

## Czy filmy wideo z serwisu YouTube™ są wiarygodnym źródłem informacji o resorpcji korzenia?

## Are YouTube™ Videos a Reliable Source of Information About Root Resorption?

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### Streszczenie

Endodonta i ortodonta podjęli próbę oceny zawartości i kompletności filmów z serwisu YouTube™ jako źródła informacji na temat leczenia ortodontycznego i innych problemów występujących u pacjentów z resorpcją korzenia. **Cel.** Celem tego badania jest ocena informacji na temat resorpcji korzenia dostępnych w Internecie z zastosowaniem serwisu YouTube™ jako kluczowego źródła danych oraz ocena tych danych porównawczo z perspektywy różnych specjalności w stomatologii. Ponadto celem jest ocena, czy filmy w serwisie YouTube™ mogą być wykorzystane jako źródło informacji na temat możliwego ryzyka resorpcji korzenia u pacjentów ortodontycznych. **Materiał i metody.** Wyszukiwanie przeprowadzono w serwisie YouTube™ przy

### Abstract

An endodontist and an orthodontist sought to assess the content and completeness of YouTube™ videos as an information source for orthodontic treatment and other issues among patients with root resorption. **Aim.** The aim of this study is to investigate the information about root resorption available on the Internet using YouTube™ as a key source and to evaluate this data comparatively from the perspectives of different specialties in dentistry. In addition, it is aimed to evaluate whether YouTube™ videos can be used as a source of information against the possible root resorption risk of orthodontic patients. **Material and methods.** A search was made using four different terms related to root resorption in the YouTube™. After exclusion criteria were

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użyciu czterech różnych terminów związanych z resorpcją korzenia. Po zastosowaniu kryteriów wykluczenia wybrano 51 filmów. Przy ocenie filmów brano pod uwagę czas trwania, prawa własności, liczbę wyświetleń, liczbę kciuków w górę i w dół, komentarze, jakość parametrów wideo i audio. Dokładność filmów analizowano przy użyciu sześciu kategorii: etiologia, anatomia, objawy, procedura leczenia, przebieg pooperacyjny i rokowanie dla resorpcji korzenia. Treść oceniano pod względem kompletności i analizowano statystycznie testem U Manna-Whitney'a ( $P < 0,05$ ). **Wyniki.** Większość udostępnionych filmów dotyczyła przypadków (31,37%) związanych z procesem leczenia. Podczas statystycznej oceny wyników przedstawionych przez różnych specjalistów stwierdzono istotną różnicę w ocenie jakości i dokładności filmów ( $P < 0,05$ ). Wykryto statystycznie istotną wysoką korelację między pomiarami obu badaczy dla wszystkich wyników ( $P < 0,05$ ). **Wnioski.** Wybrane filmy w serwisie YouTube™ dotyczące resorpcji korzenia były umiarkowanej jakości. Podczas gdy endodonta stwierdził, że filmy były wyższej jakości pod względem parametrów audio i wideo, ortodonta ocenił je wyżej pod względem dokładności. Serwis YouTube™ nie jest obecnie odpowiednim źródłem informacji dla pacjentów szukających informacji na temat resorpcji korzenia. Endodonta i ortodonta muszą podjąć dalsze wysiłki w celu stworzenia wiarygodnych treści medycznych o wysokiej jakości na popularnych platformach mediów społecznościowych, takich jak serwis YouTube™. **(Buyukcavus BH, Kurnaz S. Czy filmy wideo z serwisu YouTube™ są wiarygodnym źródłem informacji o resorpcji korzenia? Forum Ortod 2020; 16 (3): 201-9).**

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**Słowa kluczowe:** leczenie ortodontyczne, endodoncja, resorpcja korzeni, dane internetowe, YouTube™

## Introduction

External root resorption is a type of surface resorption defined as a pathologic and physiologic dissolution of mineralized tissues, such as dentin, cementum and the adjacent alveolar bone. This biological process is multifactorial and mainly a consequence of osteoclastic cell activity (1). External root resorption is a common complication in orthodontic treatment (2). Histologic studies have shown that the occurrence of external root resorption in orthodontically treated teeth is higher than 90% (3). External root resorption may jeopardize the longevity of a tooth and lead to its early loss (4).

applied, 51 videos were selected. The assessment of the videos took into account duration, ownership, views, likes and dislikes, comments, video and audio quality. Video accuracy was analyzed using six categories: etiology, anatomy, symptoms, treatment procedure, postoperative course and prognosis of root resorption. The content was scored for completeness level and statistically analyzed using the Mann-Whitney U test ( $P < 0.05$ ). **Results.** The majority of the shared videos were case videos (31.37%) related to the treatment process. When the scores given by different specialists were evaluated statistically, a significant difference was found in the video quality and accuracy scores ( $P < 0.05$ ). A statistically significant high correlation was detected between the measurements of both researchers in all scoring ( $P < 0.05$ ). **Conclusions.** The selected YouTube™ videos on root resorption were moderate quality. While the endodontist found the videos higher quality in terms of audio and video, they were scored higher by the orthodontist in terms of accuracy. YouTube™ is not currently a suitable source of information for patients seeking to learn about root resorption. Endodontists and orthodontists need to make further efforts to create reliable and quality medical content on popular social media platforms such as YouTube™. **(Buyukcavus BH, Kurnaz S. Are YouTube™ Videos a Reliable Source of Information About Root Resorption? Orthod Forum 2020; 16 (3): 201-9).**

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Positive correlations have been found between external root resorption and continuous force, heavy force, intrusive force and treatment duration (5). It is considered a severe root resorption when there is a loss of more than 4 mm or more than 1/3 of the total root length, and it is estimated that up to 15% of patients receiving orthodontic treatment can be affected by the complication (6,7). Therefore, it is important to reduce these adverse effects of orthodontic treatment.

It is now common for people to use online resources to access medical information, and the public's use of the Internet as a source of healthcare information has increased in the last decade (8,9). Using social media, patients can

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easily obtain information about dental topics that interest them, and based on the information they obtain, their participation in the treatment process may be affected (10).

Created in 2005, YouTube™ is one of the most popular free-to-access video-sharing websites, with more than 2 billion registered users, more than 65,000 videos uploaded and over 100 million videos watched every day (11,12). YouTube™ has also proved to be an effective source for patients, who can use it to access and evaluate health-related information (13). Since there is no formal peer review process for health-related videos on YouTube™, there has been some concern about the accuracy, reliability and scientific validity of the content of these health-related videos, with some pointing out that erroneous and misleading information may be provided in relation to health (14,15).

Much research has been undertaken to examine the quality of health-related videos on YouTube™, and medical and dental professionals have recognized the platform's impact as a source of patient information (16). Videos about dentistry topics such as root canal treatment (17), impacted canines (18), dental avulsion injuries (15), orthognathic surgery (19,20), orthodontic treatment (21), clear aligners (22) and oral hygiene (23,24) have been assessed in the literature. To our knowledge, no studies have evaluated the content and quality of YouTube™ videos on external root resorption.

### Aim

Therefore, the aim of this study is to investigate the information about root resorption available on the Internet using YouTube™ as a key source and to evaluate this data comparatively from the perspectives of different specialties in dentistry. In addition, it is aimed to evaluate whether YouTube™ videos can be used as a source of information against the possible root resorption risk of orthodontic patients.

### Material and methods

This study was planned as a cross-sectional study. Since the study contains only publicly available data, it did not require ethics committee approval. Search terms were chosen from the terms used by patients and dental specialists on social media.

#### YouTube™ Analysis

The online video hosting resource YouTube™ [http://www.youtube.com] was searched on 24 March 2020 for videos containing information relevant to root resorption. The Google Trends application determines the most commonly used search terms by calculating the search frequency relative to the total search volume in various regions of the world. Using this application, it was determined that the most commonly used terms related to root resorption are

“root resorption,” “external root resorption,” “root resorption in orthodontics,” and “root resorption in endodontics.” The search parameters were restricted to the past 5 years and the “Worldwide” settings to prevent restrictions based. The following four search terms were used: 1) root resorption, 2) external root resorption, 3) root resorption in orthodontics and 4) root resorption in endodontics (Fig. 1). The inclusion criteria for videos were that they must 1) be in the English language, 2) contain primary content related to root resorption and 3) be produced with acceptable audio and video quality. Videos were thus excluded if they 1) were not in English, 2) lacked audio or visuals, 3) focused on internal resorption and surgery or periodontal content or 4) lasted longer than 15 minutes. Only one of the same videos was taken into consideration. Because of the videos over 15 minutes duration were long and their interactions were very low, these videos were excluded to obtain standardization and to prevent the results from being misleading in this study.

A YouTube™ account was created for the purpose of the study, and all retrieved video links were stored following the removal of duplications. The videos were then further sorted using the YouTube™ advanced search option “sort by relevance.” The resulting 51 videos from this combined playlist which met the inclusion criteria from the 127 videos reviewed were then assessed (Fig. 2). For 51 videos that met the criteria for the study, Power analysis was performed and our sample size was determined to be 80% power for 0.05 significance level.

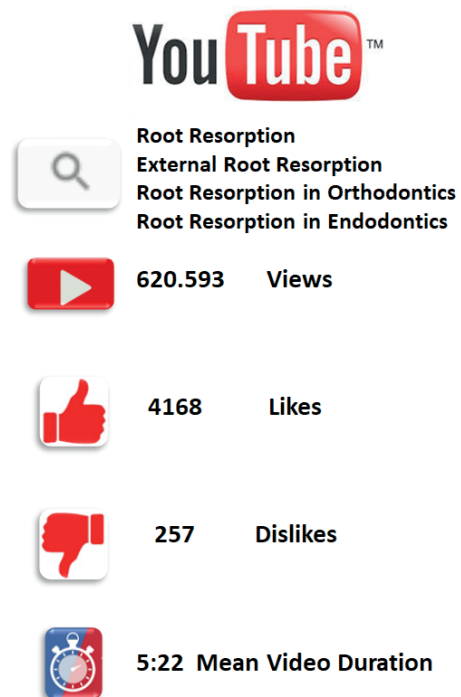


Figure 1. Background data for videos.

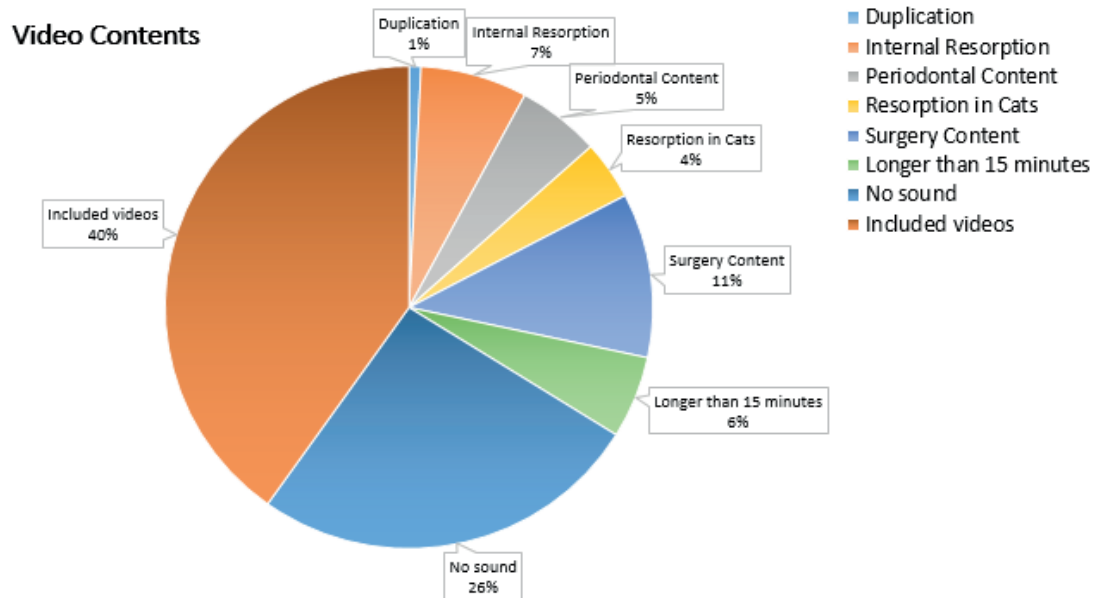


Figure 2. Content of the videos evaluated.

$$\text{Interaction Index (\%)} = \frac{\text{Number of likes} - \text{Number of dislikes}}{\text{Number of views}} \times 100$$

$$\text{Viewing Rate (\%)} = \frac{\text{Number of views}}{\text{Number of days since upload}} \times 100$$

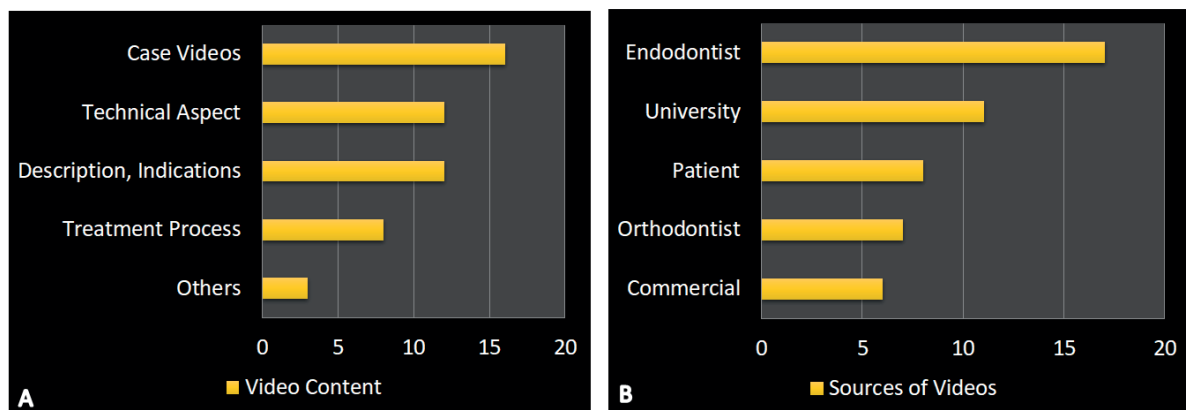
Figure 3. Calculation of the interaction index and viewing rate.

All videos were viewed in their entirety, and the following general parameters were recorded for each: 1) number of views, 2) duration (minutes), 3) total number of “likes” and “dislikes,” 4) number of comments and 5) video share date. In addition to this information, the interaction index and viewing rate were calculated for each video (Fig. 3).

Videos were also categorized into six basic groups according to their sources: 1) orthodontists, 2) endodontists, 3) patients, 4) commercial sources, 5) academic institutes and 6) others. The primary intention for each video was categorized into one of five different groups, which included: 1) technical aspects, 2) descriptions, indications and benefits, 3) treatment processes, 4) case videos and 5) others.

Each video’s content and visual and audio quality were also rated separately by both the endodontist and the orthodontist. All assessments were carried out by the

endodontist (SK; DDS, MSc; for 8 years) and orthodontist (MHB; DDS, MSc; for 7 years). As standardized and validated means do not exist to perform this type of analysis, a set of pre-determined criteria were modified from a previous study. The ratings used by Sorensen et al. were used for these evaluations (25). The audio quality of the videos was scored on a three-point scale of good (3), fair (2) or poor (1). Good was defined as no difficulty understanding spoken words or music. Fair was for videos with speech that was somewhat difficult to understand, or with distracting audio or background sounds. Audio quality was designated as poor when the listener had difficulty understanding spoken words or music. The visual quality of the videos was also scored on a three-point scale of good (3), fair (2) or poor (1). Videos were categorized as good when they had clear visuals and text as well as some professional graphics or effects, as fair

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**Figure 4.** Histograms for each video, showing a list of video contents related to the root resorption (A), and histograms of video sources (B).

when they were home videos or contained average video quality and text clarity and as poor when the visuals were blurry, grainy or difficult to understand.

In order to test the accuracy of the information contained in the videos, the scoring system used by Nason et al. was adopted (17). The two researchers watched each video entirely and then scored each video numerically for accuracy (0 to 2: 0 = incomplete, 2 = very complete) in all six content areas. Information was considered complete when the investigating team evaluated it as evidence-based or generally accepted within endodontics and orthodontics. A total score of 0 to 12 points was obtained for the six content areas: root resorption etiology, root resorption anatomy, root resorption symptoms, root resorption treatment procedure, root resorption postoperative course, and prognosis of root resorption.

In addition, for assessing the reliability of information, an adapted form of the DISCERN tool (an instrument for judging the quality of written consumer health information about treatment choices) was used (Tab. 1). The survey contained five questions. For each question, the answer “no” scored 0 points and the answer “yes” scored 1 point. A reliability score was obtained by calculating the total of these points (22,26,27). To evaluate video quality, a 5-point scale, the global quality scale (GQS) was applied (Tab. 1) (22,26,27).

### Statistical Analysis

Data were collected independently by the two researchers using a Microsoft Excel (Microsoft) spreadsheet. SPSS package program (SPSS for Win, ver 20.0; SPSS Inc., Chicago, Ill) was used to analyze the data. Descriptive statistics were generated for the video characteristics, including the number of views, likes, dislikes and comments, the duration of the videos, interaction index, viewing rate and the number of days online since being posted. Means and standard deviations were calculated for the continuous variables.

The means and standard deviations of the audio, visual and accuracy scores were calculated separately by both the endodontist and the orthodontist. All videos were rewatched and scored three weeks after the first evaluation by both researchers to evaluate the reliability of the measurements. Repeatability coefficients between scores were found to be high ( $\alpha \geq 879$ ). Data were compared using the Mann-Whitney U test, and Pearson's correlation coefficient was calculated for the measurements taken by both researchers. Results were considered statistically significant at a significance level of  $P < 0.05$ .

### Results

Background data on the videos are provided in Table 1. The top 51 videos on root resorption identified on YouTube™ had a total of 620,593 views, with a mean of  $4,925.34 \pm 20,705.46$ . The most viewed video was derived from an academic source and described the treatment of root resorption. The videos had a mean duration of  $5:22 \pm 4:12$  minutes. The mean number of likes for each video was  $33.08 \pm 131.02$ , and the mean number of dislikes was  $2.04 \pm 12.12$ . The most liked video received 1,100 likes and was uploaded by a patient. The most disliked video received 131 dislikes and was uploaded by a commercial source. The mean of the interaction index was  $0.89 \pm 1.71$ . The mean of the viewing rate was  $580.49 \pm 2,188.77$ .

It was observed that 80% of the videos were related to the endodontic aspects of root resorption, while 20% were related to the orthodontic aspects. The majority of the shared videos related to the treatment process of specific cases (31.37%) (Fig. 4A). The categorized sources of the videos are shown in Figure 4B. Most of the videos had been made by endodontists (33.33%)

Based on the endodontist's assessment, the audio quality of the videos was generally good (43.47%) or fair (42.02%),

**Table 1. Evaluation of Information Reliability and GQS Criteria of Root Resorption Videos**

Reliability Score*		GQS Definition	GQS Score
1. Are the aims clear and achieved?	0/1	Poor quality, poor flow of the video, most information missing, not at all useful for patients	1
2. Are reliable sources of information used? [ie, publication cited, speaker is an orthodontist]	0/1	Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to patients	2
3. Is the information presented balanced and unbiased?	0/1	Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for patients	3
4. Are additional sources of information listed for patient reference?	0/1	Good quality and generally good flow, most of the relevant information is listed but some topics not covered, useful for patients	4
5. Are areas of uncertainty mentioned?	0/1	Excellent quality and flow, very useful for patients	5

\*One point for "yes", zero points for "no."

and only 14.49% were considered poor quality (Tab. 2). The mean score for the audio quality was  $1.31 \pm 1.26$ . In the orthodontist's assessment, the audio quality of the videos was generally fair (50.68%) or good (32.87%), and only 16.43% were seen as poor quality. The mean score for the audio quality was  $1.25 \pm 1.19$ . Although the audio quality scores given by the endodontist were high in general, there was no significant difference ( $P > 0.05$ ) between the scores given by the two researchers (Tab. 2).

**Table 2. Video data**

	Mean $\pm$ SD	Min	Max
Number of Views	4925.34 $\pm$ 20705.46	1	210910
Duration	5:22 $\pm$ 4:12	0:12	14:54
Number of Likes	33.08 $\pm$ 131.02	0	1100
Number of Dislikes	2.04 $\pm$ 12.12	0	131
Number of Comments	4.13 $\pm$ 20.23	0	167
Interaction Index	0.89 $\pm$ 1.71	0.01	9.09
Viewing Rate	580.49 $\pm$ 2188.77	0.82	5922.33

The endodontist assessed the visual quality as generally good (36.8%) or fair (42.02%), and classified only 14.49% as poor quality (Tab. 2). The mean score for the video quality was  $2.06 \pm 0.81$ . In the orthodontist's evaluation, the visual quality of the videos was generally fair (46.82%) or of poor quality (33.3%), with only 19.84% considered good. The mean score for the visual quality was  $1.86 \pm 0.72$ . While the average of the accuracy score given by the endodontist was  $2.31 \pm 2.56$ , the orthodontist gave an average accuracy score of  $3.19 \pm 3.32$ . Overall, the audio and visual quality scores given by the endodontist were high, but in terms of accuracy, the orthodontist assigned higher scores than the endodontist did. When the scores given by the two dental specialists were evaluated statistically, there was no statistically significant difference in sound quality ( $P > 0.05$ ), but

statistically significant differences were found in the visual quality and accuracy scores ( $P < 0.05$ ) (Tab. 2).

Finally, when the correlation between the scores given by the two researchers was examined, a statistically significant high correlation ( $\pm 0.8 < R < \pm 1$ ;  $P < 0.05$ ) was detected between the measurements of both researchers in all scoring categories. For intraexaminer reliability, ICC (Interclass Correlation Coefficient) values varied from 0.879 to 0.921, and for interexaminer reliability, ICC values varied from 0.817 to 0.901 (Tab. 3).

**Table 3. Scoring of videos by Endodontist and Orthodontist**

	Endodontist	Orthodontist	P
Video Quality	2.06 $\pm$ 0.81	1.86 $\pm$ 0.72	0.042 *
Audio Quality	1.31 $\pm$ 1.26	1.25 $\pm$ 1.19	NS
Accuracy Score	2.31 $\pm$ 2.56	3.19 $\pm$ 3.32	0.016 *
Reliability Score [Mean]	1.96 $\pm$ 0.72	2.04 $\pm$ 0.69	NS
Global Quality Score [Mean]	3.42 $\pm$ 0.81	3.38 $\pm$ 0.78	NS

P: Results of Mann-Whitney U test; \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ ; NS: not significant.

## Discussion

This study highlights the volume of information about external root resorptions available that is on YouTube™. Patients mostly use the Internet to learn about the treatment options for dental issues, and YouTube™ videos can play an important role in patients' orthodontic treatment decisions. Patients' cooperation and knowledge about orthodontic treatments are important factors in the treatment's success. Many patients research orthodontic treatment, but they can

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Table 4. Correlation of measurements of endodontist and orthodontist

	Video Quality	Audio Quality	Accuracy Score	Reliability Score	Global Quality Score
Endodontist	r: 0.817	r: 0.891	r: 0.871	r: 0.901	r: 0.883
vs	P: 0.000	P: 0.000	P: 0.000	P: 0.000	P: 0.000
Orthodontist	***	***	***	***	***

P: Results of Pearson correlation test; Low [ $\pm 0.01 < R < \pm 0.5$ ]; Medium [ $\pm 0.5 < R < \pm 0.8$ ]; High Correlation [ $\pm 0.8 < R < \pm 1$ ]; \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$

access information on social media more easily than on scientific platforms. Thus, the use of the Internet, specifically video-sharing websites like YouTube™, is very common among patients investigating information about health and health procedures. However, information and videos can wrongly inform patients as they are often created and shared without any scientific filtering. Videos with poor educational or scientific quality can hinder patients' knowledge gathering and have negative effects on the doctor-patient relationship. Because patients are increasingly using digital sources to obtain health-related information, clinicians should be aware of the content and quality of this information in order to guide their patients appropriately (17,28-30). Therefore, this study was designed to evaluate the quality of YouTube™ videos on a specific dental issue.

It is widely accepted that the force applied during orthodontic treatment often causes external root resorption on the treated dentition. Because of the absence of pathognomonic symptoms, these resorptions are generally detected by routine radiographic examinations (5). Despite the prevalence and severity of root resorption, there is limited information about the etiology and pathology of this resorption (31). Additionally, there is no consensus yet on how to prevent root resorption or how to manage it when this type of resorption occurs during orthodontic treatment. Moreover, little is known about the long-term stability and prognosis of the tooth affected by external root resorption (4).

The treatment of external root resorption depends on the location, severity, the restorability of the tooth and whether the defect has perforated the root canal system. In cases with infected pulp tissue, root canal treatment should be performed by repairing the perforation site with a sealing material (32,33). If external root resorption is in an extensive or difficult-to-access area, surgery is generally performed. Surgical treatment of external root resorptions involves periodontal flap reflection, the removing of inflamed tissue and cleaning of the affected area. The resorption area is restored with biocompatible materials such as glass ionomer, composite resin or mineral trioxide aggregate. In addition, the use of intracanal medications containing calcium hydroxide has inhibitory effects on inflammatory root resorption (34,35).

The statistically significant difference between the endodontist and orthodontist in terms of video quality and

accuracy score does not constitute a contradiction in terms of the results of the study. Since the video quality is a subjective assessment, even if it is not an expert, it can be different among people. Accuracy score is a more objective evaluation method than video quality. The significant difference in this scoring indicates that root resorption can be evaluated differently by two different branches of dentistry. This is also natural situation. Because while root resorption is a complication of treatment for orthodontists, it is a problem for endodontists that they examine in terms of treatment. While keeping the root resorption to a minimum and preventing its emergence is the interest of orthodontists, endodontists are concerned with direct treatment. Therefore, when evaluating videos, perspectives may be different and scoring can be different. For this purpose, it is aimed to compare the evaluations of orthodontists and endodontists with each other in this study.

Previous studies have been mostly cross-sectional, examining the most recent or most popular videos on a given subject. Such a focus is natural as, according to published statistics, about 60 hours of video are uploaded to YouTube™ every minute, turning the platform into a very dynamic video database that can change quickly in a short time (36). However, past evidence on search strategies has shown that most viewers do not go beyond the first three pages of YouTube™ search results, and the vast majority of the videos are in English (37).

The video content was evaluated using a subjective rating score instead of a valid scoring system, which is not currently available for YouTube™. In addition, only the interactive index and the viewing rate were examined objectively. Approved evaluation tools such as the DISCERN questionnaire can be used to evaluate written health information provided on the Internet (38). However, a similar tool is not currently available for the evaluation of social media content or video-based resources such as those found on YouTube™. However, the kappa coefficient showed a very high fit for the content rating used in this study, indicating that the technique used was valid even though the two researchers hailed from different disciplines that deal with root resorption in different capacities.

This assessment was carried out jointly by an endodontist and orthodontist, and although this methodology was useful for measuring the content and quality according to

specific criteria, the introduction of non-professionals could be helpful in future studies (39). As more information is obtained in video format, practitioners must consider how it is evaluated and managed as part of the process of ensuring patients have access to high quality and accurate information.

An important question posed by this research is how we interact with the Internet as professionals to ensure that patients have access to appropriate and accurate information and to help them make informed choices about healthcare (19). This may include making and publishing high-quality videos to which patients can be directed. Many such videos can be found on professional community websites, but these are often poorly accessed by patients. Instead, patients will tend to use search engines such as Google, which creates an easily searchable list of general websites, images and videos. If healthcare professionals refrain from interacting with websites and platforms such as YouTube™, there is a danger that balanced and accurate messages will be lost under the weight of online information.

This study, in which only English videos were analyzed, included mostly videos uploaded from native English-speaking countries, which was a geographic limitation. However, English is a global language, and it is possible to access English information from anywhere in the world. One of the most important limitations of this study is that it was based on the evaluation of most recent posts performed in a single

time range on the YouTube™ platform. Another limitation is that the data changes continuously on YouTube™. Therefore, the results of this study cannot be generalized to videos in other languages and videos uploaded after the date this study was performed.

## Conclusions

As a conclusion, the selected YouTube™ videos on root resorption were inadequate and generally of moderate quality. Results indicate that YouTube™ is not currently a suitable source of information for patients seeking to learn about root resorption. Videos about root resorption; while the endodontist found higher quality in terms of audio and video, they were scored higher by the orthodontist in terms of accuracy. Endodontists and orthodontists need to make further efforts to create reliable and quality medical content on popular social media platforms such as YouTube™.

## Conflict of interest

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

## Ethical Approval

Since the study contains only publicly available data, it did not require ethics committee approval. National Statement on Ethical Conduct in Research Involving Humans.

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