

## **The Zoom Effect: A Google Trends Analysis**

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## Abstract

**Background:** Increased video-chatting, stimulated by the COVID-19 pandemic, has been correlated with increased appearance concerns. Initial lockdown restrictions correlated with a decrease in aesthetic/cosmetic plastic surgery case volumes.

**Objectives:** We aim to delineate public interest in aesthetic procedures surrounding the COVID-19 pandemic via Google Trends (GT). We hypothesize that because of the pandemic, public interest in plastic surgery procedures increased, especially localized above the shoulder.

**Methods:** Trends in the US for given search terms and volumes were gathered via Google Trends between January 2015 to March 2021. The search volumes were normalized, and a bivariate regression analysis of panel data was then applied to the aggregate trendlines to determine if a statistically significant change in search volume occurred following the stay-at-home orders.

**Results:** The following search terms had statistically significant ( $p < 0.000$ ) increases in search volumes after February 2020: blepharoplasty, Botox, brachioplasty, breast implant removal, breast reduction, brow lift, buccal fat removal, hair transplantation, lip augmentation, mentoplasty, otoplasty, platysmaplasty, rhinoplasty, and thighplasty. Chi-squared analysis demonstrated a statistically significant association (Chi-squared = 4.812,  $p = 0.028$ ) between increases in search volume and above the shoulder procedures.

**Conclusions:** Public interest in above the shoulder surgical procedures showed a statistically significant increase following February 2020 compared to below the shoulder procedures. Continued examination of specific procedure trends, as well as determining correlations with more accurate procedural datasets, will provide increased insight into consumers' mindsets and to what extent video conferencing plays on the public's interest in pursuing aesthetic surgery.

The COVID-19 pandemic has caused a significant impact on consumer behavior, daily routines, and health care administrations. As stay-at-home orders dictated approximately half of the US population to work from home, many individuals began using video conferencing or video chatting services (e.g. Zoom (San Jose, CA, USA) FaceTime (Cupertino, CA, USA), Skype (Palo Alto, CA, USA)) in lieu of in-person meetings. This quickly led to an increase in appearance related concerns. Unlike face-to-face interactions, individuals' faces are constantly reflected on their digital interface as they view themselves from the perspective of an observer allowing real-time comparison of one's appearance to others. Studies have demonstrated a correlation between video chatting and appearance concerns, body dissatisfaction, and eating disorders.

The pandemic has also vastly impacted the healthcare industry. With the initial increased restrictions, there was a decrease in aesthetic/cosmetic plastic surgery case volumes. However, following successful vaccine implementation and distribution, there have been self-reported increases in surgical volumes. This self-reported data does not distinguish between which operations individuals are seeking nor does it quantify the overall increase in plastic surgery volume or the specific procedures.

Google Trends (GT) is a website service provided by Google (Mountain View, California, USA) that analyzes the popularity of search queries and then uses graphs to compare the volumes of queries over time. Recent research has shown that GT data may offer practical information to plastic surgeons highlighting seasonal and geographic trends of cosmetic procedures. This data has previously been used to evaluate public interest in cosmetic procedures. One study by Tijerina et al. used GT to analyze the correlation between public interest in breast implant removal procedures and Breast Implant-Associated Anaplastic Large-Cell Lymphoma (BIA-ALCL).

In this study, we aim to quantify the number of aesthetic procedures performed before and after the COVID-19 pandemic by utilizing GT data as a proxy for public interest in various plastic surgery procedures. We hypothesize that as a result of the pandemic, there is not only an increase in the public interest in plastic surgery procedures, but that there is an increasing number of procedures being performed, especially those of the head and neck as these represent the areas seen most frequently while video conferencing.

## **METHODS**

Trends in the US for given search terms and volumes were gathered via Google Trends between January 2015 to March 2021. The search volumes were normalized by the Google Trends tool to facilitate comparisons between search terms. To normalize, Google Trends takes the search volume for a specific month and divides it by the total searches within the US to compare relative popularity. The search volume for that month was then scaled on a range of 0-100 based on the term's proportion to all searches on all topics. Moreover, the normalization is conducted by the Google Trends tool, and thus the actual search volumes are not directly available to the public or research authors.

Searches included popular aesthetic surgical procedures in the US during the time period of January 2015 to March 2021. Synonyms and related terms, based on The Aesthetic Society statistics, for the same procedure were queried to capture a comprehensive dataset reflecting public interest. These synonyms were grouped by procedure category to avoid redundancy. **Table 1** shows a comprehensive list of search terms and their groupings. A trendline was generated from each individual search term with a normalized search volume score for each month from January 2015 to March 2021. Within each group, the sum of all terms' normalized scores produced the aggregate trendline to describe a procedure's total search volume. These aggregate trend lines illustrate public interest in certain cosmetic surgery procedures over the queried time period.

A bivariate regression analysis of panel data was then applied to the aggregate trendlines to determine if a statistically significant change in search volume occurred following the stay-at-home orders. February 2020 was chosen as the inflection point, indicated on each trendline, because the first COVID-19 stay at home order in the state of California was issued on March 19th, 2020. Significant increases and decreases were determined by a p-value  $<0.05$  with a 95% confidence interval.

Procedures were further categorized into the following dichotomous system: either "above the shoulder" or "below the shoulder". Categorized as "above the shoulder" were the following procedures: blepharoplasty, Botox, brow lift, buccal fat removal, hair transplantation, lip augmentation, lip reduction, malar augmentation, mentoplasty, otoplasty, platysmaplasty, rhinoplasty, and rhytidectomy. Categorized as "below the shoulder" were the following procedures: abdominoplasty, brachioplasty, breast augmentation, breast implant removal, breast lift, breast reduction, butt lift, calf augmentation, lower body lift, male breast reduction, pectoral implant, and thighplasty. A Chi-squared test was used to determine if there was a significant association between above the shoulder procedures and increased search volumes. Analyses were conducted with a single degree of freedom and a p-value of  $<0.05$  was used for statistical significance.

K. T., S. F., and T. K. conducted the search. K. T., S. F., T. K., C. A., S. A., and R. N. reviewed the search results. Disagreements and suggestions were handled through email and video conferencing. Multiple phone calls and meetings helped us resolve issues between the contributing authors; any issues were surely resolved with all parties in agreement.

## RESULTS

The aggregate trend lines illustrate fluctuations in searches for a given aesthetic surgery procedure. **Figures 1 and 2** show the trendlines for breast implant removal and mentoplasty. The remaining trendlines can be found in the Appendix, available online at [www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com). Bivariate regression analysis reported directionally significant differences (denoted by a positive or negative Z-score) in search flow volume before and after February 2020 (marked as a red dot on each trendline). Coefficients, standard errors, z-scores, p-values, and 95% confidence intervals are reported for all procedures in **Table 2**. Blepharoplasty ( $p < 0.000$ ), Botox ( $p < 0.000$ ), brachioplasty ( $p <$

0.000), breast implant removal ( $p < 0.018$ ), breast reduction ( $p < 0.000$ ), brow lift ( $p < 0.000$ ), buccal fat removal ( $p < 0.000$ ), hair transplantation ( $p < 0.000$ ), lip augmentation ( $p < 0.000$ ), mentoplasty ( $p < 0.000$ ), otoplasty ( $p < 0.000$ ), platysmaplasty ( $p < 0.000$ ), rhinoplasty ( $p < 0.000$ ), and thighplasty ( $p < 0.000$ ) had statistically significant increases in search volume after February 2020. Butt lift ( $p < 0.000$ ) and mastopexy ( $p < 0.000$ ) had statistically significant decreases in search volume after February 2020. Abdominoplasty ( $p = 0.151$ ), breast augmentation ( $p = 0.986$ ), lip reduction ( $p = 0.749$ ), lower body lift ( $p = 0.745$ ), malar augmentation ( $p = 0.423$ ), male breast reduction ( $p = 0.786$ ), pectoral implant ( $p = 0.257$ ), and rhytidectomy ( $p = 0.761$ ) had no statistically significant difference in search volume after February 2020.

Chi-squared analysis was used to determine whether there was an association between statistically significant increases in search volumes and above the shoulder procedures. There was a statistically significant association (Chi-squared = 4.812,  $p$ -value = 0.028) between above the shoulder procedures and an increase in search volumes with 1 degree of freedom.

## **DISCUSSION**

The COVID-19 pandemic has vastly increased the use of video conferencing platforms. Zoom, the most popular video conferencing application, saw an increase from 10 million daily meeting participants in 2019 to 200 million in March 2020. Labeled as the “Zoom Effect”, an increased usage of video conferencing tools has heightened individuals’ awareness of their appearance and has led to increasing appearance related concerns. For many, this has reaffirmed their interest or desire in aesthetic surgery. Reports do not distinguish whether this increase in procedures during the pandemic are primarily above the shoulders, easily visible on video conferencing such as Zoom, or below the shoulders, which is relatively hidden. With the help of Google Trends (GT), we investigated whether the March 2020 lockdown was associated with increased interest in cosmetic procedures above the shoulder as compared to procedures localized below the shoulder.

GT offers the ability to gauge public interest by providing normalized trendlines of search volumes for a given search query. As a publicly accessible tool, Google Trends data can be used by plastic surgeons to measure patient interest in specific procedures. However, Google Trends does not give absolute numbers, only making relative values available to the public. This is a limitation of the tool as it influences the type and scope of statistical analyses that can be performed. In most areas in the United States, social distancing regulations were placed at some point during the month of March 2020. To be conservative, February 2020 was chosen as an inflection point at which to compare search results before and after the implementation of social distancing and the subsequent increase in virtual video conferencing.

Statistically significant increases in search volumes after February 2020 were found for the following procedures: blepharoplasty, Botox, brachioplasty, breast implant removal, breast reduction, brow lift, buccal fat removal, hair transplantation, lip augmentation, mentoplasty, otoplasty,

platysmaplasty, rhinoplasty, and thighplasty. Butt lift and mastopexy had statistically significant decreases in search volume after February 2020 (**Table 2**). Chi-squared analysis demonstrated a statistically significant association between increases in search volume and above the shoulder procedures (Chi-squared = 4.812, p-value = 0.028). Our findings demonstrate a statistically significant increase in public interest related to above the shoulder surgical procedures following the designated inflection point of February 2020 as compared to below the shoulder procedures. This finding suggests that after the March 2020 lockdown, above the shoulder procedures were more likely to see an increase in public interest.

There remain other data sets like the American Society of Plastic Surgeons (ASPS) procedure data, which can serve as valuable comparisons moving forward. A standardized means of capturing this data, across societies, would make future comparisons easier with resulting conclusions likely more impactful.

As we return to some semblance of *normalcy*, we were accustomed to prior to the pandemic, it will be interesting to follow this data to determine if the increase in aesthetic surgery interest remains or if it begins to wax and wane. As most business sectors and companies begin to implement hybrid models for returning to work, video conferencing will likely remain a vital component of our interactions and thus the “Zoom Effect” shall remain, albeit to what extent we cannot yet be certain. By utilizing Google Trends to continue examining this data in real time and correlating it with more accurate procedural data, we can assess if the increased public interest actually leads to increased procedures performed. Additionally, we can examine if each of these trends changes as people begin returning to work and increasing their face-to-face interactions. We posit there will be a continued rise in aesthetic surgery interest that will then hit a plateau phase and then subsequently resume a trend line similar to what was observed prior to the February 2020 inflection point. The consideration of aesthetic surgery interest hitting a plateau phase could be contingent on the prolongation of the pandemic. Since the initial lockdown and distribution of the COVID-19 vaccine, multiple variants of the virus have prolonged and potentially normalized pandemic patterns of behavior, thus there may be an argument for interest in aesthetic surgery to continue to steadily rise due to the continuation of pandemic patterns of behavior even after the pandemic has been resolved. Regardless, interest in cosmetic surgery seems to be increasing based on our data analysis which can only be a positive sign for the field of aesthetic surgery moving forward.

## **CONCLUSION**

The “Zoom Effect” refers to the heightened awareness of one’s own appearance leading to a subsequent increased interest in aesthetic surgery. Following the March 2020 stay-at-home orders and social distancing policies, increased video conferencing has been associated with anecdotal increases in aesthetic plastic surgery procedures. As such, we hypothesized there would be a greater interest in

cosmetic surgery procedures, particularly those located above the shoulder as these are the most visible areas while utilizing video conference modalities.

The following procedures showed statistically significant increases in search volumes after the chosen inflection point of February 2020: blepharoplasty, Botox, brachioplasty, breast implant removal, breast reduction, brow lift, buccal fat removal, hair transplantation, lip augmentation, mentoplasty, otoplasty, platysmaplasty, rhinoplasty, and thighplasty. Butt lift and mastopexy showed statistically significant decreases in search volume after the inflection point. Chi-squared analysis demonstrated a statistically significant association between increases in search volume and above the shoulder procedures (Chi-squared = 4.812, p-value = 0.028). Our findings demonstrate a statistically significant increase in public interest related to above the shoulder surgical procedures following the designated inflection point of February 2020 as compared to below the shoulder procedures.

The GT data presented is thought provoking and worthy of reporting and discussion. Our results demonstrate how GT data can be a useful tool that can help plastic surgeons optimize their practice and care for their patients. With the increased knowledge provided by knowing the current trends in aesthetic procedures, plastic surgeons can be better prepared with the insight into overall public interest and perception. We would be remiss to not mention certain risks associated with plastic surgeons' response to the Zoom Effect. These risks may include increased patient dissatisfaction and legal cases, by nature of more patients undergoing cosmetic surgery. Moving forward, continued examination of the trends for specific procedures, as well as correlation to more accurate procedural data sets will provide increased insight into the consumer mindset as it relates to aesthetic surgery and what effect, if any, video conferencing may play on the public's interest in pursuing these procedures.



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**Figure Legend**

**Figure 1.** Aggregate trendlines for Breast Implant Removal search volumes from January 2015 to March 2021, the red circle indicates the inflection point when the COVID-19 lockdowns began (February 2020).

**Figure 2.** Aggregate trendlines for Mentoplasty search volumes from January 2015 to March 2021, the red circle indicates the inflection point when the COVID-19 lockdowns began (February 2020).

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**Table 1.** Aesthetic Surgery Procedure Types and Associated Search Terms

Procedure	Search terms
Abdominoplasty	tummy tuck abdominoplasty liposuction
Blepharoplasty	blepharoplasty eyelid plastic surgery eyelid surgery
Botox	Botox Botox injection
Brachioplasty	upper arm lift brachioplasty arm lift arm lift surgery
Breast Augmentation	breast augmentation boob job breast implant(s) breast augmentation surgery breast implant surgery boob job surgery
Breast Implant Removal	breast implant removal breast implant removal surgery breast explantation
Breast Reduction	breast reduction breast reduction surgery
Brow Lift	brow lift forehead lift
Buccal Fat Removal	buccal fat removal facial fat transfer facial fat grafting buccal fat surgery
Butt Lift	butt lift Brazilian butt lift gluteal injection butt injection butt implant(s) butt fat transfer butt fat transfer butt lift surgery

Calf Augmentation	calf augmentation calf implant(s)
Hair Transplantation	hair transplantation hair restoration hair transplant hair transplant surgery
Lip Augmentation	lip injection lip filler(s) lip augmentation lip surgery lip enhancement lip augmentation surgery
Lip Reduction	lip reduction lip reduction surgery
Lower Body Lift	lower body lift body lift body lift surgery lower body lift surgery
Malar Augmentation	cheek implants malar augmentation cheek implant cheek implant surgery
Male Breast Reduction	male breast reduction gynecomastia surgery male breast reduction surgery
Mastopexy	breast lift boob job mastopexy breast enhancement
Mentoplasty	mentoplasty chin lift chin filler chin augmentation chin lift surgery
Otoplasty	otoplasty ear lift ear lobe repair ear surgery
Pectoral Implant	pectoral implant

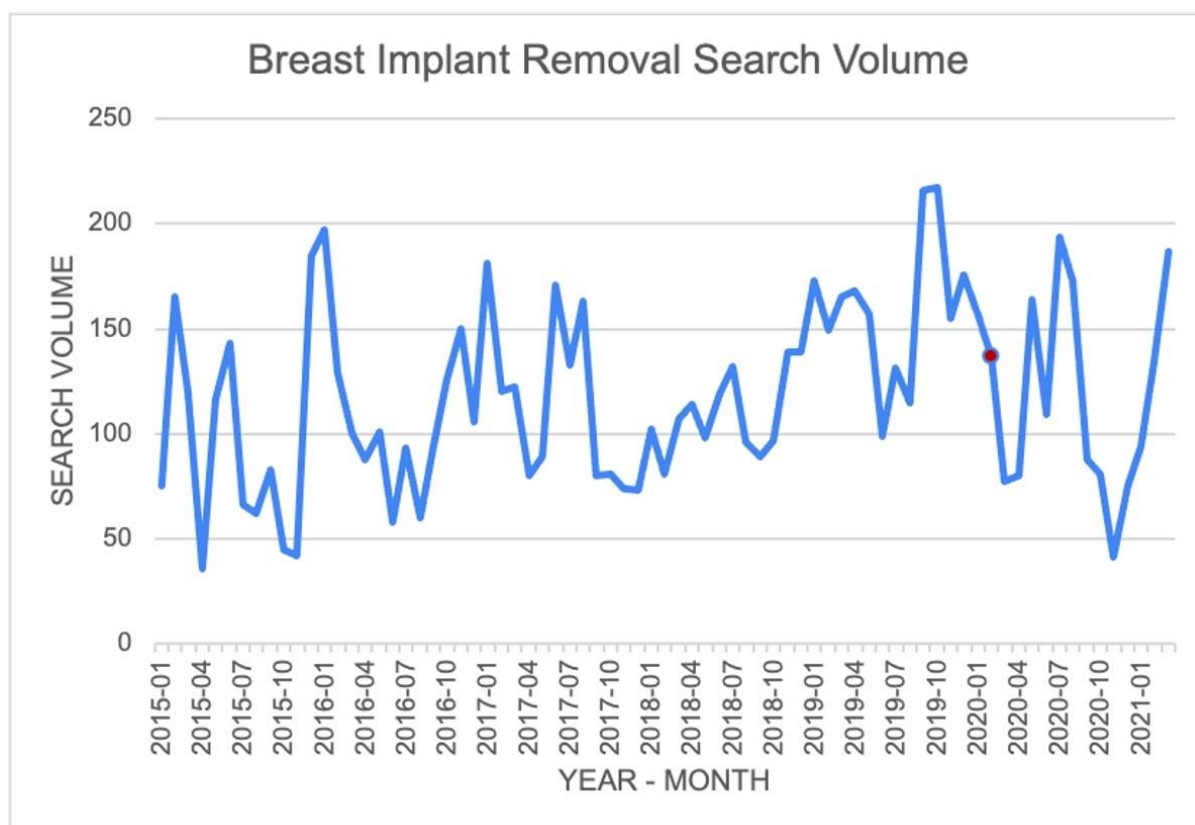
	pec implants pec surgery pectoral implants
Platysmaplasty	platysmaplasty neck lift neck lift surgery
Rhinoplasty	nose job rhinoplasty rhinoplasty surgery
Rhytidectomy	rhytidectomy facelift facelift surgery
Thighplasty	thigh lift thighplasty thigh lift surgery

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**Table 2.** Bivariate Regression Results for Cosmetic Surgical Procedures

Procedure	Coefficient	Standard error	z-score	P >  z	[95% confidence interval]
Abdominoplasty	0.237	0.165	1.44	0.151	(-0.086, 0.560)
Blepharoplasty	0.579	0.143	4.05	0.000	(0.299, 0.860)
Botox	0.861	0.093	9.30	0.000	(0.680, 1.043)
Brachioplasty	1.247	0.206	6.07	0.000	(0.844, 1.650)
Breast Augmentation	0.005	0.285	0.02	0.986	(-0.553, 0.563)
Breast Implant Removal	0.536	0.226	2.37	0.018	(0.093, 0.978)
Breast Reduction	0.704	0.105	6.67	0.000	(0.497, 0.910)
Brow Lift	1.071	0.110	9.78	0.000	(0.856, 1.286)
Buccal Fat Removal	1.889	0.214	8.83	0.000	(1.469, 2.307)
Butt Lift	-2.352	0.304	-7.74	0.000	(-2.948, -1.757)
Calf Augmentation	-0.180	0.242	-0.74	0.456	(-0.655, 0.294)
Hair Transplantation	0.554	0.140	3.96	0.000	(0.280, 0.830)
Lip Augmentation	1.519	0.239	6.36	0.000	(1.051, 1.986)
Lip Reduction	0.055	0.173	0.32	0.749	(-0.284, 0.394)
Lower Body Lift	0.079	0.250	0.31	0.745	(-0.412, 0.570)
Malar Augmentation	-0.201	0.252	-0.80	0.423	(-0.696, 0.292)
Male Breast Reduction	-0.056	0.208	0.27	0.786	(-0.351, 0.464)
Mastopexy	-1.028	0.161	-6.36	0.000	(-1.344, -0.171)
Mentoplasty	1.547	0.205	7.53	0.000	(1.144, 1.950)
Otoplasty	1.183	0.190	6.22	0.000	(0.810, 1.556)
Pectoral Implant	-0.253	0.223	-1.13	0.257	(-0.691, 0.184)
Platysmaplasty	0.871	0.187	4.66	0.000	(0.504, 1.237)
Rhinoplasty	0.595	0.132	4.50	0.000	(0.336, 0.855)
Rhytidectomy	0.050	0.166	0.30	0.761	(-0.274, 0.375)
Thighplasty	0.949	0.244	3.88	0.000	(0.470, 1.427)

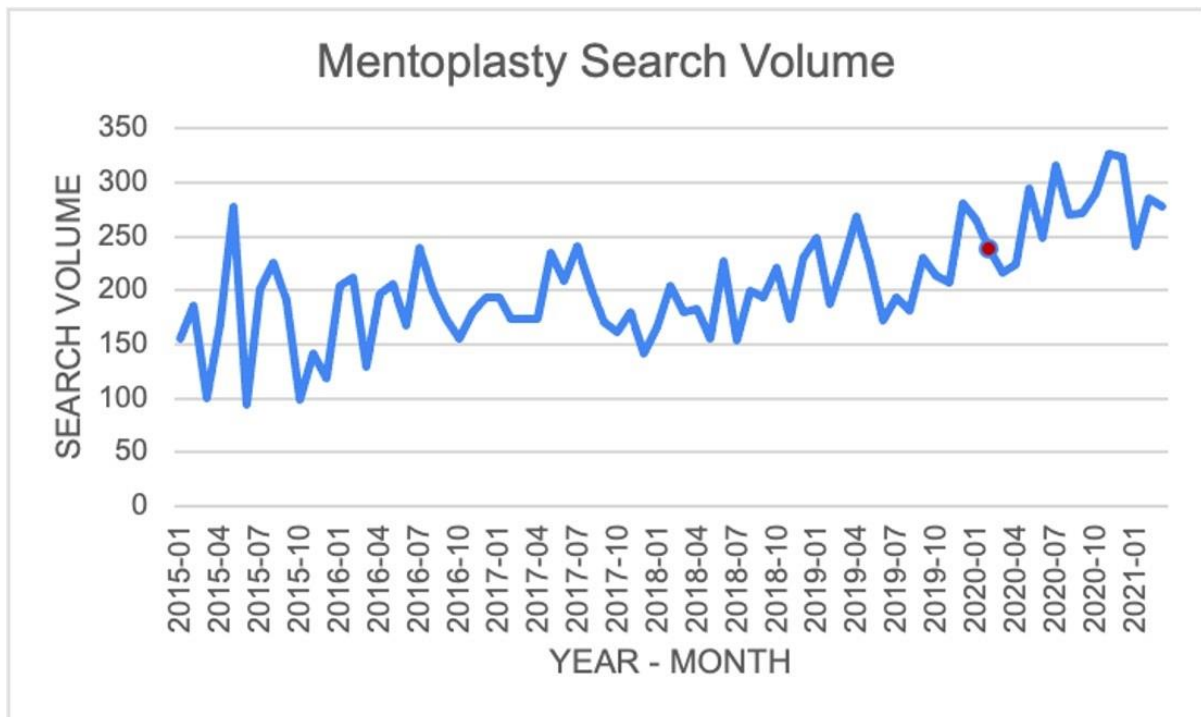
Figure 1



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Figure 2



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