Effects of periodontal endoscopy on the treatment of periodontitis

A systematic review and meta-analysis

Yunchun Kuang, BS; Bo Hu, MSc; Jin Chen, BS; Ge Feng, PhD; Jinlin Song, PhD

Periodontitis is a chronic infective disease of the tooth-supporting apparatus, including the gingivae, periodontal ligament, and alveolar bone. It affects a large percentage of the dentate population and is responsible for much of the tooth loss that occurs in later life.[1,2] Attachment loss and bone absorption are signs of periodontitis. The typical clinical manifestations of periodontitis are gingival inflammation (GI), bleeding on probing (BOP), formation of periodontal pockets, and tooth mobility.[3,4] Bacteria in plaque biofilms and their by-products play an initial and progressive role in periodontitis.[5] With a rough and polyporous surface, dental calculus provides optimal conditions for bacteria to colonize, metabolize, and cause disease.[6] The primary objective of periodontal therapy is to remove plaque biofilm, along with the calculus and bacterial by-products, thus maintaining a biologically harmonious root surface. Ultimately, clinicians who perform periodontal

ABSTRACT

Background. For this systematic review, the authors evaluated and synthesized the available scientific evidence related to the effects of periodontal endoscopy on the treatment of periodontitis.

Methods. The authors searched PubMed, Embase, Cochrane Library, Chinese Scientific Journals database, China National Knowledge Infrastructure, and Chinese Medicine Premier's Wanfang database for articles about periodontal endoscopy that were published through January 2017. The authors considered the percentage of residual calculus, average treatment time, bleeding on probing (BOP), gingival inflammation (GI), and probing depth (PD) as outcome measures. The authors extracted data and performed meta-analyses for groups of articles for which it was appropriate.

Results. The authors identified 8 articles as being suitable for this systematic review. The investigators of 3 studies reported results related to BOP and GI that revealed some advantages of periodontal endoscopy over traditional scaling and root planing (SRP). The investigators of 4 studies explored PD and found no difference between periodontal endoscopy and traditional SRP. The authors could not perform meta-analyses on the study results related to BOP, GI, or PD. The percentage of residual calculus after periodontal endoscope–aided debridement was significantly less than the percentage of residual calculus after traditional SRP (mean difference, −3.18; 95% confidence interval, −4.86 to −1.49; $P = .002$; heterogeneity $I^2 = 74\%$). The authors found that periodontal endoscopy took significantly more time than traditional SRP (mean difference, 6.01 minutes; 95% confidence interval, 4.23 to 7.8; $P < .00001$; heterogeneity $I^2 = 0\%$).

Conclusions and Practical Implications. Periodontal endoscopy may provide additional benefits for calculus removal compared with traditional SRP, although it could take more time to perform. With respect to BOP, GI, and PD, the authors found no sufficient evidence to support the difference between the use of periodontal endoscopy and traditional SRP. The authors concluded that additional scientific research is required to assess the effects of periodontal endoscopy on the treatment of periodontitis.

Key Words. Periodontitis; scaling and root planing; periodontal endoscope; systematic review; meta-analysis.

JADA 2017:■(■):■-■

http://dx.doi.org/10.1016/j.adaj.2017.05.011

therapy expect to arrest the inflammatory process and preserve the natural dentition.[7-9]

The precise evaluation of subgingival accretions, root surfaces, and soft tissues is critical for diagnosing periodontitis, planing treatment, and estimating the benefits of therapy.[10] In a traditional periodontal evaluation, clinicians usually make judgments about the distribution and volume of subgingival calculus, which always can be disturbed by means of using manual and tactile exploration and owing to the complicated anatomic structures of the teeth, such as enamel projection and root furcation, among others.[11-14] Investigators also have reported the inability to detect some root deposits that have not been eliminated.[15-17] Clinicians use traditional scaling and root planing (SRP), a criterion standard therapeutic modality, for the purpose of removing supragingival and subgingival accretions and scaling the roots to generate smooth surfaces. However, owing to the difficulty that practitioners may have with seeing all of the existing calculus during SRP, some surface areas that feel smooth may contain a small amount of calculus that the practitioner may have missed. Some investigators have verified the clinician's inability to see these areas clearly, which affects their ability to scale and plane the subgingival root surface completely.[16,17] In addition, to achieve smooth root surfaces, some investigators have suggested that clinicians should perform diligent, repeated planing, along with traditional SRP, which may result in the excessive removal of dental tissues such as cementum.[18] Investigators also have reported that bacterial toxins can be located on, not within, root surfaces,[19-21] from which we can infer that it is not necessary to perform excessive removal of the cementum and that the selective removal of subgingival accretions deserves recommendation.[22]

For many years, surgeons have used endoscopy to see through natural channels or the diminutive openings they create during minimally invasive surgery.[23] Gradually, clinicians have introduced the endoscopic technique into the stomatologic field, by using arthroscopy to visualize the temporomandibular joint and endoscopy to visualize the maxillary sinus, root canal endoscopy, and periodontal endoscopy, for example.[18,24-27] The periodontal endoscopic system consists of an imaging system and some modified apparatuses, such as curettes and probes. The imaging system includes a fiber-optic cord that conducts a beam of light to illuminate root surfaces and transmits the images back to a display screen. The fiber-optic cord inserts into a sheath, which prevents contamination of the cord. The sheath is linked to a pump that conducts the flow of water to wash the biofilm, calculus, flood, and other debris out of the working field.[10,28,29] Clinicians who adopt the periodontal endoscopic system can locate visually the calculus, root surface, and soft tissue and remove the subgingival accretions through magnified images in real time.[10,28] Investigators have reported that the clinician's ability to visualize root surfaces with periodontal endoscopy might improve the clinical results of periodontal therapy.[18,23] However, some investigators have noted an absence of significant differences between the results of periodontal endoscopy and the results of traditional SRP.[30-32] The inconclusive evidence is disadvantageous for the clinical application and the promotion of periodontal endoscopy as an initial periodontal therapy.

Therefore, we determined that it was imperative to perform a systematic review to determine whether the use of periodontal endoscopy has any advantages over traditional SRP for the treatment of periodontitis. For the purposes of this systematic review, we focused on analyzing the results of randomized controlled trials (RCTs) to assess the effects of periodontal endoscopy on the clinician's ability to remove calculus, the average treatment time, and the clinical parameters of periodontitis.

METHODS

Focused question. On the basis of the results of the RCTs included in this study, what were the effects of using periodontal endoscopy after periodontal therapy on the practitioner's ability to remove calculus, the average length of treatment time, and the clinical parameters of periodontitis?

Search strategy. We searched online sources including PubMed, Embase, Cochrane Library, VIP (Chinese Scientific Journals database), China National Knowledge Infrastructure (CNKI), and Chinese Medicine Premier's Wanfang database for eligible articles published through January 2017. We projected that the structured search strategy would contain any related published articles whose authors had compared the effects of periodontal endoscopy and traditional SRP.

We used the following search strategy for PubMed:
{(Intervention) AND (outcome)
{(Intervention: [MeSH Terms] endoscopes OR [Text Word] perioscope OR perioscopy OR endoscopy OR endoscopic OR endoscope OR videoscope OR videoscopy OR videoscopic)
AND
(outcome: [MeSH Terms] periodontal diseases OR periodontitis OR dental deposits OR dental calculus OR periodontal debridement OR periodontal pocket OR [Text Word] dental accretion OR calculus removal OR periodontal pocket debridement OR non-surgical periodontal debridement OR periodontal therapy OR bleeding on probing OR clinical attachment loss OR probing depth OR gingival inflammation)}

ABBREVIATION KEY. **ATT:** Average treatment time. **BOP:** Bleeding on probing. **C:** Control. **GI:** Gingival inflammation. **NM:** Not mentioned. **PD:** Probing depth. **PRC:** Percentage of residual calculus. **RCT:** Randomized controlled trial. **SRP:** Scaling and root planing. **T:** Test.