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ORIGINAL PAPER

Everything is ok on YouTube! Quality assessment of YouTube videos on the topic of phacoemulsification in eyes with small pupil

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Abstract

Objective Usage of YouTube as an educational tool is gaining attention in academic research. To date, there has been no study on the content and quality of eye surgery videos on YouTube. The aim of this study was to analyze YouTube videos on phacoemulsification in eyes with small pupil.

Methods We searched for the phrases "small pupil cataract surgery," "small pupil phacoemulsification," "small pupil cataract surgery complications," and "small pupil phacoemulsification complications" in January 2015. Each resulting video was evaluated by all authors, and Krippendorff's alpha was calculated to measure agreement. Videos were classified according to pupil size (small/very small) in the beginning of the surgery, and whether pupillary diameter was large enough to continue surgery safely after pupillary dilation by the surgeon in the video (safe/not safe). Methods of dilatation were also analyzed. Any stated ocular comorbidity or surgical complications were noted.

Results A total of 96 videos were reviewed. No mechanical intervention for pupillary dilatation was performed in 46 videos. Fifty-eight operated eyes had no stated ocular comorbidity. Ninety-five operations ended successfully without major complication. There was fair agreement between the evaluators regarding pupil sizes ($K\alpha = 0.670$) but poor agreement regarding safety ($K\alpha = 0.337$).

Conclusions YouTube videos on small pupil phacoemulsification have low complication rates when compared to the literature, although no reliable mechanical dilatation methods are used in almost half of these videos. Until YouTube's place in e-learning becomes clearer, we suggest that viewers be cautious

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regarding small pupil phacoemulsification videos on YouTube.

Keywords YouTube · Cataract · Phacoemulsification · Small pupil · E-learning · Surgical videos

Introduction

It is increasingly common for medical students and medical practitioners to seek out internet-based resources to obtain medical information [1, 2]. Social media in particular has an emerging role in the healthcare system. Social media tools have common features such as ease of accessibility, interactivity, and lack of peer review; however, each tool differs by content and purpose.

YouTube is the world's largest video-sharing website. It serves as an open access, simple, and integrated online platform where people can upload, share, watch, and comment on videos of any subject matter. Approximately 300 h of video are uploaded to YouTube every minute. Not surprisingly, YouTube has more content about eye surgery videos than video-sharing sites such as Eyetube, which contain only eye surgery videos.

YouTube is continuing to expand its worth, from 1.65 billion dollars in 2006 to almost 70 billion dollars in 2014 [3]. It is likewise also gaining significant attention in academic research. As a reflection of this, almost 200 articles are returned when searching PubMed for papers published between March 2007 and December 2015 that have the word "YouTube" in their titles, and nearly half of these papers have been published in the last 2 years. There have been papers published from both basic and clinical science, including the fields of anatomy [4], neurology [5], and orthopedics [6]. These articles also have a wide variety of purposes, including assessment of educational quality, evaluation of accuracy, and even creation of novel methodology. To our knowledge, only one study has been published on YouTube related to ophthalmology [7]. This previous study attempted to categorize retinitis pigmentosa videos from YouTube according to factual accuracy and reported that 60% of videos were misleading. They stated that this result was significantly higher than other YouTube studies employing similar methodology.

Cataract surgery is performed with an increasing frequency in many countries and with low complication rates [8]. However, cases with pseudoexfoliation, posterior synechiae, diabetes mellitus, uveitis, and advanced age are prone to having small pupil, also known as submaximal dilated/non-dilatable/non-enlarging pupil. This situation can compromise the surgery and can lead to serious complications, such as anterior and posterior capsule tears, iris trauma, dropped nucleus or intraocular lens, cystoid macular edema, and retinal detachment [9, 10]. Fortunately, most of the surgical difficulties related to a poorly dilated pupil can be overcome with the use of specialized surgical maneuvers and devices [11]. These intraoperative methods can be mechanical or non-mechanical, and they can be grouped as sphincter-sparing or sphincter-involving methods. Examples of mechanical methods used to overcome small pupil include iris hooks, pupil expansion rings, pupil stretch methods, and iris sphincterotomy techniques. Mechanical techniques make it possible to obtain acceptable and stable pupil size. However, these techniques can lengthen the surgery and are associated with an increased risk of sphincter rupture, which can cause postoperative atonic pupil and thus lead to both esthetic and functional problems.

There is reason to believe that a high volume of eye surgeries is represented on YouTube. Because there has been no study to date of the content and quality of eye surgery videos on YouTube, we aimed to analyze videos on the topic of phacoemulsification in eyes with small pupil.

Materials and methods

In January 2015, we entered the following phrases into the YouTube search bar: "small pupil cataract surgery," "small pupil phacoemulsification," "small pupil cataract surgery complications," and "small pupil phacoemulsification complications." For each phrase, videos from the first ten pages of results were registered into a playlist that was accessible to all authors. Videos showing the basic steps of phacoemulsification surgery and videos with sufficient technical quality to allow the viewer to clearly observe surgical details were included in this study. Videos

showing only parts of the phacoemulsification surgery, videos with techniques other than phacoemulsification, videos with laser-assisted surgeries, and videos in which the viewer could not discriminate sufficient detail were excluded from the study. Narration and language were not included as criteria. Total view counts and publishing dates were assessed. In cases of duplicate videos, the entry with the most views was included in the study.

In the reviewed videos, there were four methods noted for the mechanical dilatation of pupils: iris hooks, pupil rings, stretching techniques, and sphincterotomies. Videos in which was no use of mechanical procedures for dilatation of pupils were considered to show a non-mechanical method.

Each video was evaluated independently by the three authors who have different levels of experience in cataract surgery: AA is the most experienced surgeon (5-year specialist, average 250 phaco surgeries per year), ASK is less experienced as a surgeon (2-year specialist, average 100 phaco surgeries per year), and BK is a third-year resident (average 50 phaco surgeries per year). Videos were each independently classified according to pupil size at the beginning of the surgery (small or very small) using the evaluator's subjective opinion. Figure 1a shows an example of a pupil that all three surgeons agreed was small, while Fig. 1b shows an example of a pupil that all three surgeons agreed was very small. For each video, each evaluator also assessed whether the pupillary diameter would be large enough to continue surgery safely with his or her current experience after the pupil was dilated by the surgeon in the video (safe or not safe). Figure 2a shows an example of a pupil that all three surgeons agreed was safe, while Fig. 2b shows an example of a pupil that all three surgeons agreed was unsafe. Figure 2c shows an example of a pupil that the most experienced surgeon finds it safe and the other two surgeons find it unsafe. Finally, videos were analyzed for methods of dilatation. Any ocular comorbidities or surgical complications, if stated, were noted.

Although our main subject was small pupil videos on YouTube, we did a similar search on Eyetube (https://eyetube.net), thinking that it will be a strong alternative platform in the future, using the same criterion.

Statistical analyses

Descriptive statistics of the continuous variables in the study are shown with mean (standard deviation) and median values. Categorical variables are shown with frequency and percentage. Harmonization of the observers' opinions for both pupil size and safety question was evaluated by Krippendorff alpha coefficient. Yates Chi-square and Pearson's Chi-square tests were used for group comparisons of categorical variables. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using SPSS software version 22.0 (IBM Corp, Armonk, New York, USA).

Results

A total of 96 videos were reviewed in January 2015. The mean number of times each video had been viewed was 1 311, with a range of 5–16 132 times. A mean of 35 months had passed between the uploading and reviewing dates of videos, with a range of 1–96 months. Table 1 summarizes the methods, complications, and ocular comorbidities in the subject videos. There were no mechanical interventions for pupillary dilatation in 46 of the videos. Pupil stretching occurred in 11 surgeries, iris hooks were used in 15 surgeries, a combination of pupillary stretching and iris hooks was used in two surgeries, pupil rings were used in 19 surgeries, and sphincterotomies were performed in two surgeries.

Fifty-eight operated eyes had no ocular comorbidity stated. Twelve eyes had uveitis sequelae-like posterior synechiae, 10 eyes had pseudoexfoliation syndrome, nine eyes had intraoperative floppy iris syndrome, and seven eyes had other comorbidities such as corneal scarring, nystagmus, or previous surgery.

Ninety-five operations ended successfully. A peripheral tear occurred in the anterior curvilinear capsulorhexis in two of the operations, and a posterior capsular rupture was encountered in one operation. Table 2 reports the association between complications and ocular comorbidities.

There was a fair agreement between the evaluators when classifying pupils according to size ($K\alpha = 0.670$). An example of each pupil size is shown in Fig. 1.

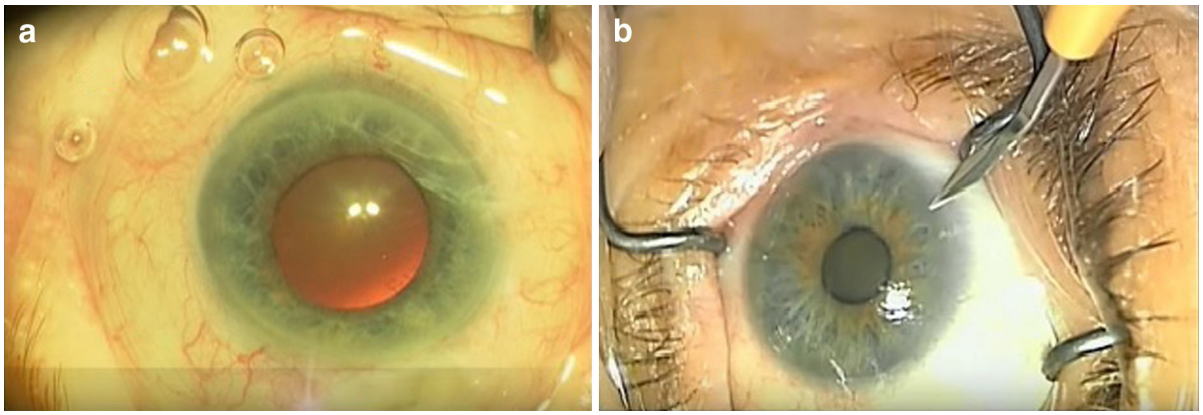

Fig. 1 Example of pupil sizes at the beginning of the surgery. **a** An example of a pupil that all three surgeons agreed was small. **b** An example of a pupil that all three surgeons agreed was too small

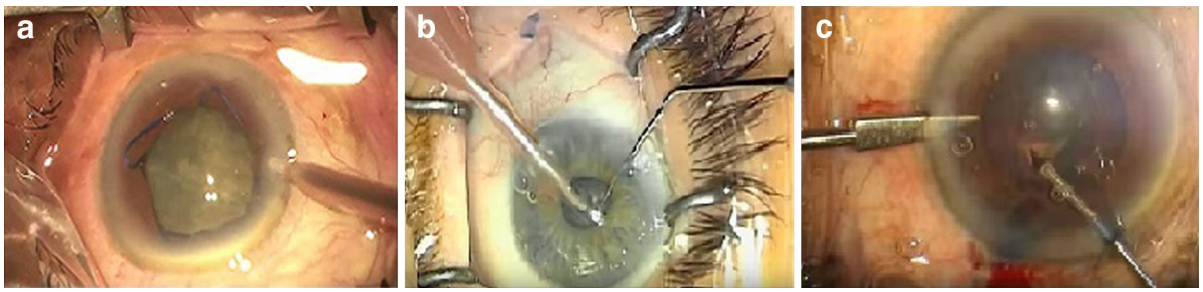

Fig. 2 Example of pupil sizes regarding safety. **a** An example of a pupil that all three surgeons agreed was safe. **b** An example of a pupil which all three surgeons agreed was unsafe. **c** An example of a pupil that the most experienced surgeon finds it safe and the other two surgeons find it unsafe

When classifying each surgery according to safety, there was poor agreement between the evaluators ($K\alpha = 0.337$). For the most experienced evaluator, there was no statistically significant difference between the methods used for pupil dilatation in the videos and safety ($p = 0.082$). However, there was a statistically significant difference between the methods used for pupil dilatation and the classification of safety by the two evaluators with less experience ($p = 0.022$ for ASK, $p < 0.001$ for BK). For both of these surgeons, iris hooks and rings were associated with the determination that surgery was safe to continue.

The Eyetube search yielded only nine videos with no complications. The pupil ring used in four videos was the most preferred mechanical method. Iris hooks were used in two surgeries, pupil stretching occurred in one surgery and no mechanical intervention for pupillary dilatation in two of the videos. Five eyes had no ocular comorbidity stated. Two eyes had pseudoexfoliation syndrome, and two eyes had glaucoma.

Discussion

Even when great care is taken, cataract surgery is not complication-free. When we analyzed published data on complications in cataract surgery, we found that there were different complication rates as well as different rates among subgroups of data. For example, Muhtaseb et al. [12] showed that complication rates ranged from 4.32% in low-risk groups to 32% in high-risk groups. We observed a complication rate of 3.1% in the videos analyzed for the present study. Chen et al. [13] reported a very low incidence of posterior capsular rupture and a vitreous loss rate of 0.68% by very experienced surgeons in a private hospital. However, small pupil cases constituted 30% of the series' complicated cases. In the videos we watched

and analyzed, there was only one major complication, vitreous loss, and one minor complication, rhexis tear. Cases with incomplete rhexis finished uneventfully.

Uveitic disease was the most frequent of the stated comorbidities in the analyzed videos. Different types of uveitic diseases are known to cause different intraoperative and postoperative complications in the eye, including anterior capsulorhexis problems due to small pupil size, intraoperative hemorrhage, zonular problems, macular edema, and others [14]. In the videos included in this study, there were no major or minor complications in any of the eyes with uveitic disease as the stated comorbidity.

PEX is also associated with an increased risk of intraoperative complications during phacoemulsification surgery. Akman et al. [11] found that among 40 cases of small pupil secondary to PEX, with all pupils dilated mechanically, there were no complications other than minor iris hemorrhage. In our study, only 10 videos stated PEX was a comorbidity, and just four of these included surgeries in which the eye was mechanically dilated. We found no complications in any of the 10 eyes with PEX, regardless of whether mechanical dilation took place.

Table 1 Methods, complications, and ocular comorbidities in the subject videos

	n	%
Methods		
No mechanical intervention	46	47.9
Pupillary stretching	12	12.5
Iris hooks	16	16.6
Pupil rings	19	19.7
Sphincterotomy	3	3.1
Complications		
None	93	96.9
Posterior capsule rupture	1	1.0
Tear in anterior capsule	2	2.1
Non-stated	58	60.0
Ocular comorbidities		
Flomax usage	9	9.4
PEX	10	10.4
Uveitis sequelae	12	12.5
Other	7	7.3

This absence of complications in a group of eyes with high risk may be explained by several ideas. Firstly, because we can know nothing about the surgeons in the videos, all of them could potentially be very qualified and experienced. Ericsson [15] defined this class of surgeon as "experts" who have better outcomes than non-experts. To support this idea, there was no statistically significant difference between the method for pupillary dilation and our most experienced evaluator's classification of surgery continuation as "safe." In contrast, the two less experienced surgeons' safety classifications were statistically associated with the method of pupillary dilation, with iris hooks and pupillary rings being more likely to be present in videos classified as "safe."

The second possible reason for this disparity is related to sociocultural and psychological factors. People tend to see their abilities as superior to others in specific areas, such as driving [16]. Wolpe et al. [17] demonstrated that people are biased toward the success of their performance on visuomotor tasks compared to observed actions. Because phacoemulsification surgery in small pupils is a very demanding visuomotor task, some surgeons may consider themselves better than their colleagues and may thus upload more demanding surgeries on YouTube. We can see evidence of this overconfidence in the surgeons' selections of pupillary dilatation methods. Although these are uncertain and challenging cases, we did not see any mechanical pupillary intervention in almost half of the cases. There have been few studies conducted on "the physician personality" [18], and

Table 2 Association between complications and ocular comorbidities

Ocular comorbidity	Complications			Total
	None	Posterior capsular rupture	Tear in anterior capsule	
None	56 (96.6%)	1 (1.7%)	1 (1.7%)	58
Flomax	9 (100%)	0 (0%)	0 (0%)	9
PEX	10 (100%)	0 (0%)	0 (0%)	10
Uveitis	12 (100%)	0 (0%)	0 (0%)	12
Other	6 (85.7%)	0 (0%)	1 (14.3%)	7

most of these have underscored the idea that surgeons have different personalities than non-surgeons. These personality differences include having a larger ego, and they may have played a role in choosing to upload videos on YouTube.

Finally, scientists and surgeons are often motivated by the desire to publish a paper rather than to conduct pure science. They are also concerned about their careers and their reputations. Even though a negative result should be considered as valuable as a positive result, papers with positive results are published more often than the ones with negative results [19]. Likewise, a laboratory experiment with a positive result is more likely to gain approval than one with a negative result. This may raise the question: Why does not a complicated surgery get more applause than a complex uneventful surgery?

The place of YouTube videos in the lifelong education of surgeons is an important issue. Use of multimedia tools predates the beginning of social media. In 1988, Hoyt et al. [20] demonstrated that reviewing actual resuscitation footage in a weekly conference caused an increase in the efficiency of actual resuscitations. We believe that the use of YouTube videos for medical education has evolved from the use of video tapes and DVDs in the past. YouTube videos are greater in quantity and more easily accessible, but they are also more difficult to control for quality. However, they are capable of providing the basic elements of learning and have great potential. There is an old apprenticeship statement: "see one, do one, teach one." that may be rephrased in the current age as: "see many, do a few, broadcast some, teach many."

As an alternative to YouTube, Eyetube is a website dedicated to ophthalmology. Eyetube features podcasts, meeting coverages, and business interviews alongside surgical videos. Also as a website policy, surgical videos should be between 3 and 7 min in duration, must be accompanied by an English narration, and should include any financial disclosures relevant to the video. In addition to those criteria, we know that there is a medical board examining the videos before broadcasting. Although this feature signs for better videos in terms of quality, we do not know the exact level of peer review. Despite these superior features from YouTube, Eyetube's greatest handicap for now is lack of number of videos. In our study, we only found nine videos related to our topic compared to 96 videos on YouTube. However, we think that video numbers will increase on Eyetube over time. When this happens, Eyetube has a potential to become a number one reference source for educational videos.

Our study had several limitations. There was not enough information in the videos about preoperative and perioperative non-mechanical measures. Therefore, we were only able to analyze the mechanical techniques for increasing pupil size. Also the number of reviewers could have been more, and scientific versus non-scientific uploading source could have been taken into account.

In conclusion, we found that YouTube videos on small pupil phacoemulsification have very low complication rates when compared to the literature, even though in almost the half of these videos no mechanical methods were used. Although these videos are neither officially educational nor scientific, they can still be helpful for surgeons. More information is needed on how the viewers interpret these videos or apply them to their daily practices. YouTube's place in e-learning is not completely definite, and until it becomes clearer, we suggest that uploaders be responsible and that viewers be cautious when interpreting small pupil phacoemulsification videos on YouTube.

Compliance with ethical standards

Conflict of interest None.

Ethical approval This article does not contain any studies with human participants performed by any of the authors.

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