Root Canal Treatment versus Single-Tooth Implant: A Systematic Review of Internet Content

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Abstract

Introduction: There is an absence of professional consensus regarding when a tooth should be retained with root canal treatment and when to extract and replace it with an implant. Considering that patients often seek health-related information on the Internet, completeness and accuracy of online content are highly desirable. Websites should also fulfill several technical characteristics to be accessible to all. **Methods:** The search term *root canal treatment implant* was entered into 4 search engines. The first 100 webpages per engine search were evaluated. After removal of duplicates, those webpages comparing root canal treatment against single-tooth implant by using the AAE Implant Statement criteria as a benchmark were included. Completeness of information was evaluated against the AAE Statement by using a binary scale assessment tool. The related content was synthesized by using a protocol for systematic review of textual, non-research evidence. The webpages/sites were assessed for accessibility, usability, reliability, and quality of information by using the DISCERN and LIDA tools. **Results:** Twenty-six relevant webpages were found. Information completeness scores ranged from 1 to 6; however, nearly one third scored 1. Nine syntheses were derived relating to survival rates, tooth restorability, bone quality, esthetic demands, and systemic factors. The median overall scores for LIDA and DISCERN were 72% and 61%, respectively. **Conclusions:** There is scarcity of information available on the Internet for the lay public with respect to the specific clinical question, although the webpages' content was consistent with available scientific literature. The accessibility, usability, reliability, and quality of information were largely moderate or low. *(J Endod 2016;42:846–853)*

Key Words

Consumer health information, dental implant, Internet, quality of information, root canal treatment, systematic review, text and opinion

The number of Internet users has been growing continuously, with 46% of the world's population having access to and possessing the basic knowledge required to use it (1). In particular, about 87% of the United States population uses the Internet (2).

More than 4% of all Internet searches are concerned with health-related information and are carried out by people who have been either diagnosed with a medical condition or know someone who has been (3–5). Patients often seek information before or after visiting a physician, with online information shown to influence patients' decisions about treatment and care (3). There is legitimate concern about the possible use of the Internet to promulgate health advice that may harm rather than help people (6).

One of the current controversies in dentistry is when to retain a compromised natural tooth with root canal treatment (RCT) or when to extract and replace it with a single-tooth implant (STI), because there is no high level scientific evidence to answer this (7, 8). Factors such as natural and/or pathologic variations, together with a clinician's background, perception, and/or preference, influence treatment options and the decision-making process (7). Furthermore, patients may visit different clinicians as part of this process (ie, general dental practitioner, endodontist, implant surgeons), possibly resulting in inconsistent information and advice. Patients may consequently feel the need to seek information independently; one of the possible sources is the Internet (9).

The American Association of Endodontists Implant Position Statement (AAE Statement) mentions that apart from survival rates, other factors such as restorability of the tooth, quality of bone, esthetic demands, cost-benefit ratio, and systemic factors should be taken into account when deciding whether to treat a tooth endodontically or to place an STI (10). It would be expected that these factors are included on websites/pages that aim to support patients deciding between these treatment options.

Apart from accuracy and completeness of information, other technical aspects including design and readability should be used to evaluate health information (4, 11). Several instruments have been produced to evaluate and determine the quality of health information (4). Among these are DISCERN (12, 13), a user guidance toolkit designed to judge the quality of health information on treatment choices by looking at publication reliability (trust in the information that is based on source of information) and quality of information (information on treatment alternatives). It is based on 15 key questions that assess different aspects within the themes of quality of information and reliability; an optional overall rating question allows for a subjective judgment to be made about the assessed material (4, 12, 14, 15). Similarly, the LIDA instrument (16) allows evaluation of the design and content of health information on the Internet with regard to accessibility (does the website meet legal standards and can users access the information?), usability (can users find the information they need?), and reliability (does the site provide comprehensive,

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relevant, and unbiased information?). Accessibility is calculated by semi-automated software online, whereas usability and reliability are calculated by using a 27-item questionnaire. It is worth clarifying that websites are locations connected to the Internet that maintain 1 or more webpages on the World Wide Web (17).

The first objective of this study was to evaluate completeness of information available on the Internet for the lay public with respect to the decision-making criteria in the AAE statement and to synthetize the related narrative content. A second objective was to assess the accessibility, usability, reliability, and quality of information on the Internet comparing RCT versus STI.

Materials and Methods

Search Strategy and Webpages/sites Characteristics

To replicate the methods that a patient may use when searching the Internet for information comparing RCT versus STI, the key word terms *root canal treatment implant* were used. These key word search terms were entered in a systematic manner into 4 search engines: Google, Yahoo!, Bing, and Ask.com, in this order, on November 5, 2015 by using a computer connected to the Internet in Australia, without modifying the default settings of the search engines. The first 100 results per search engine output were included. Removal of internal and cross-search engine duplicates was undertaken after the search engine searches were completed.

The inclusion criteria specified that webpages were in English and freely accessible. In addition, the information of the webpage should address at least 1 criterion within the AAE statement. The exclusion criteria stipulated that links to videos, advertisements, professional/scientific literature, commercial dental laboratories/supply companies, professional forums/blogs, public message boards be excluded. Retrieved webpages were screened by the first author according to the inclusion/exclusion criteria. The country of global origin, publication date, and ownership of the websites were recorded for all included webpages/sites.

Information Completeness Evaluation

To evaluate completeness according to the AAE statement (overall survival rates, restorability of the tooth, quality of bone, esthetic demands, cost-benefit ratio, and systemic factors), a 6-item binary scale was developed. Whenever an item was mentioned, a score of 1 was allocated; otherwise, 0 was assigned. Therefore, a webpage could achieve a total score between 1 and 6.

Systematic Review and Synthesis of Narrative Contents of the Webpages

The Joanna Briggs Institute (JBI) methodology for the systematic review of text and opinion strategy was followed (18, 19). This involved a predetermined search strategy and critical appraisal, followed by textual data extraction and synthesis (18, 19).

Critical appraisal of the webpages was carried out by 2 authors (G.R.F., E.J.D.) independently by using the NOTARI 7-question critical appraisal tool (18, 19). Disagreements were resolved by consensus. Webpages were then categorized in tertiles according to the scores obtained as follows:

1st tertile (0–2), low quality
2nd tertile (3–5), medium quality
3rd tertile (6 or 7), high quality

Textual data findings (verbatim extracts) with respect to the decision-making criteria in the AAE statement were retrieved from the included webpages, categorized under those criteria, with subsequent synthesis of similar findings (18, 19).

Assessment of Webpages/sites for Accessibility, Usability, Reliability, and Quality of Information

Assessment of all webpages/sites for accessibility, usability, reliability, and quality of information was undertaken by the first author by using the LIDA instrument version 1.2 and the DISCERN instrument, after calibration. Intra-examiner agreement was tested by repeating the assessments for 10 webpages/sites 1 month apart. They were selected randomly by random number generation (www.random.org). Agreement was determined by using the Cohen kappa coefficient by using IBM SPSS Statistics, version 23 software (IBM Corp, Armonk, NY); this was calculated for the usability and reliability components of LIDA and for both components of DISCERN, but not for LIDA's accessibility component because the online software calculates accessibility.

To facilitate comparison of the results obtained by both instruments, the DISCERN results were converted into percentage scores. The scores were graded as high (>90%), moderate (90%–50%), and low (<50%) (20).

Results

Search Results and Webpages/sites Characteristics

More than 2 million webpages were retrieved by the search engines. Of the 400 webpages assessed, 26 fulfilled the inclusion and exclusion criteria. The search retrieval flow diagram is presented in Figure 1.

Fifteen webpages originated from the United States, 6 from Australia, and 3 from the United Kingdom. Austria and Bulgaria contributed 1 webpage each.

More than half (14) of the webpages were published in the year of assessment (2015) or the previous year. Three webpages were published in 2008, 2 in 2011, and 1 each in 2007, 2009, 2010, or 2013. It was not possible to determine the publication date of 3 webpages.

Fourteen of the webpages were from specialist endodontic or general dental practice websites. Online information resources/magazines accounted for 10 websites. The remaining 2 websites were each owned by a professional association and a dental insurance plan.

Evaluation of Completeness of Information

Results on completeness of information are reported in Figure 2. A single webpage, an online information resource from the United States, achieved the maximum score of 6, whereas nearly one third scored 1, the lowest score possible. The latter were pages of online information resources/magazines and dental practices. The criterion most frequently discussed among the assessed webpages was survival rates (20 webpages), whereas cost-benefit ratio was discussed on only 1 webpage.

Systematic Review and Synthesis of Narrative Contents of the Webpages

According to the NOTARI critical appraisal tool, half of the webpages were high quality; 11 of these originated from the United States. Eleven webpages were medium quality, and 2 were low quality. Eight high-quality webpages were from treatment provider websites, 4 were information resources/magazines, and 1 was produced by the professional association.

Data findings and synthesized findings generated are reported in Tables 1–5. Synthesized findings include the following:

- Survival rates are similar for both treatments.
- Survival rates are high for both treatments.