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YouTube as an information source for instrument separation in root canal treatment

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ABSTRACT

Objectives: The reliability and educational quality of videos on YouTube for patients seeking information regarding instrument separation in root canal treatment were evaluated.
Materials and Methods: YouTube was searched for videos on instrument separation in root canal treatment. Video content was scored based on reliability in terms of 3 categories (etiology, procedure, and prognosis) and based on video flow, quality, and educational usefulness using the Global Quality Score (GQS). Descriptive statistics were obtained and the data were analyzed using analysis of variance and the Kruskal-Wallis test.
Results: The highest mean completeness scores were obtained for videos published by dentists or specialists (1.48 ± 1.06). There was no statistically significant difference among sources of upload in terms of content completeness. The highest mean GQS was found for videos published by dentists or specialists (1.82 ± 0.96), although there was no statistically significant correlation between GQS and the source of upload.
Conclusions: Videos on YouTube have incomplete and low-quality content for patients who are concerned about instrument separation during endodontic treatment, or who experience this complication during endodontic treatment.

Keywords: Endodontics; Internet; Root Canal Preparation; Intraoperative Complications

INTRODUCTION

Root canal treatment, which is one of the most widely practiced dental therapies, relies on root canal preparation. The treatment is composed of the disinfection and shaping of root canals. Endodontic instruments tend to break off during these procedures [1]. Separated root canal instruments may include endodontic files, spreaders, lentulo spirals, and Gates-Glidden burs, and can be made of stainless steel, nickel-titanium (NiTi), or carbon steel [2]. Instrument separation occurs in 0.5% to 5% of procedures [3-5].

The separation of rotary NiTi instruments inside the root canal occurs as a result of torsional failure or cyclic flexural fatigue or a combination of both [6]. Instrument design, manufacturing process, dynamics of instrument use, canal configuration, preparation/ instrumentation technique, number of uses, cleaning and sterilization procedures are also

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predisposing factors for rotary NiTi instrument separation [2]. If the separated instrument hinders sufficient cleaning of the canal beyond the blockage, the prognosis might be affected negatively [7,8]. However, the prognosis depends on asepsis and disinfection of the root canal, rather than the presence of a separated fragment [9].

Separation of the root canal instrument is one of the most unfortunate occurrences during endodontic treatment. Although the prognosis of poor endodontic treatment is significantly worse than that of cases with instrument separation, malpractice claims often arise as a result of broken and retained instruments in root canals [10-14]. However, not informing the patients about the possibility and the occurrence of complication could make the situation more serious [15]. If the patient is informed of the possibility of instrument separation beforehand, notified if fracture occurs, and the necessary records are kept documenting proper communication, it could be easier to deal with an unsatisfied patient with a separated instrument [16].

YouTube is a very popular web resource where patients can search for information on dental procedures. Importantly, YouTube videos are not subjected to peer review; therefore, patients browsing YouTube for healthcare information might come across incorrect and potentially misleading content.

Several studies have evaluated YouTube content dealing with various dental procedures such as dental implants, wisdom tooth surgery, and orthodontics [17-21]. One study researched YouTube videos related to root canal treatment, but no study has yet evaluated videos on YouTube on the topic of instrument separation during endodontic treatment [22]. Our study aimed at analyzing the completeness and quality of YouTube videos about separated instruments in endodontics.

MATERIALS AND METHODS

On January 16, 2020 between 11 AM and 1 PM, the online video streaming resource YouTube (http://www.youtube.com) was searched for videos containing information related to separated instruments in endodontics using the term "separated instrument." The search results were sorted by relevance, which is the default option on YouTube. In our study, the first 150 videos appearing as results were screened for information.

Preliminary screening of videos was performed by 2 researchers together to determine which videos to include. Commercial advertisements suggested by YouTube, videos in any language other than English, videos without audio or visual content, videos longer than 15 minutes, duplicated videos, and videos irrelevant to the topic were excluded. All included video links were stored following the application of the exclusion criteria.

A literature search was conducted prior to the assessment to evaluate the videos according to evidence-based information. The investigators assessed the completeness of each video by viewing each video in its entirety and then scoring each video independently based on its information content on a scale of 0–2 (0 = incomplete, 2 = very complete) in 3 content areas (etiology, treatment, and prognosis), yielding a total possible score of 6. As a second evaluation method, the 5-point Global Quality Score (GQS) index (**Table 1**) was used to score videos (from 1 to 5) based on flow, quality, and educational usefulness of the video for patients seeking information online.

Table 1. Global Quality Score

Scores	Description
1	Poor quality; very unlikely to be of any use to patients
2	Poor quality but some information present; of very limited use to patients
3	Suboptimal flow, some information covered but important topics missing; somewhat useful to patients
4	Good quality and flow, most important topics covered; useful to patients
5	Excellent quality and flow; highly useful to patients

After the assessment of the videos, the total video duration in seconds, the source of the upload, and the numbers of views, days since upload, "likes," and "dislikes" were recorded. Viewers' interactions were estimated according to the interaction index ([number of likes − number of dislikes]/total number of views × 100%) and the viewing rate (number of views/ number of days since upload × 100%).

The source of upload was categorized as "dentist/specialist," "hospital/university," "commercial" (referring to dental manufacturing companies), and "other," referring to a layperson or an unclear source.

Any disagreements between researchers on the classification and scoring of videos were resolved by a literature review and an in-depth discussion on the issue until a consensus was reached.

Statistical analysis

Statistical analysis of the data was performed using MiniTab 17 Statistical Software (Statistical Software Release, version 17.3.1, Minitab Inc., State College, PA, USA). Interobserver agreement was assessed using Fleiss kappa analysis. Descriptive statistics were obtained. Continuous variables were analyzed using analysis of variance and the Kruskal-Wallis test, and p values < 0.05 were considered to indicate statistical significance for all tests.

RESULTS

After application of our exclusion criteria, 48 videos were screened out of the initial sample of 150 videos. The distribution of reasons for exclusion is presented in **Table 2**. The majority (83%) of the videos were posted by a dentist or specialist ($n = 40$), whereas commercial sources accounted for 4% ($n = 2$), and hospital/university and other sources posted 6% of the videos ($n = 3$). The distribution of videos by source of upload is presented in **Table 3**. The mean length of the videos was 261.44 seconds (range, 26 seconds to 804 seconds). The mean number of views of the videos was 24,482.6 (range, 7 to 328,215). The mean value of number

Table 2. Reasons for exclusion

Reasons	Value
Not in English	2
No audio	8
No video	0
Duplicated	11
Longer than 15 minutes	5
Irrelevant	80
Total excluded	101

Table 3. Source of upload (number of videos)

Dentist/specialist	Hospital/university	Commercial	Other
40	3	3	3

Table 4. Video characteristics

Duration	Views	Days since upload	Likes	Dislikes	Interaction index	Viewing rate
278.66 ± 221.48 (range, 26 seconds to 1,071 seconds)	24,872.8 ± 57,624.8 (range, 7 to 328,215)	1,447.55 ± 1,027.15 (range, 67 to 3,732)	121.49 ± 217.48 (range, 0 to 942)	6.9 ± 15.1 (range, 0 to 76)	1.31 ± 2.05 (range, −0.27% to 12.5%)	1,414.36 ± 2,510.42 (range, 1.16 to 10,499.5)

of likes was 112.54 (range, 0 to 942). The mean number of dislikes was 6.79 (range, 0 to 76). The mean interaction index value was 1.31242% (range, −0.273% to 12.5%). The mean viewing rate was 1,363.93 (range, 1.16 to 10,499). No statistically significant associations were found between the interaction index or viewing rate and source of upload ($p > 0.05$). Characteristics of the videos, such as the mean number of duration, views, likes, dislikes, interaction index, days since upload, and viewing rate, are presented in **Table 4**.

The weighted kappa value for inter-observer agreement for the completeness score and GQS was 0.84 and 0.80, respectively. The information completeness scores and GQS are summarized in **Table 5**. The highest mean values for all 3 areas of completeness scores were obtained for videos uploaded by dentists or specialists. The mean overall completeness score of the videos uploaded by dentists or specialists was 1.48 (range, 1 to 5), with scores of 0.07 for prognosis, 1.1 for treatment, and 0.3 for etiology. There was no statistically significant difference in content completeness according to the source of upload ($p = 0.52$). The highest mean GQS was obtained for videos uploaded by dentists or specialists (1.82). There was likewise no statistically significant correlation between the GQS and the source of upload ($p = 0.42$).

DISCUSSION

Although YouTube was not created as an educational platform, due to its availability and popularity, the video content of YouTube has been evaluated by researchers. To the authors' knowledge, only 1 study has assessed YouTube videos on root canal treatment procedures [22]. While the majority of the videos regarding the matter were posted by dentists/ specialists or hospitals/universities, due to the very nature of YouTube, the information provided by these videos is not peer-reviewed and not pre-assessed by authors in the relevant field. Therefore, it is quite predictable that most videos failed to cover all aspects of separated instruments in endodontics.

Unfortunately, it was not possible to identify the profile of the audience in terms of age, intention, country, or profession. However, it is clear that patients are more interested in the causes and postoperative course of such a complication than in the technical aspects of management of a separated instrument in root canal treatment, which was the main focus of most of the available videos on YouTube. We noted that regardless of the source of upload, most videos were incomplete because they lacked etiological and prognostic aspects of instrument separation in root canal treatment, not because they presented

Table 5. Completeness score and Global Quality Score (GQS) by source of upload

Scores	Dentist/specialist	Hospital	Commercial	Other
Etiology	0.30 ± 0.69	0 ± 0	0 ± 0	0 ± 0
Treatment	1.10 ± 0.38	1.00 ± 0	1.33 ± 0.58	1.33 ± 0.58
Prognosis	0.07 ± 0.26	0 ± 0	0 ± 0	0 ± 0
Overall score (0–6)	1.48 ± 1.06	1.00 ± 0	1.33 ± 0.58	1.33 ± 0.58
GQS (1–5)	1.83 ± 0.96	1.33 ± 0.58	2.00 ± 1.00	1.33 ± 0.58

Values are presented as mean ± standard deviation.

misleading information. Therefore, the majority of the videos had low completeness scores and GQS. Several previous studies reported the limited scope of YouTube videos on medical information, which similarly resulted in low scores [22-24].

Dental Trauma UK prepared an informative video for public awareness about avulsed teeth entitled "Save a knocked out tooth" [25]. We think that similar educational videos on root canal treatment and its complications are needed for public access. Such videos might avert possible misconceptions among patients.

The audience on YouTube has "like" and "dislike" options to engage with videos, but these are far from being indicative of reliability in terms of evidence-based dentistry. Nonetheless, this feature of YouTube as a platform can be helpful for dental professionals to evaluate whether viewers find the video useful or not. Therefore, further videos may be prepared accordingly.

As in many previous studies, users' interactions with videos were assessed by the interaction index and viewing rate [24,26,27]. However, in our study, there was no statistically significant correlation between the completeness score or GQS and these characteristics. Moreover, we should note that since views and interaction of viewers are affected by the ranking of videos on YouTube, more complete and informative videos might not be sorted first and hence be missed by viewers.

In another study, it was reported that 46% of videos related to root canal treatment were posted by a dentist or specialist [22]. In our study, 82% of the videos were uploaded by a dentist or specialist. When the specificity of the topic is taken into consideration, it is predictable that the majority of the videos were posted by dental professionals. Although the videos evaluated in our study were uploaded by professionals to a greater extent than those in the previous study, the completeness of videos did not vary significantly by source. This result might be attributed to the fact that most videos in our study, irrespective of source, did not focus on etiology and prognosis, which resulted in poor scores for the majority of the videos.

A limitation of this study is that, to date, there is no established method for analyzing video-based resources. Therefore, the researchers created a checklist after a comprehensive literature search and assessed videos subjectively, as done in several other studies in dentistry [22,28]. In this study, 2 different scoring methods were used. The completeness score, which was created by the researchers, was used to evaluate the accuracy and reliability of the videos, whereas the GQS was used to assess video flow, quality, and educational usefulness. Subjectively created scoring methods and the GQS were used in previous studies for the assessment of the informativeness of videos on YouTube [22,26,29,30]. The GCS score is a 5-point scale that reflects the quality and flow of video content. Studies evaluating YouTube videos have reported a variety of mean GQS scores. Videos related to cardiopulmonary resuscitation had a mean score of 2.87, those on orthodontic clear aligners had a mean score of 3.08, those on refractive surgery had a mean score of 1.7, and those on kyphosis had a mean score of 1.68 [29,31,32].

In our study, specific search terms such as "instrument removal," "causes of separation," or "prognosis of tooth with separated file" were deliberately avoided not to exclude relevant videos that patients might search for and watch. Another limitation of this study is that, although root canal treatment is widely performed in all over the world, only English-language videos were evaluated. Since English is not the first language in most countries, our findings are limited.

YouTube is free and user-friendly, making it a popular medium for the public to reach information. However, the limitations of YouTube should be understood, and peer-reviewed scientific journals and guidelines published by endodontics societies should remain the main sources of information. Furthermore, dentists/endodontists, hospitals, universities and organizations of dental professionals should be encouraged to post comprehensive videos related to the etiology and prognosis of instrument separation during endodontic treatment. In addition, the availability of extensive videos on complications related to root canal treatment might be beneficial for other dentists, as well as patients.

CONCLUSIONS

YouTube, despite its potential as a tool to increase public awareness on instrument separation during root canal treatment, is not a reliable source for patients due to the incompleteness of the information contained in YouTube videos. Due to the incomplete and low-quality nature of the videos on YouTube, until satisfactory resources are present, dentists should resolve their patients' concerns through direct communication and should inform their patients about procedural complications of endodontics such as instrument separation.

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