All patients suffered biting pain, and none had spontaneous pain. In addition, some had the concomitant symptom, i.e., occasional slight sensitivity when contacting cold or hot food (N = 26, 41%). Patients consulted our stomatological hospital when their symptoms persisted for less than 6 months (N = 31, 49%), between 6 and 12 months (N = 11, 17%), and more than 1 years (34%).

### 3.2. Clinical characteristics of the CT

The patients’ clinical characteristics were shown in Table 1. Biting sensitivity was examined with a small cotton ball or with Tooth Slooth (Professional Results, Laguna Niguel, California). Moreover, part of the CT were prone to pain with percussion test either from the vertical direction (N = 9, 14%) or from the lateral direction (N = 23, 37%). None of the CT exhibited mobility, palpation pain, spontaneous pain, abscess/swelling, and sinus tract. Most of CT had a medium probing depth between 4 and 6 mm (N = 40, 64%), and part of the teeth (30%) had initial interproximal probing ≤ 3 mm.

Then, a pulp vitality test was performed. Before treatment, most of the teeth exhibited normal sensitivity to cold (N = 18, 28%) or moderate sensitivity to cold (N = 37, 59%). Eight teeth (13%) showed severe cold sensitivity. Periapical radiography further showed that most of the CT exhibited the normal width of periodontal ligament (PL) in the apical area (N = 55, 87%).

**Table 1**  
Distribution and statistical analysis of demographic and clinical data on cracked tooth.

Category/Variable	Subgroup	n (%)
Gender	Female	30 (52%)
	Male	28 (48%)
Age, years	≤30	16 (28%)
	31–49	36 (62%)
	≥50	6 (10%)
Chief complaint	Thermal sensitivity—Yes	26 (41%)
	Thermal sensitivity—No	37 (59%)
	Biting pain—Yes	63 (100%)
Duration of symptoms	Less than 6 months	31 (49%)
	between 6 and 12 months	11 (17%)
	More than 1 years	21 (34%)
Location of tooth	Maxillary second premolar	4 (6%)
	Maxillary first molar	25 (40%)
	Maxillary second molar	21 (34%)
	Mandibular first molar	9 (14%)
	Mandibular second molar	4 (6%)
	Cold test	Normal pulp
Percussion test	Moderate cold sensitivity	37 (59%)
	Severe cold sensitivity	8 (13%)
	Vertical—Normal	54 (86%)
Probing depth	Vertical—Painful	9 (14%)
	Lateral—Normal	40 (63%)
	Lateral—Painful	23 (37%)
	≤3 mm	19 (30%)
Periodontal ligament of apical area	4–6 mm	40 (64%)
	>6 mm	4 (6%)
	Normal	55 (87%)
	Widened	8 (13%)

### 3.3. Features of crack lines

The crack lines' features were shown in Table 2 and Fig. 1. Majority of the teeth had 3 (N = 18, 28%) or 4 (N = 16, 25%) crack lines on the finish line, followed by 2 crack lines on the finish line (N = 15, 24%), while 8 patients (13%) were found with 5 crack lines on the finish line. Moreover, 2 crack lines through preparation on the finish line were the most prevalent (N = 34, 54%), followed by 0 crack line (N = 18, 28%) and 3 crack lines (N = 10, 16%).

### 3.4. The symptoms of the CT treated by occlusal veneer

For all teeth, after occlusal veneer restoration, they were clinically evaluated at the following time until the symptoms disappeared during the follow-up period. By May 2023, all CT had a follow-up period of 12 months, 20 CT had a follow-up period of 18 months, and 8 CT had a follow-up period of 24 months. The symptom changes of the CT after occlusal veneer were recorded during the recall periods (Fig. 2).

After 1 week, 52% of the patients experienced relief from thermal pain, and 62% experienced relief from biting pain. After 3 months, most patients experienced relief from thermal pain (92%) and biting pain (94%). At 12th month, all the teeth were asymptomatic.

### 3.5. The risk factors of thermal/biting sensitivity in CT treated by occlusal veneer

We performed Pearson chi-square to evaluate the risk factors leading to a long period ( $\geq 1$ month) of thermal/biting sensitivity. Results showed that lateral percussion pain ( $P = 0.002$ ) was a significant risk factor causing more than 1 month of thermal sensitivity posttreatment. Widened periodontal ligament of the apical area ( $P = 0.097$ ) and the number of crack lines on the finish line  $> 4$  ( $P = 0.08$ ) had a marginal difference with thermal sensitivity after treatment (Table 3). For biting sensitivity, the number of crack lines through preparation on the finish line  $> 2$  ( $P = 0.009$ ) could be significant predictors causing more than 1 month sensitivity for CT restored by occlusal veneer (Table 3).

## 4. Discussion

Pain from biting was the first time that practitioners should intervene for CT [6]. The patient always complained about pain when chewing, to the extent of not being able to chew on the side on which the crack occurred. Thermal sensitivity was another common symptom for CT [2]. Therefore, the aim of our study was to investigate the relief time and risk factors of thermal and biting sensitivity of CT restored by occlusal veneer.

The recommendation of treatment for CT is a complete crown [6,11,

**Table 2**  
The crack lines' features of the involved cracked tooth after preparation.

Category/Variable	Subgroup	n (%)
The number of crack lines on the finish line	1	1 (2%)
	2	15 (24%)
	3	18 (28%)
	4	16 (25%)
	5	8 (13%)
	6	5 (8%)
The number of crack lines through preparation on the finish line	0	18 (28%)
	2	34 (54%)
	3	10 (16%)
	4	1 (2%)

[12]. However, there existed some clinical problems. Complete crown needed for restricting clinical crown height and complex tooth preparation. Some CT, especially second molars, might fail to meet the requirement. Meanwhile, teeth with vital pulp restored by the crown were also at a certain risk of applying RCT because of irreversible pulpal inflammation. Previous studies showed that the survival rates for pulp vitality were 84% after 10 years and 81% after 15 years when vital teeth were restored with metal-ceramic crowns [13]. In this study, occlusal veneer was applied to restore CT. Occlusal veneer was cuspal-coverage restoration with simple and minimal preparation and had no need for restricting clinical crown height because of bonding to retention. Schlichting et al. reported that the successful rate of glass-ceramic occlusal veneers was 100% during 3 years' observation [14].

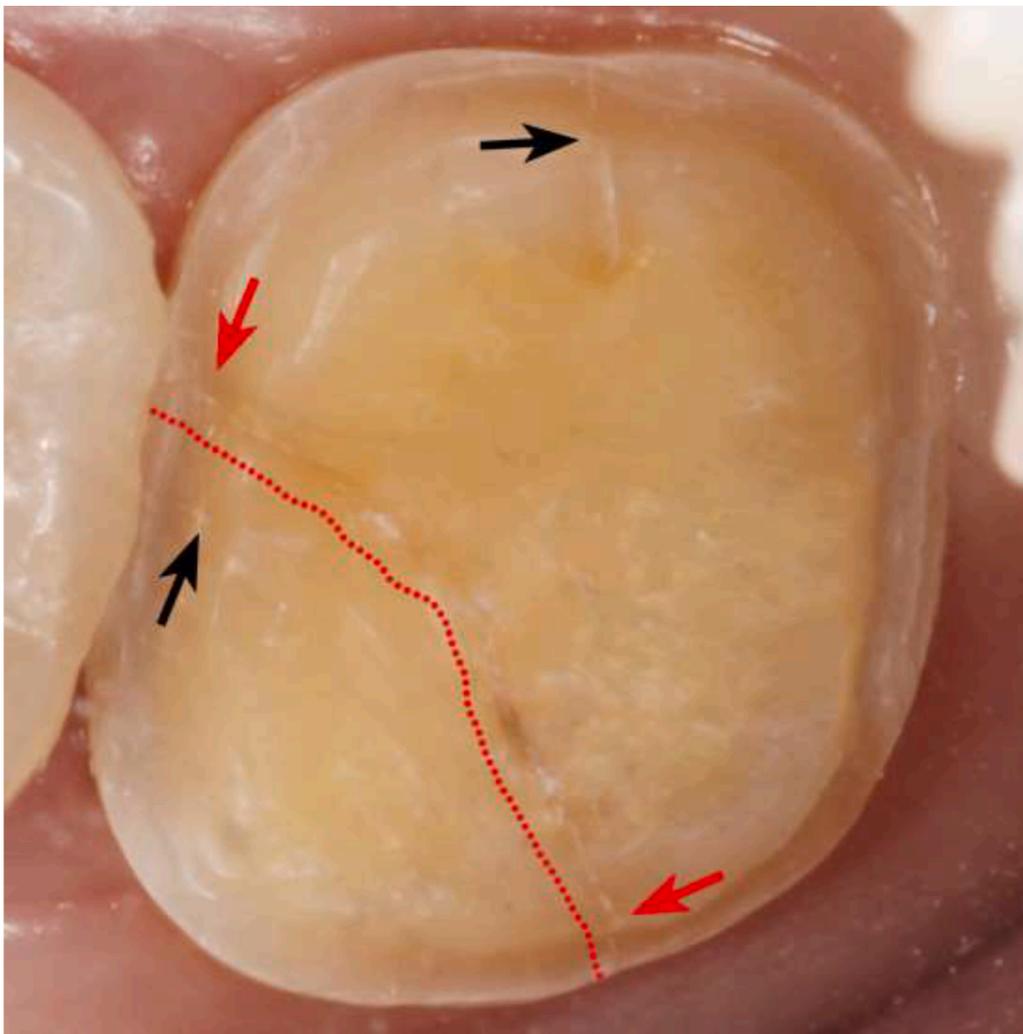
Guthrie et al. reported that 25 of 28 (89%) patients diagnosed with CT might become asymptomatic after restoration with complete crown [15]. Another study enrolled 290 CT with biting pain and 438 with cold pain before treatment. Most of the CT was treated with restorations only, primarily crowns. 263 of 290 (91%) CT became free of biting pain while 287 of 438 (66%) stayed free of cold pain during the recalled time of 3 years [16]. In our study, more than half of the patients felt asymptomatic within 1 week and reached to 100% after 1 year of restoration. We speculated that the minimal invasive tooth preparation contributed to this better treatment outcomes. Toubes et al. revealed that 3 of 26 CT required subsequent RCT because of presenting symptoms after restoration [11]. According to our results, monitoring might be an alternative plan instead of RCT as sensitivity might last several months. To our knowledge, few literatures reported the detailed relief time of cracked tooth restored by occlusal veneer.

Lastly, we analyzed the risk factors leading to a long period ( $\geq 1$ month) of thermal/biting sensitivity posttreatment. Lateral percussion, namely percussing perpendicularly to the cusp ridge, could help locating the crack lines. Liao et al. reported that 64% CT exhibited pain to percussion [17]. Lee et al. found that CT with pain on percussion at the first visit had a lower pulp survival rate [18]. However, they didn't discuss the differences between vertical and lateral percussion. In this study, preoperative examination of painful in lateral percussion might predict a long period of thermal sensitivity posttreatment. Interestingly, the chief complains of thermal sensitivity before treatment had no relationship with temperature discomfort after treatment. Crack lines could be located through naked eyes, transillumination, methylene blue dye staining and microscope [19]. Sim et al. founded that tooth with extension of the cracks onto the pulpal floor were more often extracted [20]. Another study reported that the location and direction of crack lines had no relationship with the loss of CT [11]. Our study showed that the number of crack lines had significant relations with biting sensitivity and marginal significance with thermal sensitivity posttreatment.

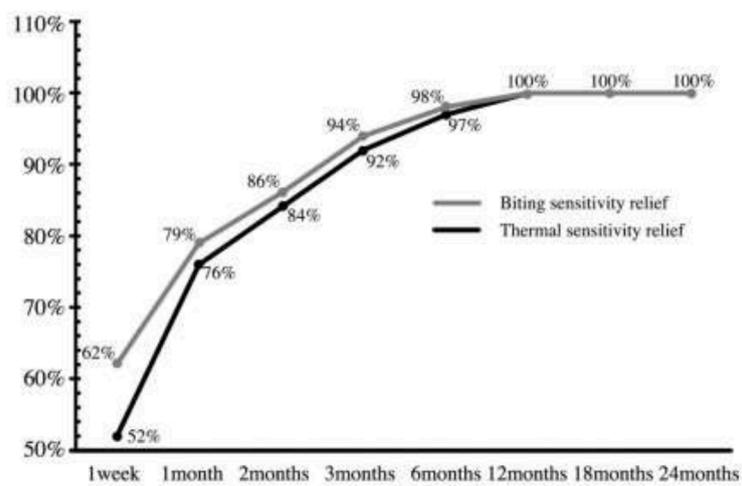
In conclusion, Most patients ( $>90\%$ ) became asymptomatic within 3 months after restored by occlusal veneer, and completely relieved for each by 12 months. To our knowledge, this study was the first to report detailed relief time and risk factors of biting/thermal sensitivity in cracked tooth. However, further longitudinal studies correlating pre-operative factors were still necessary to expand the sample size and extend the follow-up observation time to corroborate our findings.

## 5. Conclusion

In the present study, we analyzed the relief time and risk factors of thermal and biting sensitivity of CT restored by occlusal veneer with a follow-up of 12 – 24 months. More than 90% CT of patients became asymptomatic after 3 months. Lateral percussion and the number of crack lines through preparation on the finish line could help to predict a long period ( $\geq 1$ month) of thermal and biting sensitivity respectively. To our knowledge, this study was the first to report detailed relief time and risk factors of biting/thermal sensitivity in CT restored by occlusal veneer. However, the sample size was small and the short observation period was another limitation in this study. Further studies are needed to



**Fig. 1.** Crack lines were identified clearly after tooth preparation. The black and red arrow showed the crack lines on the finish line. The red arrow showed the crack lines through preparation on the finish line.



**Fig. 2.** The thermal and biting sensitivity changes of the CT after occlusal veneer restoration during the recall periods.

design, especially the pulp status in a long period of follow-up observation which is our next research subjects.

**CRediT authorship contribution statement**

**Mengke Wang:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing, Validation.

**Table 3**

The risk factors of thermal/biting sensitivity in cracked tooth treated by occlusal veneer.

Groups	Items	Parameter	The relief time (n)			Pearson Chi-square
			≤1week	≥1month	All (n)	
Thermal pain	Lateral Percussion	Normal	27	13	40	0.002
		Painful	6	17	23	
	Periodontal ligament of apical area	Normal	31	24	55	0.097
		Widened	2	6	8	
The number of crack lines on the finish line	≤4	29	21	50	0.08	
	>4	4	9	13		
Biting pain	The number of crack lines through preparation on the finish line	≤2	36	16	52	0.009
		>2	3	8	11	

**Yingying Hong:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing, Validation. **Xiaomei Hou:** Conceptualization, Visualization, Investigation. **Yinfei Pu:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing, Validation, Supervision.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jdent.2023.104694](https://doi.org/10.1016/j.jdent.2023.104694).

### References

- American Association of Endodontists glossary of endodontic terms., American Association of Endodontists. (2022). <https://doi.org/www.aae.org/specialty/clinical-resources/glossary-endodontic-terms/>.
- D.G. Seo, Y.A. Yi, S.J. Shin, J.W. Park, Analysis of factors associated with cracked teeth, *J. Endod.* 38 (3) (2012) 288–292, <https://doi.org/10.1016/j.joen.2011.11.017>.
- J. Fong, A. Tan, A. Ha, U. Krishnan, Diagnostic and treatment preferences for cracked posterior teeth, *Aust. Dent. J.* (2023), <https://doi.org/10.1111/adj.12959>.
- R.F. Seet, P.Y. Chan, S.T. Khoo, V.S.H. Yu, J.N. Lui, Characteristics of cracked teeth with reversible pulpitis after orthodontic banding—a prospective cohort study, *J. Endod.* 48 (12) (2022) 1476–1485, <https://doi.org/10.1016/j.joen.2022.09.002>, e1.
- S. Wu, H.P. Lew, N.N. Chen, Incidence of pulpal complications after diagnosis of vital cracked teeth, *J. Endod.* 45 (5) (2019) 521–525, <https://doi.org/10.1016/j.joen.2019.02.003>.
- J.L. Ferracane, T.J. Hilton, E. Funkhouser, G. National dental practice-based research network collaborative, lessons learned from the cracked tooth registry: a 3-year clinical study in the nation's network, *J. Am. Dent. Assoc.* 154 (3) (2023) 235–244, <https://doi.org/10.1016/j.adaj.2022.11.020>.
- K.V. Krell, E.M. Rivera, A six year evaluation of cracked teeth diagnosed with reversible pulpitis: treatment and prognosis, *J. Endod.* 33 (12) (2007) 1405–1407, <https://doi.org/10.1016/j.joen.2007.08.015>.
- S. Kohli, S. Bhatia, A. Al-Haddad, S.J. Pulikkotil, N.B. Jamayet, Pulpal and periapical status of the vital teeth used as abutment for fixed prosthesis—a systematic review and meta-analysis, *J. Prosthodont.* 31 (2) (2022) 102–114, <https://doi.org/10.1111/jopr.13433>.
- A.A. Maghrabi, Effect of dentin sealers on postoperative sensitivity of complete cast crowns cemented with glass ionomer cement, *J. Prosthodont.* 20 (5) (2011) 385–390, <https://doi.org/10.1111/j.1532-849X.2011.00724.x>.
- D. Hashem, F. Mannoce, S. Patel, A. Manoharan, J.E. Brown, T.F. Watson, A. Banerjee, Clinical and radiographic assessment of the efficacy of calcium silicate indirect pulp capping: a randomized controlled clinical trial, *J. Dent. Res.* 94 (4) (2015) 562–568, <https://doi.org/10.1177/0022034515571415>.
- K.M.S. de Toubes, C.J. Soares, R.V. Soares, M.I.S. Cortes, S.Q. Tonelli, F.F. B. Bruzinga, F.F. Silveira, The correlation of crack lines and definitive restorations with the survival and success rates of cracked teeth: a long-term retrospective clinical study, *J. Endod.* 48 (2) (2022) 190–199, <https://doi.org/10.1016/j.joen.2021.10.010>.
- T.J. Hilton, E. Funkhouser, J.L. Ferracane, M. Schultz-Robins, V.V. Gordan, B. J. Bramblett, R.M. Snead Jr., W. Manning, J.R. Remakel, P.C.G. National Dental Practice-Based Research Network, *J. Prosthet. Dent.* 123 (1) (2020) 71–78, <https://doi.org/10.1016/j.prosdent.2018.12.005>.
- G.S. Cheung, S.C. Lai, R.P. Ng, Fate of vital pulps beneath a metal-ceramic crown or a bridge retainer, *Int. Endod. J.* 38 (8) (2005) 521–530, <https://doi.org/10.1111/j.1365-2591.2005.00982.x>.
- L.H. Schlichting, T.H. Resende, K.R. Reis, A. Raybolt Dos Santos, I.C. Correa, P. Magne, Ultrathin CAD-CAM glass-ceramic and composite resin occlusal veneers for the treatment of severe dental erosion: an up to 3-year randomized clinical trial, *J. Prosthet. Dent.* 128 (2) (2022) e1–158, <https://doi.org/10.1016/j.prosdent.2022.02.009>, 158e12.
- R.C. Guthrie, P.M. DiFiore, Treating the cracked tooth with a full crown, *J. Am. Dent. Assoc.* 122 (9) (1991) 71–73, <https://doi.org/10.14219/jada.archive.1991.0285>.
- E. Funkhouser, J.L. Ferracane, T.J. Hilton, V.V. Gordan, G.H. Gilbert, R. Mungia, V. Burton, C. Meyerowitz, D.T. Kopycka-Kedzierawski, P.C.G. National Dental, Onset and resolution of pain among treated and untreated posterior teeth with a visible crack: three-year findings from the national dental practice-based research network, *J. Dent.* 119 (2022), 104078, <https://doi.org/10.1016/j.jdent.2022.104078>.
- W.C. Liao, Y.L. Tsai, K.L. Chen, B. Blicher, S.H. Chang, S.Y. Yeung, M.C. Chang, J. H. Jeng, Cracked teeth: distribution and survival at 6 months, 1 year and 2 years after treatment, *J. Formos. Med. Assoc.* 121 (1 Pt 2) (2022) 247–257, <https://doi.org/10.1016/j.jfma.2021.03.020>.
- J. Lee, S. Kim, E. Kim, K.H. Kim, S.T. Kim, Y.Jeong Choi, Survival and prognostic factors of managing cracked teeth with reversible pulpitis: a 1- to 4-year prospective cohort study, *Int. Endod. J.* 54 (10) (2021) 1727–1737, <https://doi.org/10.1111/iej.13597>.
- F. Li, Y. Diao, J. Wang, X. Hou, S. Qiao, J. Kong, Y. Sun, E.S. Lee, H.B. Jiang, Review of cracked tooth syndrome: etiology, diagnosis, management, and prevention, *Pain Res. Manag.* 2021 (2021), 3788660, <https://doi.org/10.1155/2021/3788660>.
- I.G. Sim, T.S. Lim, G. Krishnaswamy, N.N. Chen, Decision making for retention of endodontically treated posterior cracked teeth: a 5-year follow-up study, *J. Endod.* 42 (2) (2016) 225–229, <https://doi.org/10.1016/j.joen.2015.11.011>.