

ORIGINAL ARTICLE

Is it safe to use YouTube™ to learn about root canal preparation? Analysis of content and quality of videos

ABSTRACT

Aim: This study assessed the quality, educational content, and demographics of root canal preparation videos on YouTube™.

Methodology: The study was performed for root canal preparation using the keywords “root canal shaping,” “root canal preparation,” and “root canal instrumentation” on YouTube™. In total, 108 English language videos shorter than 15 minutes were acquired. After evaluating the demographic characteristics, the viewing rates of the videos were estimated. The quality of the videos was assessed using DISCERN, the Global Quality Scale (GQS), and the Video Power Index (VPI). Statistical analyses of the evaluated results were performed.

Results: Endodontists uploaded the most videos (32%), mainly shot on the teeth of patients (30%). The number of views and the VPI were significantly higher for the videos uploaded by commercial companies than by endodontists ($p < 0.05$), with no significant difference between videos uploaded by dentists or endodontists. As the DISCERN (reliability) value increased, the number of views/likes and the VPI increased, even though these values were not statistically significant ($p > 0.05$). While a positive and meaningful relationship was found between DISCERN and the GQS ($p < 0.05$), a negative and significant association was found between the VPI and the interaction index ($p < 0.05$). When dentists, commercial companies, and others were considered as a single group and compared with endodontists, no significant difference was found between the two groups in terms of GQS and DISCERN ($p > 0.05$).

Conclusion: It was highlighted that a high-quality contribution from uploaders is needed for videos posted on YouTube™ about root canal preparation. It is crucial to refer to high-quality sources of information.

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Introduction

Shaping the root canals is one of the most critical procedures for a more successful treatment outcome (1). For long years, stainless-steel K and H hand files have been used for root canal shaping. Unfortunately, shaping the root canal is difficult with hand files, especially in curved canals. Nickel-titanium (NiTi) file systems have steadily increased among endodontists and general dentists for shaping root canals (2). It has been stated that there are many advantages of using NiTi systems in root canal shapings, such as fewer procedural errors (3), a shorter treatment time (4), and potentially better clinical outcomes (5). Because of these advantages, with the support of technology, Gavini et al. stated that more than 160 NiTi file systems were available in 2018 (6). For this reason, dentists should follow up-to-date information to use the new NiTi systems in the clinic successfully. Recently, surveys have been conducted on attitudes towards root canal treatment procedures and adopting new technologies in general dental practice. The results show differences between general daily practice and academic teaching (7); therefore, dentists need continuous professional development to update and expand their knowledge and skills (8). Additionally, many dental students find endodontic procedures difficult and stressful. They also lack confidence while performing endodontic procedures (9, 10). Because of the risk of transmission of coronavirus disease 2019 (Covid-19), social media and websites may be valuable in providing new educational opportunities (11).

YouTube™ is one of the largest video-based sharing platforms. Monthly, more than a billion hours of video are watched by people internationally (12). It enables easy access to information, collaborative content creation and storage, sharing, and visualization. Because the visualization of learning via learning materials is a significant input for educational development, the YouTube™ platform also aims to provide information to educators with the help of videos (13) and to be considered a learning

tool by learners (14). Despite many advantages of YouTube, unrelated commercials, some opprobrious content, long videos, and lack of uncertainty are among the main disadvantages of YouTube™ videos (15). In a survey study conducted among third- and fourth-year dental students in the USA, endodontics was found to be one of the most preferred disciplines in terms of YouTube™ use (16), and, although education was not the primary purpose for using YouTube™, these students were likely to use it as a resource to learn and prepare for clinical dental procedures. This situation draws attention to the importance of the content and quality of the videos shared on YouTube™.

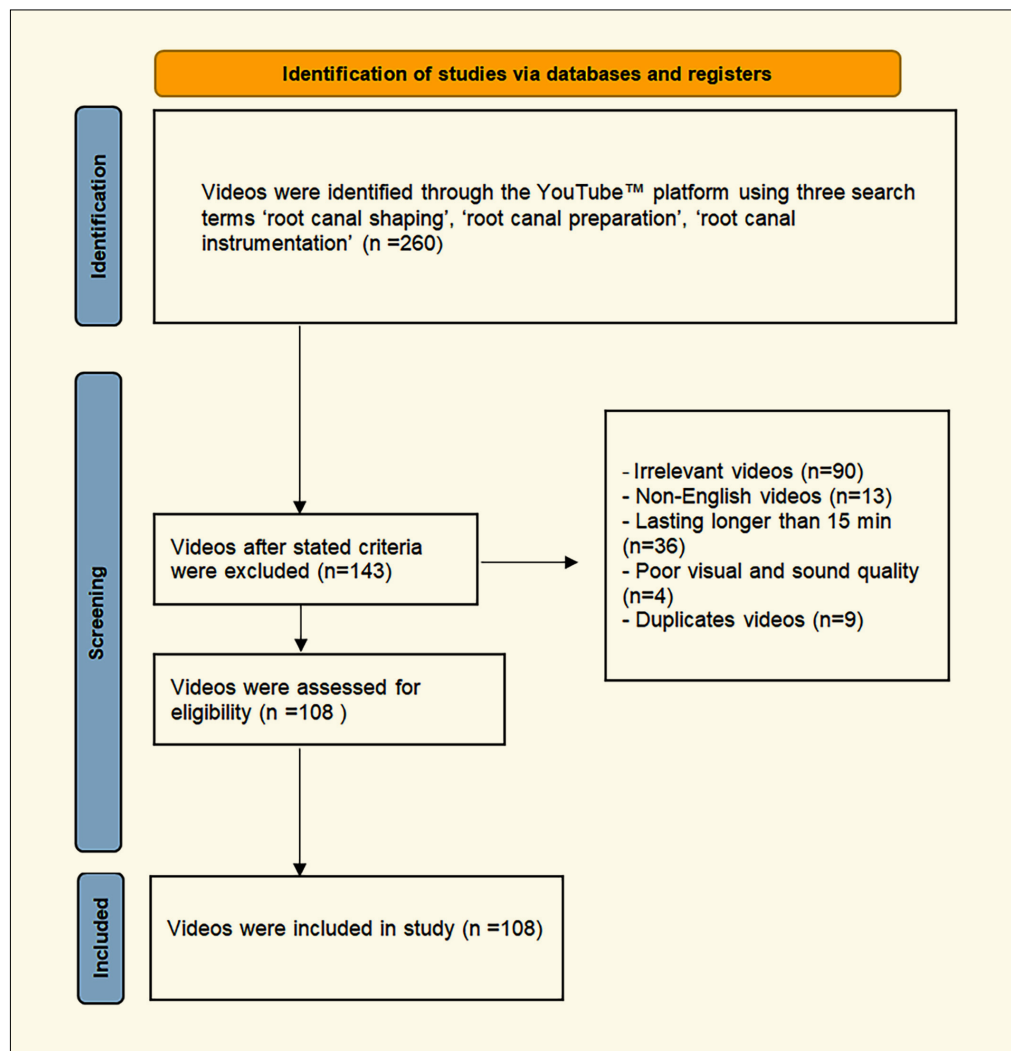
Although the quality and precision of YouTube™ videos have been researched on different topics in endodontics (12, 17-20), no data is available on inspecting YouTube™ videos as inquiries for root canal preparation. Thus, this study aimed to evaluate the quality and content of the information videos available on YouTube™ regarding root canal preparation. The alternative hypothesis of this study was that most of the relevant videos evaluated contained low educational quality or incomplete information.

Materials and Methods

Publicly available data were used in this study, and ethical approval was not obtained from the research ethics committee as any material collected from humans or animals was not included in the study.

The authors followed the PRISMA flow diagram for the video selection process in the present study (21) (Figure 1). The keywords “root canal shaping,” “root canal preparation,” and “root canal instrumentation” were searched, and “sort by relevance” was used as the default filter. A total of 260 videos were analyzed by two researchers who were specialists in endodontics. Of these videos, 152 were excluded: non-English language videos, videos longer than 15 minutes; videos with poor visual and sound quality; videos irrelevant to the search terms; and duplicated videos. The remaining 108 videos meeting the

Figure 1
PRISMA flow diagram for the video selection process.



inclusion criteria were analyzed further. Each video's demographics, duration (s), number of views, viewer rating (likes and dislikes) and timespan (day) were evaluated. The source of the videos was classified as a dentist, endodontist, commercial company, or other. The tooth/model (ex-

tracted human tooth, artificial tooth model, patient's tooth, topic description, no model), instrumentation file (hand file, NiTi file systems, hand and NiTi file systems), and preparation technique were determined for content classification. The reliability of the content in the videos was

Table 1

The DISCERN index consists of five questions

DISCERN - Reliability of information (1 point for every Yes, 0 points for No)

Are the objectives clear and achieved?

Are reliable sources of information used?

Is the information presented balanced and unbiased? Is there any reference to other treatment choices?

Are additional sources of information listed for patient reference?

Are areas of uncertainty mentioned?

Table 2

Demographic features of videos [Frequency (n) and percent (%)]

Parameter	n	%
Uploader		
Dentist	21	19
Endodontist	35	32
Commercial company	23	21
Other	29	27
The used tooth/model		
Extrated human tooth	6	6
Artificial tooth model	16	15
Patient's tooth	32	30
Topic description	29	27
No model	21	19
Topic		
Hand file	5	5
NiTi file systems	73	68
Hand and NiTi file systems	2	2
Preparation technique	28	26

Table 3

Descriptive statistics of videos [Mean ± Standard Deviation (SD), Median (Minimum-Maximum)]

Parameter	Mean ± SD	Median (Min - Max)
Duration (sec)	337±193	309 (40-884)
View	60.291±325.303	3.025 (5-3.253.704)
Like	440±1.605	27(1-15.000)
Video timespan (day)	1.295± 04	1.003 (7-3.692)
DISCERN	1±1	1 (0-4)
VPI	6.320±46.944	283 (1-487.812)
Interaction index	3±6	2 (0-50)

DISCERN, Quality Criteria for Consumer Health Information; VPI, video power index.

evaluated using DISCERN (22) and where the answers were scored as “yes” or “no”, 1 point was given for the “yes” answer and 0 points for the “no” answer. DISCERN consists of five questions, the answer to each of which was determined between 1 and 5 points as a result of the evaluation (Table 1). The quality of video information was evaluated using the Global Quality Scale (GQS), which is based on the quality of information available and evaluates the extent to which the observed video is helpful (23). The GQS scores are given in Table 2. The Video Power Index (VPI) was used to evaluate the popularity/preference rate of the videos: $[(\text{View Ratio} \times \text{Like Ratio})/100]$, where $\text{View Ratio} = \text{views/day}$ and $\text{Like Ratio} = [(\text{Likes} \times 100)/(\text{Likes} + \text{Dislikes})]$ (24, 25).

Statistical analysis

SPSS software package version 20 (IBM Corp, Armonk, IL) was used for statistical analysis. Descriptive statistics (mean, standard deviation, median, frequency, percentage, median, minimum and maximum) were obtained, and the data distribution was calculated using the Shapiro-Wilk and Kolmogorov-Smirnov tests. The Kruskal-Wallis test was used to compare three or more non-normally distributed quantitative data groups, and the Mann-Whitney U test was used to compare two non-normally distributed groups. Spearman's test was performed for the correlation of data. Significance was evaluated at the $p < 0.05$ level.

Results

The kappa test results indicated no statistically significant differences between inter-examiner values for scoring the GQS and DISCERN (kappa= 0.923 and 0.930, respectively).

Table 2 shows the topic described in the video, the video's uploader, and the tooth or model used. Table 3 shows the duration time, views, likes, video timespan, and video scale/index (DISCERN, VPI, interaction index). In terms of



Table 4
Distribution of videos by global quality scale (GQS) [Frequency (n) and percent (%)]

GQS	n	%
1 (Poor quality, poor flow of the video, most information missing, not at all useful for patients)	68	63
2 (Poor quality, poor flow of the video, most information missing, not at all useful for patients)	28	26
3 (Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for patients)	11	10
4 (Good quality and generally good flow. Most of the relevant information is listed, but some topics not covered, useful for patients)	1	1
5 (Excellent quality and flow; very useful for patients)	0	0

GQS, global quality scale.

video uploaders, endodontists uploaded the most videos ($n=35$; 32%), mainly shot on the teeth of patients ($n=32$; 30%). NiTi file systems were the most mentioned ($n=73$; 68%). In terms of quality, most of the videos were of low quality and unlikely to be useful to clinicians because many important topics were not discussed in their content ($n=68$; 63%). In the videos uploaded by the commercial company, brief information was given about the files' kinematics, cross-sections and size. According to the overall GQS score, none of the 108 videos evaluated were in

the "excellent quality and flow" category (Table 4).

In Table 5, there was no significant difference between video uploaders in terms of video duration, number of likes or the DISCERN score. The number of views and the VPI were significantly higher for the videos uploaded by commercial companies than by endodontists ($p=0.005$, $p=0.026$), respectively. There was no significant difference between dentists and endodontists concerning the number of views and the VPI parameters ($p=0.177$, $p=0.199$), respectively. The commercial companies'

Table 5
Analysis of variables by video uploader

	Dentist	Endodontist	Commercial company	Other
Duration (sec)	456 (64-705)	230 (56-884)	279 (75-593)	374 (40-767)
View	3881 (30-3.253.704) ^{ab}	953 (5-803.778) ^b	10.282 (8-485.294) ^a	3350 (8-335.580) ^{ab}
Like	53 (1-15.000)	16 (1-1.600)	32 (1-1.900)	22 (1-4.200)
Video timespan (day)	790 (144-2.986) ^a	834 (43-3359) ^{ab}	1819 (467-3.285) ^b	855 (7-3.692) ^{ab}
VPI	588 (4-487.812) ^{ab}	166 (1-25.476) ^b	615 (1-16.757) ^a	179 (1-18.645) ^{ab}
Interaction index	2 (0-7) ^a	2 (0-20) ^a	1 (0-13) ^b	1 (0-50) ^a

VPI, video power index.

^{ab}There is no difference between the values expressed with the same letters in the same row.

Kruskal Wallis H test

Table 6
Reliability-based comparison of popularity and visibility

Parameter	DISCERN (0-1) n=76	DISCERN (2-5) n=32
View	2728 (8-204.168)	7086 (5-3.253.704)
Like	24 (1-2.600)	47 (1-15.000)
GQS*	1 (1-2)	2 (1-4)
VPI	249 (1-18.645)	646 (1-487.812)
Interaction Index	2 (0-50)	1 (0-20)

Mann Whitney U test, * $p < 0,05$

DISCERN, (Quality Criteria for Consumer Health Information); GQS, global quality scale; VPI, video power index.

Table 7
Comparison of GQS and DISCERN values of three uploaders with those of endodontists

Uploader	Endodontist (n=35)		Dentist - Company - Other (n=73)	
	Mean \pm SD	Median (Min-Max)	Mean \pm SD	Median (Min-Max)
GQS	1.51 \pm 0,61	1 (1-3)	1.48 \pm 0,77	1 (1-4)
DISCERN	1.34 \pm 0,68	1 (0-3)	1.19 \pm 0,84	1 (0-4)

DISCERN, Quality Criteria for Consumer Health Information; GQS, global quality scale.

Mann Whitney U test

videos were a significantly longer video timespan than those uploaded by dentists ($p=0.031$). There was no significant difference between dentists, endodontists, and other uploaders concerning video timespan ($p > 0.05$).

The interaction index of the commercial companies was significantly lower than the other three uploaders ($p=0.001$). There was no statistically significant difference in interaction index value between the other three uploader types ($p > 0.05$).

As the DISCERN (reliability) value increased, the number of views/likes and the VPI increased even though they were not statistically significant ($p > 0.05$). There were no dislikes in our searching. Furthermore, as the DISCERN score increased, the GQS value increased significantly ($p=0.001$). In

other words, the reliability and quality of the videos were better. Also, as the DISCERN score increased, the interaction index decreased significantly ($p < 0.05$) (Table 6). Regarding the educational aim of videos, for evaluating DISCERN and GQS, dentists, commercial companies, and others were considered a single group and compared with endodontists. No significant difference was found between the two groups in terms of GQS and DISCERN ($p > 0.05$) (Table 7).

Table 8 shows a positive and significant relationship between duration time, number of views/likes, and the VPI ($p < 0.001$). While there was a positive and significant relationship between the views/likes, video timespan, and the VPI, a significant negative correlation was found with the interaction index ($p < 0.001$). A positive and significant relationship was found between the number of likes and the VPI ($p < 0.001$), but a negative and significant relationship was found between the video timespan and the interaction index ($p < 0.001$). Furthermore, a positive and significant relationship was found between DISCERN and the GQS ($p < 0.001$), but a negative and significant relationship was found between the VPI and the interaction index ($p < 0.001$).

Discussion

The current study highlighted the quality and content of the information videos available on YouTube™ regarding root canal shaping. The alternative hypothesis of this study was accepted because the videos were mainly of poor quality and unlikely to be helpful to clinicians as many important topics were not discussed in their content (63%). Furthermore, most of the content was incomplete or irrelevant, as professionals did not review the uploaded videos, and the quality was checked only by those who watched the videos. Some study reports suggested that YouTube™ could be considered the power of e-learning because of its visual demonstration of clinical procedures (26-28). Burns et al. performed a survey study on the use of YouTube™ among dental students for learning clinical procedures: 95% of respondents rated YouTube™ videos on

Table 8
Correlation analysis between parameters

Parameter		Duration (sec)	View	Like	Video Timespan (day)	DISCERN	VPI	Interaction Index	GQS
Duration (sec)	r	1							
	p	-							
View	r	0.339	1						
	p	<0.001*	-						
Like	r	0.35	0.826	1					
	p	<0.001*	<0.001*	-					
Video Timespan (day)	r	0.01	0.398	0.125	1				
	p	0.918	<0.001*	0.198	-				
DISCERN	r	-0.084	0.055	-0.001	0.026	1			
	p	0.389	0.57	0.995	0.787	-			
VPI	r	0.349	0.927	0.847	0.076	0.085	1		
	p	<0.001*	<0.001*	<0.001*	0.433	0.384	-		
Interaction Index	r	-0.06	-0.483	-0.055	-0.585	-0.055	-0.294**	1	
	p	0.538	<0.001*	0.568	<0.001*	0.568	<0.001*	-	
GQS	r	0.01	0.161	0.113	0.114	0.729	0.166	-0.144	1
	p	0.919	0.096	0.246	0.241	<0.001*	0.086	0.136	-

Spearman's correlation test, * $p < 0.05$.

DISCERN, (Quality Criteria for Consumer Health Information); GQS, global quality scale; VPI, video power index.

clinical guidelines as a helpful learning tool, and 89% requested dental schools to post informative videos on YouTube™/social media (16). Some research also highlighted the positive aspects of YouTube™ users, like encouraging discussion and critical analysis (26, 29). Among dental students, YouTube™ was often used to learn about different ways to clinical procedural techniques and improve the visualization and understanding of abstract concepts (16). However, it is also a fact that YouTube™ is not a substitute for first-hand experience.

One of the challenges with easily accessible information is that the content of the videos may lack certainty about the qual-

ity and veracity (26, 29). Findings from this study supported the uncertainty of the quality of readily accessible information on YouTube™ regarding root canal preparation. Regarding video content, mainly the following were not disclosed: procedural errors, estimated frequency of file separation in the root canal, what to do to avoid file separation, and treatments that would be applied after the complications. It is essential to consider that low prior knowledge of the subject, especially among dental students, may negatively affect the video search process on YouTube™ (30). A survey study by Fu et al. (28) reported that not all feedback was positive concerning YouTube™ as a learning tool for clinical

endodontics, stating a lack of understanding of the techniques and the procedural information to be followed after possible complications during root canal treatment.

The findings of the present study also support these results. Information sharing about the problems that preparation procedures clinicians may encounter was lacking. Studies in the literature suggest that few faculties recommend YouTube™ as a learning procedures tool for clinical dentistry (16) and that faculty recommendation or validation is an essential factor influencing students' perception of the reliability of external resources (31).

In this study, there was no significant difference between video uploaders in terms of video duration, number of likes, and DISCERN, and the number of views and the VPI were significantly higher for the videos uploaded by commercial companies than those uploaded by endodontists. There was no significant difference between dentists and endodontists for these two parameters. Also, the videos were mostly shot on the teeth of patients. Uploaded videos could enhance the fame of the owner/brand of the videos. In addition, Cuddy et al. (32) reported that the videos could be intended for uploaders' commercial purposes rather than educational content. The results of this study also support this conclusion.

Endodontists uploaded more videos about root canal preparation that met the inclusion criteria on YouTube™ in this study. In this study, when dentists, commercial companies, and others were considered as a single group and compared with endodontists, no significant difference was found between them in terms of GQS and DISCERN. However, this may be because the number of endodontists uploading videos was about half the others. Although not statistically significant, the mean values of endodontists were higher. Therefore, it can be concluded that GQS and DISCERN will increase as the number of endodontists uploading videos increases. In addition, as the DISCERN score increased, the GQS value increased significantly. This result supports the data in the literature that professionals and communities supply more credible health information (12, 17, 20, 33). With higher DISCERN scores,

the veracity and content quality of the videos were considered to be almost high (33). As the length of the video increases, it may provide more detailed information to the viewer, but it may also cause a loss of concentration in the subject. In the present study, there was a significant relationship between duration time, number of views/likes, and the VPI, in agreement with the results of the previous study (12). The instructional purpose is essential in determining the length of a video intended to be used as a teaching tool. It has been stated that the shorter the video, the higher its impact on the subject (34). However, the subject's content and complexity can affect the video's length to impart the correct information to the target viewer productively (35). Therefore, for all videos rated by their viewers, there were many "likes" and no "dislikes," suggesting that viewers generally view videos as helpful. The videos evaluated here did not have "dislikes." Such video rating is unscientific and subjective but could be used to show that the viewer approves of the video and thus attracts more viewers in the future (20). The methodology of this study had some limitations. Uploaders can modify and edit videos, comments, and delineative data on YouTube™. Such tampering with the videos may lead to different search results in different time zones (33). Moreover, while endodontic treatment is widely performed worldwide, only English videos were evaluated. Thus, our findings are limited as English is not the primary language in most countries.

Conclusion

Within the limitations of this study, the content of the videos on YouTube about root canal preparation was not reliable and sufficient. However, videos with high content and quality that professionals prepare for educational purposes may help to reduce incomplete information intake over the Internet.

Clinical Relevance

In light of these findings, it is essential for dentists and dental students to be aware of

current and critical information, to direct endodontists to appropriate resources (professional or commercial) and to obtain accurate and up-to-date information.

Conflict of Interest

All authors declare no conflicts of interest.

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