ORIGINAL ARTICLE

Turk Endod J 2025;10(1):32–38
doi: 10.14744/TEJ.2025.19971

Is YouTube™ a useful learning tool? An evaluation of the videos on Mineral Trioxide Aggregate (MTA) in dentistry

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Purpose: YouTube may contain some false information and using it as a learning tool may lead to patients and students learning incomplete or incorrect information. Our aim was to analyse the content, quality, uploaders and demographic characteristics of YouTube videos with MTA content.

Methods: A Google search was performed by using the keywords 'MTA in dentistry' to find the videos on YouTube. A total of 408 videos were available. After exclusion criterias, 47 videos that met the inclusion criteria were analyzed. The demographic characteristics of the videos were recorded and the contents of the videos were determined. The videos were divided into 3 groups according to uploaders. The Global Quality Score (GQS; score range, 0-5) was used to evaluate the video quality and to classify high and low quality videos. Shapiro-Wilk test, Pearson Chi-square independence test, Mann-Whitney U test and Kruskal-Wallis test were used for statistical analysis.

Results: Although not statistically significant, the number of views was higher for high-quality videos ($p = 0.074$). A statistical difference ($p < 0.000$) was observed between the demonstration and no demonstration groups in the GQS scores. Videos with demonstration had a higher number of views ($p = 0.029$). Videos in the non-dentist group had a higher number of views ($p = 0.017$) and likes ($p = 0.040$).

Conclusion: It was concluded that the videos had a low average GQS score and low quality. Therefore, YouTube videos should be evaluated by dentists for reliable and high quality educational data.

Keywords: Mineral Trioxide Aggregate (MTA); viewing rate; YouTube.

Introduction

The use of online tools to obtain medical information is widespread among people (1). YouTube is one of the most popular online platforms, is the second most visited site after Google, where users can upload videos for free (2). More than 500 hours of new content are uploaded to YouTube, every minute (3).

The increased popularity of social media over the last decade has led to students learning more (4). YouTube is the most popular learning tool, which can be accessed anytime, anywhere and is free of charge (5). He et al. (6) found that YouTube was most commonly used as a supplementary resource by dental students (80%). However, dentists or educators do not have any evaluation tools to

Cite this article as: Kuşuçar AN, Erdem RZ. Is YouTube™ a useful learning tool? An evaluation of the videos on Mineral Trioxide Aggregate (MTA) in dentistry. Turk Endod J 2025;10:32-38.
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Submitted: August 01, 2024 Revised: January 28, 2025 Accepted: January 29, 2025 Published: April 29, 2025

verify the video content, and videos can be uploaded without verification (7). Inaccurate, inadequate, and misleading YouTube video content can lead to students receiving incomplete or incorrect information. In a study by Burns et al. (8), 89% of third- and fourth-year dental students reported using YouTube for more than five years, and 95% considered YouTube videos to be a helpful tool for learning clinical procedures (8). Students and dentists could use YouTube to obtain information prior to clinical practice because of perceived inadequacies in the education they receive regarding the clinical application of MTA.

Mineral trioxide aggregate (MTA) consists of a hydraulic calcium silicate powder containing oxide compounds, including calcium oxide, ferric oxide, silicon oxide, sodium and potassium oxides, magnesium oxide, and aluminum oxide (9). It is a biocompatible material widely used in clinical endodontic therapy due to its low cytotoxicity, high biocompatibility, and ability to stimulate new dentin growth. It has uses in dentistry, including conservative treatment of root fractures, perforation repair, pulp capping, apexification, retrograde filling material in apical microsurgery, and revascularization treatment as a coronal barrier (10). Videos about MTA have been uploaded on YouTube by specialist dentists, non-specialist dentists, dental companies and dental clinics. Some of the videos demonstrate the use of MTA, others contain only instructional content.

Considering the possibility of misleading video content, an analysis of the quality of online videos is necessary. Various video assessment tools are available to assess the reliability and quality of video content, such as the modified DISCERN, the Journal of the American Medical Association (JAMA) score, and the Global Quality Score (GQS).

There is no study that examined the quality and content of YouTube videos on MTA in the literature. The purpose of this study is to determine the demographic characteristics of MTA-related videos on YouTube, analyse their content, rank them by type of uploader, and determine the quality of these videos.

Materials and Methods

Ethics committee approval was not required because publicly available data were used for this study.

Search Strategy

Search Strategy On January 20, 2023, the term "MTA in dentistry" was searched in the Google search address bar (https://www.google.com). YouTube.com was selected as the source, and the date range selected from the tool options was January 2018 to January 2023. A total of 408 videos were found on YouTube and evaluated by criteria.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows:

- A video quality of 240p or higher was considered acceptable
- Only videos in the English language were considered
- The primary video content was about MTA in dentistry

The exclusion criteria were as follows:

- Duplicate videos
- Videos without sound and explanation
- Videos in a language other than English
- Irrelevant videos
- Advertisements

A total of 47 videos that met the inclusion criteria were analyzed (Fig. 1).

Content Evaluation

47 videos were viewed and analyzed by two researchers on the same day. For each video, some general parameters were recorded: Number of views, number of likes, number

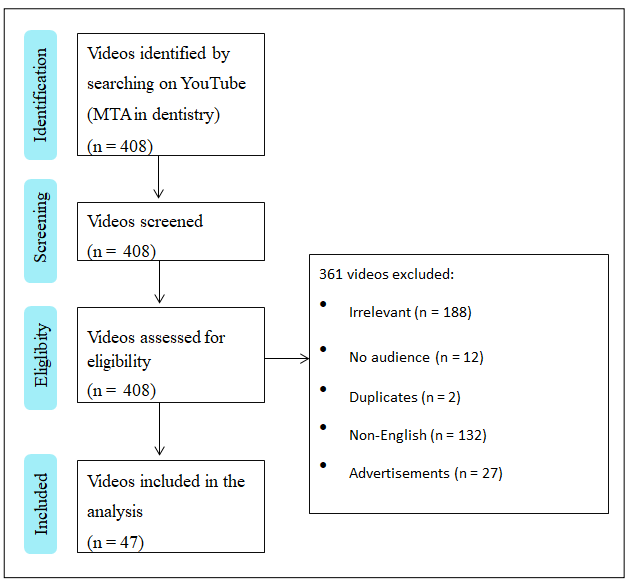

Fig. 1. A flow chart showing the screening process of the YouTube videos.

SCORE	Global Quality Scale (GQS) *
1	Poor quality, poor flow of the video, most information missing, not at all useful for patients
2	Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to patients
3	Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for patients
4	Good quality and generally good flow, most of the relevant information is listed but some topics not covered, useful for patients
5	Excellent quality and flow, very useful for patients

* The GQS evaluation was performed which scored the videos in a range between 1 (poor quality) to 5 (excellent quality).

Fig. 2. Global Quality Scale used in the study.

of comments, duration of the video, number of days after upload, and the source of the uploader. In addition, the viewing rate was calculated for each video based on the data obtained. The viewing rate was calculated by dividing the total number of views by the number of days the video was on YouTube. Viewing rate: Number of views / number of days since the video was uploaded X100.

All the videos were divided into three groups according to the uploader; 1) endodontist (group a), 2) other specialist/non-specialist dentist (group b), 3) non-dentist (dental clinic/dental company/dental magazine) (group c).

The content of the videos was categorized according to the indications of MTA: (i) perforation repair, (ii) apexification, (iii) pulpotomy, (iv) pulp capping, (v) regeneration, (vi) resorption repair by surgery, (vii) root obturation, (viii) sealer, (ix) mixing, (x) carrier, (xi) lectures.

The videos were evaluated for content quality with the Global Quality Scale (GQS). The videos were scored between 1 and 5 (Fig. 2). The videos are classified as high and low quality according to the GQS scale.

Statistical analysis

Statistical analyses were performed in IBM SPSS 25.0. The statistic of the parameters are shown as minimum, maximum, median, mean, and standard deviation.

The statistical significance was p=0.05. The Shapiro-Wilk test was initially used to assess the normality of the data. The Pearson chi-square independence test was used to test independence between two categorical variables. The Mann-Whitney U test and the Kurskal-Wallis test were used to compare data that did not have a normal distribution. Subgroup analysis of independent variables with a statistically significant difference was performed with the Mann-Whitney U test. Relationships between classified variables were examined with chi-square independence tests.

Results

Descriptive statistical data for the videos are shown in Table 1. The average number of views was 35279.02; the average number of likes was 418.23; the average number of comments was 23.96; the average time (days) from the time the videos were uploaded was 1019.60; the average number of subscribers was 31669.15; and the average length of the videos (seconds) was 456.38. The average viewing rate was 2776.68. GQS score was 2.87 on average.

The videos were classified into high and low quality according to the GQS score. It was found that the number of viewings was higher for high quality videos than for low quality videos (p = 0.074). However, there was no statistical difference in the other parameters (Table 2).

Table 1. Descriptive statistics of the Youtube videos about MTA in dentistry

	Minimum	Maximum	Mean ± SD
Number of Views	142	702530	35279.02 ± 104913.27
Number of Likes	0	3700	418.23 ± 677.48
Number of Comments	0	174	23.96 ± 35.35
Age of Videos (d)	122	1836	1019.60 ± 440.61
Number of Subscribers	631	226000	31669.15 ± 42856.98
Duration (s)	50.00	1667.00	456.38 ± 394.14
Viewing Rate	57.03	38706.89	2776.68 ± 6112.16

SD: Standart deviation; d: Day; s: Second.

Table 2. Comparison of parameters between high and low quality video

	GQS < 4			GQS > 3			
	Min.	Max.	Mean ± SD	Min.	Max.	Mean±SD	P Value
Number of Views	142	77804	14571.24 ± 18919.2	1966	702530	89437.85± 191874.30	0.074
Number of Likes	0.00	1400	299.82 ± 379.76	56	370	727.92 ± 1104.19	0.122
Number of Comments	0.00	174	24.21 ± 38.28	4	87	23.31 ±27.60	0.163
Age of Videos (d)	249	1836	972.09 ± 374.43	122	1815	1143.85 ± 579.25	0.230
Number of Subscribers	631	226000	32519.41 ± 47958.95	5130	91100	29445.38± 26611.80	0.283
Duration (s)	50	1667	491.68 ± 409.25	83	1429	364.08 ± 349.48	0.279

Max: Maximum; Min: Minimum; SD: Standard deviation; GQS: Global quality scale; Mann-whitney u testi; p=0,05

Table 3 GQS values are shown according to the uploaders and demonstration

	GQS Scores					P
	1	2	3	4	5	
Uploader						
Endodontist (n = 21)	3	3	11	4	0	
Other specialist dentist (n = 14)	2	5	2	5	0	0.145
Non-dentist (n = 12)	0	1	7	4	0	
Demonstration						
Yes (n = 16)	5	6	2	3	0	< 0.001
No (n = 31)	0	3	18	10	0	

Max: Maximum; Min: Minimum; SD: Standard deviation; GQS: Global quality scale; Mann-whitney u testi; p=0,05.

Table 4. Analysis of videos parameters according to demonstration

	Videos with Demonstration (n = 16)			Videos without Demonstration (n = 31)			
	Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD	P Value
Number of Views	142.00	75733.00	16883.00 ± 19593.01	710.00	702530.00	44773.74 ±128107.38	0.074
Number of Likes	0.00	1400.00	424.44 ±470.37	8.00	3700.00	415.03 ±770.14	0.122
Number of Comments	0.00	174.00	33.00 ± 44.76	0.00	96.00	19.29 ±29.13	0.163
Number of Subscribers	1460.00	226000.00	50663.13 ±60116.16	631.00	124000.00	21865.81 ±26788.21	0.283
Viewing Rate	57.03	5048.87	1656.47 ±1345.28	60.84	38706.89	3354.85 ±7440.66	0.029

n: Number; Max: Maximum; Min: Minimum; SD: Standard deviation; GQS: Global quality scale; Mann-whitney u testi; p=0.05.

Table 3 shows the GQS scores for the videos with and without demonstration. A statistical difference ($p < 0.000$) was observed between the group with demonstration and the group without demonstration. Videos with demonstration had a higher number of views ($p = 0.029$) (Table 4).

Correlations between the types of uploaders and the descriptive parameters of the videos are shown in Table 5. The videos in the group C had a higher wieving rate ($p = 0.017$) and number of likes ($p = 0.040$).

Of the 47 videos, 12 were lectures, 10 were apexification, 6 were pulpotomy, 6 were perforation repair, 4 were sealers, 3 were pulp capping, 2 were shuffling, 1 was a carrier, 1 was root obturation, 1 was regeneration, and 1 was resorption repair by surgery (Fig. 3), and Figure 4 shows the content distribution of videos by uploader.

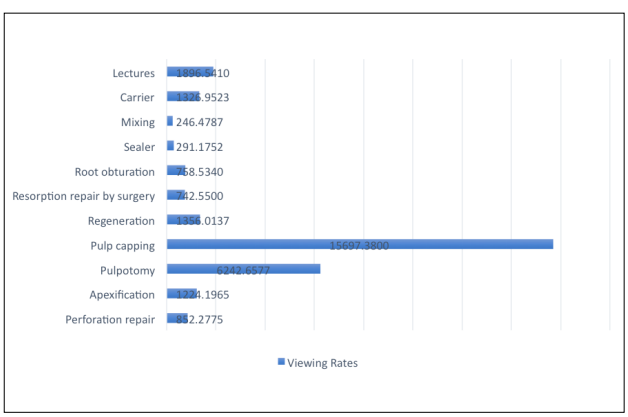

Fig. 3. The videos distribution according to video content.

Discussion

YouTube videos have been used by students to learn endodontic and oral surgery procedures (11,12). Dental students were asked which types of dental procedures they prepared for using YouTube, and endodontics was one of the most frequently selected disciplines among all of the dental schools surveyed (8).

In this study, 47 videos about MTA in dentistry were identified. The videos were categorised by eleven titles as follows: perforation repair, apexification, pulpotomy, pulp capping, regeneration, resorption repair by surgery, root obturation, usage as sealer, preparation procedure, its carrier method, and as lectures. Most of videos had lecture content and secondly most them were about apexficitation with MTA.

According to our study, videos that had procedural demonstration had more views and number of subscribers, significantly. Also, the GQS values were statistically higher for videos with demonstration. Endodontic procedures involves manual operations and competencies that are dif-

Table 5 Correlation between the types of uploader and the parameters of the videos

Uploaders	Group a[a] (n = 21)	Group bb (n = 14)	Group cc (n = 12)	P value
Number of Views				
Min.–Max.	710 - 40812	1548 - 702530	142 - 86694	0.052
Mean ± SD	9271.86 ± 9910.90	84478.36 ± 184986.09	23392.33 ± 29699.40	
Number of Likes				
Min.–Max.	10 - 1400	22 - 3700	0 - 683	0.040
Mean ± SD	218.05 ± 316.74	871.00 ± 1052.82	240.33 ± 234.74	
Number of Comments				
Min.–Max.	0-174	0-87	0-86	0.699
Mean ± SD	23.43 ± 42.04	27.93 ± 32.20	20.25 ± 27.42	
Age of Videos (d)				
Min.–Max.	486.00 - 1836	122 - 1815	249 - 1790	0.509
Mean ± SD	1064.90 ± 362.78	1040.07 ± 528.47	916.42 ± 475.85	
Number of Subscribers				
Min.–Max.	631 - 134000	2280 - 226000	1460 - 62100	0.432
Mean ± SD	21736.19 ± 29632.37	48823.57 ± 63974.62	29038.33 ± 26019.20	
Duration (s)				
Min.–Max.	50 - 733	136 - 1667	144 - 1136	0.060
Mean ± SD	296.33 ± 187.45	705.57 ± 549.29	445.75 ± 317.96	
Viewing Rate				
Min.–Max.	60.84 - 2923.10	251.71 – 38706.89	57.03- 16009.05	0.017
Mean ± SD	968.83 ± 941.31	5523.52 ± 10012.34	2735.77 ± 4505.28	

n: Number; Max: Maximum; Min: Minimum; SD: Standard deviation; GQS: Global quality scale; Kruskal-wallis test (Mann-whitney u test used for the subgroups).

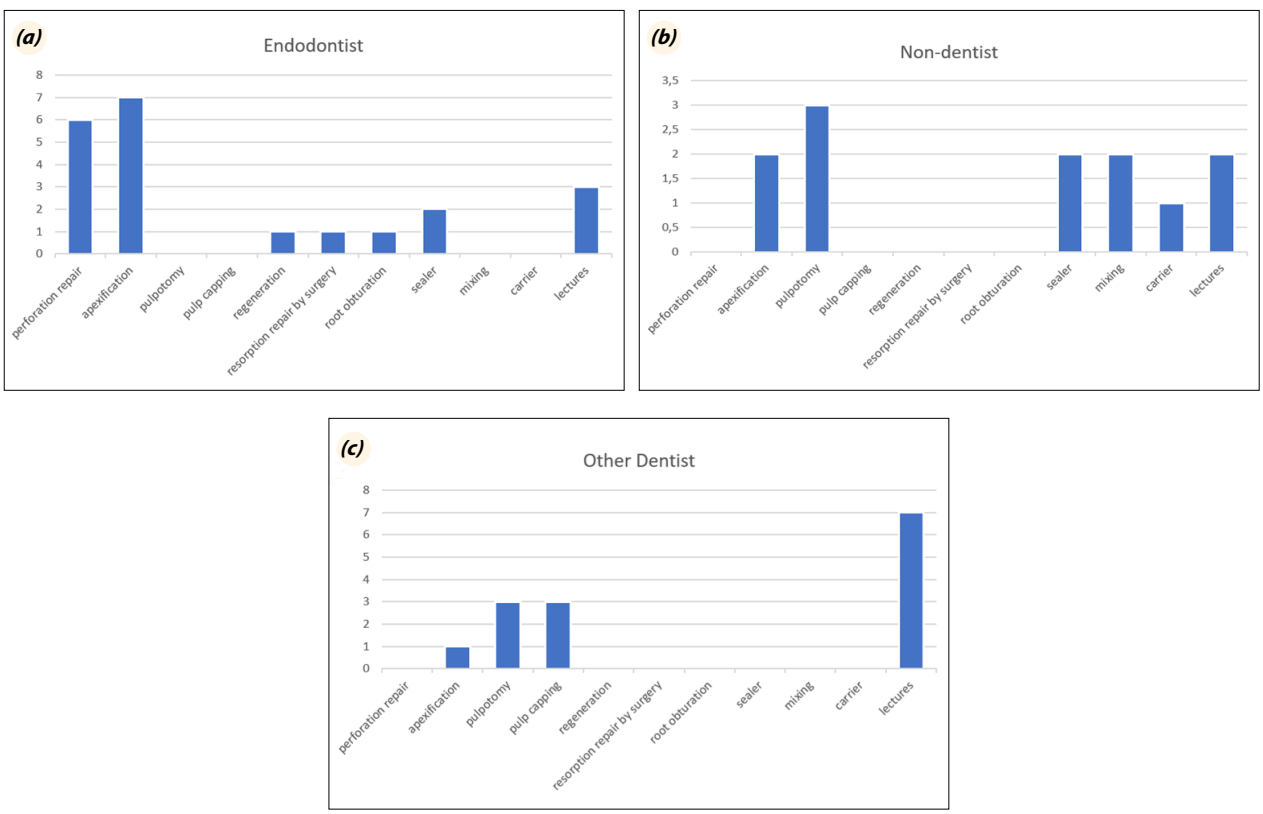

Fig. 4. The contents distribution of the videos according to uploaders. a)videos uploaded by endodontist b) videos uploaded by other dentist c) videos uploaded by non-dentist.

ficult to obtain exclusively from written documents. Practical lectures were found to be a more efficacious learning method (11). Students might have believed that videos featuring practical examples would be helpful, as dental faculties had not sufficiently covered the topic of MTA in clinical practice.

The researchers developed the GQS to assess the accuracy, reliability, streaming quality, and educational utility of the videos. Previous studies have used subjectively generated rating methods and the GQS to assess the informativeness of YouTube videos (7,13). The GCS score represents a 5-point scale that reflects the quality and fluidity of video content. Videos that score 4 and above on this index are considered high quality. Many important parameters about MTA were either not mentioned or only partially discussed. None of the analyzed videos scored 5 on the GQS. Two groups were formed depending on the GQS score: Videos that scored 4 or higher were placed in one group, while videos that scored 3 or lower were placed in the other group. The viewing rate of videos that scored 4 or more on GQS was statistically higher. However, there was no significant difference in viewing rates between the two groups.

The findings on viewing rates in relation to the GQS in our study are consistent with those of Lena and Dindarolu (14). However, it should be noted that the videos are influenced by several demographic factors. In our study, no correlation was found between video quality and the number of likes. It is important to emphasise that a higher number of likes does not necessarily mean that a video is of high quality. This is because the number of likes is relative to the viewer's perception of the usefulness of the video. As in previous studies, our research found that videos with high quality information have a higher view rate (15).

Many of the videos found on YouTube may not have been created by licensed dentists or educators. In our study, videos were uploaded by endodontists, other specialized/non-specialized dentists, and non-dentists. While there was a statistically positive difference between the three groups in terms of number of likes and viewing rate, there was no difference in terms of other variables. Videos uploaded by others (non-dentists) were viewed and liked more frequently than videos uploaded by endodontists. The reason could be that endodontists promote their videos less.

A limitation of this study is the lack of a specific method for analyzing video-based sources to date. For this reason, as in many studies in the field of dentistry, the researchers evaluated the videos subjectively after an extensive literature search (7). At the same time, we limited our work to looking at English-language videos. But YouTube is a very broad platform. It also hosts very useful videos made in other languages on YouTube. Therefore, the content and usefulness of information on the Internet should be evaluated not only in English but also in other languages (16).

Conclusion

As a result, it was found that patients and students seeking information about MTA use YouTube as a source of information. The quality of information on YouTube varies. In this study, the viewing rate was higher for high-quality videos than for low-quality videos. Videos demonstrating the procedure were of high quality and had more subscribers. Videos uploaded by non-dentists had a higher click-through rate and number of likes. Dental educators need to provide more videos in the future to provide a different perspective and increase the credibility of informational content on YouTube. This will prevent misleading information and provide support to patients.

Use of AI for Writing Assistance: Not declared

Source of Funding: None declared.

Conflict of Interest: None declared.

Ethical Approval: Ethics committee approval was not required because publicly available data were used for this study.

Informed consent: N/A

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