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Content Analysis of #Brokeninstrumentmanagement Related Posts on Instagram: Cross-Sectional Research

Instagram'da #Kırıkaletyönetimi ile İlgili Gönderilerin İçerik Analizi: Kesitsel Araştırma

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ABSTRACT Objective: To make a detailed content analysis of the management of broken instruments, which is an attractive and challenging topic on Instagram. **Material and Methods:** Instagram was searched using "#brokenfile", "#brokeninstrument" and "brokenfileremoval". After duplicates and unrelated posts were excluded, 818 posts were evaluated regarding the type of post, country, language, publication year, tooth number, location of the broken instrument, management method, presence of magnification, presence of follow-up, publisher, sharing purpose, number of likes, comments, and views. Videos were rated using the Global Quality Scale (GQS) and Confidence Score (CS). **Results:** The majority of the posts were photographs (86.5%), written in English (65.5%), and shared in 2020-2021 (65.6%). The broken instruments were in mandibular molars (49.9%) and located in the apical part (40.5%) mainly. The removal of broken instruments was the preferred management strategy (83.3%). 37.6% of the selected posts reported the use of the dental operating microscope. Clinicians tend to share posts to demonstrate their experience. The GQS and CS values in the posts where the clinicians' experiences were shared were significantly higher compared to other sharing purposes ($p<0.05$). There was no statistically significant difference between publisher types in terms of GQS, CS, and the number of visualizations of the videos ($p>0.05$). **Conclusion:** Instagram is a frequently used social media platform that allows the sharing of variable quality information and experiences about broken instrument management. Thus, the contents of shared posts are needed to be reliable and accurate since they may guide clinicians and patients.

Keywords: Dental instrument; endodontics; internet

ÖZET Amaç: Bu çalışmanın amacı, diş hekimliğinde ilgi çekici ve zorlu bir konu olarak kırık alet yönetimi hakkında İnstagram'da paylaşılan gönderilerin detaylı içerik analizini yapmaktır. **Gereç ve Yöntemler:** İnstagram'da "#brokenfile", "#brokeninstrument" ve "#brokenfileremoval" etiketleri kullanılarak detaylı bir arama yapılmıştır. Birden fazla yüklenen ve konu ile ilgili olmayan gönderiler çıkarıldıktan sonra 818 gönderi analiz edilmiştir. Yapılan analiz kapsamında; gönderi türü, ülke, dil, yayın yılı, diş numarası, kırık aletin konumu, yönetimi, büyütme varlığı, takip durumu, yayıncı, paylaşım amacı, beğeni, yorum ve görüntülenme sayısı gibi değişkenler incelenmiştir. Videolar, Küresel Kalite Ölçeği [Global Quality Scale (GQS)] ve Güven Skoru [Confidence Score (CS)] kullanılarak derecelendirilmiştir. **Bulgular:** Gönderilerin büyük bir kısmı fotoğraf (%86,5) ve İngilizce (%65,5) olarak ve çoğunlukla 2020-2021 yıllarında (%65,6) yayımlanmıştır. Kırık alet varlığı çoğunluğu mandibular molarlarda (%49,9) ve genellikle apikal bölgede (%40,5) olacak şekilde saptanmıştır. Kırık alet yönetiminde başlıca yönetim planı, aletin uzaklaştırılması olmuştur (%83,3). Seçilen gönderilerin %37,6'sında dental operasyon mikroskobu kullanımı rapor edilmiştir. Klinik uzmanlar, deneyimlerini sergilemek amacıyla paylaşım yapma eğilimindedir. Deneyimlerin paylaşıldığı gönderilerde GQS ve CS değerleri diğer paylaşım amaçlarına göre anlamlı derecede yüksek bulunmuştur ($p<0,05$). Yayıncı türleri arasında GQS, CS ve videoların görüntülenme sayıları açısından istatistiksel olarak anlamlı bir fark bulunmamıştır ($p>0,05$). **Sonuç:** İnstagram, kırık alet yönetimi hakkında değişken kalitede bilgi ve deneyimlerin paylaşılmasına olanak tanıyan, sıkça kullanılan bir sosyal medya platformudur. Bu nedenle, paylaşılan gönderilerin içeriklerinin güvenilir ve doğru olması, klinisyenlere ve hastalara yol gösterici olması kapsamında, gerekmektedir.

Anahtar Kelimeler: Dental alet; endodonti; internet

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The internet is a worldwide system of computer networks that aims to allow users to communicate across large or small distances, share information from any place around the world, and access information or answers to any question in moments.[1] Following the development of social media platforms, which can be considered a very practical innovation in terms of visualization and sharing, the use of the internet has been increasing day by day.[2,3]

Dentistry is a profession that aims to develop treatment methods based on scientific data for the increasing functional and visual demands of patients.[4] As well as in other fields, the cumulative usage of the Internet assists in getting related information in dentistry. It is a fact that accessibility to dental treatment differs among patients all around the world. Therefore, getting medical information easily and quickly through social media platforms has become more desirable.[5] Social media is defined as a collection of platforms that enable individuals to create and share information and ideas in virtual communities and networks.[5] Using social media platforms such as Facebook (Meta Platforms, Inc., USA), YouTube (Google LLC., USA), Instagram (Meta Platforms, Inc., USA), X (X Corp., USA) to reach medical information is commonly preferred in this era and most likely will be more outstanding in the foreseeable future.[6] However, the increasing use of these platforms also necessitates the evaluation of their global efficiencies.

Instagram (www.instagram.com), is one of the visual and auditory social media platforms, was initially launched in 2010 and rapidly gained popularity.[7] The application allows users to upload media, edit it with filters, and share it publicly or with preapproved followers. The content of the post can be organized by hashtags in order to make them put forward and attract like-minded Instagram users. Photos, videos, or reels can be viewed regarding the "most popular" or "most recent" related to the selected hashtag. The desirable features of Instagram have allowed dental practitioners to use this platform to share information or cases, inform patients, or advertise.

The broken endodontic instrument is challenging for clinicians during root canal treatment since it prohibits performing chemomechanical debridement effectively.[8] Therefore, removing the broken fragment or bypassing it should be the main treatment strategy in order to obtain successful outcomes.[9] Several devices and techniques have been developed for the removal of broken instruments from root canal space and these were experienced by clinicians.[10-12] In this regard, clinicians, dental clinics, and dental companies have begun to share posts related to broken instrument removal on Instagram along with widespread usage of this platform in endodontics. Most of them share their personal experience with using different techniques and equipment and a lot of people rely on these posts to get information easily and quickly, along with obtaining guidance and support.[13,14] However, shared photos or videos may not always accurately demonstrate treatment protocols.[15] Additionally, poor scientific content along with posts could raise a question mark about the reliability of used materials and methods. Due to the fact that social media has the power to modify both clinicians' and patients' ways of thinking, it is important to evaluate the quality of related information.

Compared to other social media platforms such as YouTube, there is a lack of investigation in the evaluation of Instagram content in endodontics as well as other specialties in dentistry.[15,16] Although several studies have been conducted in endodontics to assess the reliability and information quality of social media platforms, interestingly, to our knowledge, no study has been performed to assess the quality of endodontic-related information on Instagram.[17,18] Since broken instrument removal is an influential topic that stands out on many platforms, related content is also needs to be investigated on Instagram. Thus, this study aimed to assess the posts shared publicly with the #brokenfile, #brokeninstrument, and #brokenfileremoval hashtags on Instagram.

MATERIAL AND METHODS

This study was performed without the ethical approval of the institutional review board since only publicly available data were used, and any material collected from humans or animals was not assessed. The study was conducted in accordance with the Declaration of Helsinki. Since only publicly available data was used and any material from human was not

collected, informed consent is not requiered. Before conducting the search strategy, various related hashtags were checked in order to obtain more relevant input. As a result of several reviews, it was decided to use #brokenfile, #brokeninstrument, and #brokenfileremoval hashtags as they provided the most comprehensive data. Subsequently, Instagram (www.instagram.com) was accessed on December 04, 2022. All data were collected and recorded manually within one week by two independent researchers (Sıla Nur Usta and Zeliha Uğur Aydın).

Posts with insufficient information about the broken instrument, surgical procedures applied in instrument removal, seminar or congress posters, and publishers that hide the number of likes and comments were excluded from the study. After irrelevant and duplicated posts were excluded, obtained posts were characterized in terms, as follows: type of post (photograph and video), country, language (English, Turkish, and others), publication year, tooth number, location of the broken instrument (coronal, middle, and apical), management method (bypass and removal), presence of magnification [loupe and dental operating microscope (DOM)], presence of follow-up, publisher (clinician, dental clinic, and company including general dentistry pages), sharing purpose (advertising, experience, information), number of likes, number of comments, and number of views (for videos). Posts that contain both video and photo were characterized as photos since it is impossible to determine the number of views of the video. Moreover, if the information under the post was written in English and another language, the selected language was considered only English. Posts that did not indicate any follow-up period were recorded as "no follow-up" and did not report any use of magnification was categorized as "no available information".

Assessment of the quality of the videos was rated by The Global Quality Scale (GQS). The GQS for videos can be applied across a range of fields where visual and instructional quality is important, including healthcare, technical training, and academic subjects to evaluate the content, production quality, and instructional value of videos in a structured way. The GQS for videos typically uses a 5-point scale to rate different aspects of the video, including visual clarity, audio quality, engagement, and educational content. Additionally, the content was also scored between 1-5 [Confidence Score (CS)] for accuracy and reliability.[2] This score helps viewers, educators, and professionals evaluate whether the video content can be relied upon to deliver accurate, well-researched, and evidence-based information. The CS is especially relevant in fields like healthcare, dentistry, science, and education, where precision and factual correctness are critical. All assessments and scoring were carried out by 2 researchers independently (Sıla Nur Usta and Zeliha Uğur Aydın). Different results were discussed until a consensus was reached. By following this process, it was ensured that all perspectives were considered and that the final decision was well-informed, transparent, and mutually agreed upon.

STATISTICAL ANALYSIS

All statistical analyses were performed using SPSS (IBM SPSS Inc., Chicago, IL) version 26. The Cohen's kappa coefficient was used to measure the reliability of comparative agreement between 2 evaluators. Descriptive statistics were calculated to identify the overall characteristics of the photographs and videos. The Shapiro-Wilk test was performed to check the normality. The Kruskal-Wallis test was used to compare the number of visualization, GQS, and CS among publishers and the sharing purposes. When the results were statistically significant, the Mann-Whitney U test was used for pair-by-pair comparisons. The significance level was set at $p<0.05$.

RESULTS

The Cohen kappa value was calculated as 0.931 for inter-examiner agreement. A total of 5,290 posts were retrieved after searching the #brokenfile (n=1,813), #brokeninstrument (n=1,284), and #brokenfileremoval (n=2,193) hashtags on Instagram. After removing duplicates and unrelated ones with the topic, 818 posts regarding photographs (n=708) and videos (n=110) were evaluated. Selected posts were published between July 17, 2014-November 15, 2022.

It was found that Russia (n=152) was the country with the highest number of shared posts in terms of the management of broken instruments, followed by Türkiye (n=79). Countries with at least 20 posts

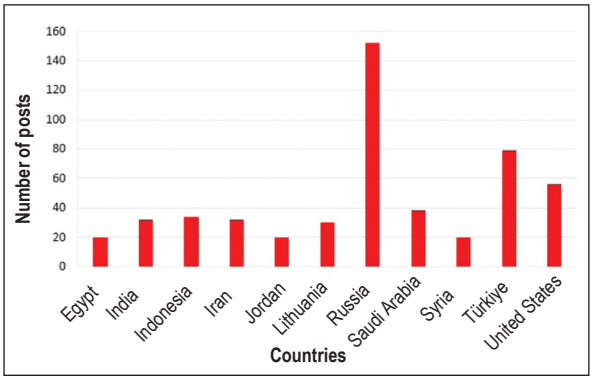

FIGURE 1: Contributed countries with at least 20 shared posts

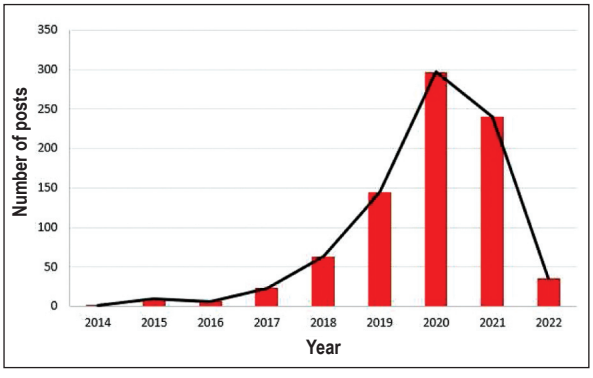

FIGURE 2: Number of shared posts according to years

are shown in Figure 1. The contents under the shared posts were written mainly in English (n=536), followed by Turkish (n=33) and other languages (n=249). The majority of the posts were shared in 2020-2021. Figure 2 shows the number of published posts based on years.

Half of the instrument breakage (49.9%) was observed in the mandibular molar teeth (4.6=140, 4.7=75, 3.6=136, 3.7=38, and 3.8=1) and 28.5% of them were maxillary molars (2.6=65, 2.7=51, 1.6=85, and 1.7=22). The frequencies of instrument breakage in terms of maxillary incisors, maxillary premolars, mandibular incisors, and mandibular premolars were 8.5%, 1.6%, 8.5%, and 3%, respectively.

According to the assessed posts, the location of the broken instruments was mainly in the apical part (n=317), followed by the middle (n=307) and coronal (n=157) parts of the root canal system. Regarding broken instrument management, 83.3% of those instruments were removed (n=651) and the rest were bypassed (n=130). Management methods in terms of the position of the instrument are demonstrated in Table 1. Furthermore, in the vast majority of shared posts, there was a lack of information about whether magnification was used. Only 37.6% of the selected posts reported the use of magnification and in all those posts, DOM was used to improve visualization.

Among cases in shared posts, 3.8% of them were followed up from 3 to 120 months. Clinicians (n=738) have published a larger number of posts, followed by dental clinics (n=33) and companies (n=47). There was not a statistically significant difference between publisher types in terms of GQS, CS, and the number of visualization of the videos ($p>0.05$). Moreover, regarding the sharing purposes of the publishers, exhibiting clinical experience (n=780) was the main trend, followed by advertising (n=30) and ensuring information (n=8). The GQS and CS values in the posts where the clinicians' experiences were shared were found to be significantly higher compared to other sharing purposes ($p<0.05$).

Broken file-related posts obtained a total of 112,877 likes (0-1,817) and 4,866 comments (0-94). Furthermore, videos were visualized 315,231 times (22-85,090) in total. It was observed that the number of the visualization did not significantly differ be-

TABLE 1: Number and the percentage (%) of the removed and bypassed broken instruments regarding the location

	Coronal	Middle	Apical	Total
Remove	153 (97%)	273 (89%)	225 (79%)	651 (83.4%)
Bypass	4 (3%)	34 (11%)	92 (29%)	130 (16.6%)
Total	157	307	317	781

TABLE 2: The comparison of the number of visualization, the GQS, and CS values of the videos related to broken instrument management with publisher type

	Clinician	Dental clinic	Company	p value
Number of visualization*	3,102.06	705	1,601.31	0.711
GQS*	3.35	2.5	3	0.236
CS*	3.61	2.5	3.23	0.136

*Mean values. GQS: Global Quality Scale; CS: Confidence score

TABLE 3: The comparison of the number of visualization, the GQS, and CS values of the videos related to broken file management with the sharing purpose.

	Experience	Advertising	Information	p value
Number of visualization*	2759.63	2886.47	4765.75	0.444
GQS*	3.42[a]	1.85[b]	2.25[b]	0.003
CS*	3.72[x]	1.86[y]	1.75[y]	0.000

*Mean values. Read horizontally. Different superscript lowercase letters (a,b,x,y) in the same row indicate a statistically significant difference. GQS: Global Quality Scale; CS: Confidence score

tween publishers and sharing purposes (p>0.05). The comparisons of the number of visualization, the GQS and CS values with publisher type, and the sharing purpose are represented in Table 2 and Table 3, respectively.

DISCUSSION

Nowadays, developments in technology lead to the obtaining and transfer of information via the internet commonly. Especially in dentistry applications, using visual tools such as photographs and videos to show the treatment steps and results has made social media platforms more popular. Similarly, in the field of endodontics, various videos, photographs, and dental x-rays of endodontic treatments are widely shared by clinicians and dental clinics for reasons such as information transfer, advertising, or promotion on social media. However, the content and quality of the shared data are important since they may have an impact on the perspective of both clinicians and patients toward endodontic applications, and therefore, they need to be investigated. Especially some critical views such as the risk of misleading information, professionalism concerns, privacy issues, and time management should be highlighted during the assessment of social media concerns.

Management of broken instruments in endodontics is challenging and requires experience for clinicians.[19] It has been reported that an increase in the incidence of broken instruments has been observed in endodontic treatments, especially following the introduction of nickel-titanium instruments.[20,21] Although many techniques and equipment have been discovered to remove or bypass broken instruments, which are very difficult to manage clinically, an adequate methodology that can overcome this difficulty has not been developed yet.[9,22] In this context, the application of different techniques related to the management of broken instruments and sharing the results on social media is an attractive topic for clinicians who do not have sufficient experience. Moreover, the shared posts on social media can appeal to a wide community, as they allow patients to have an opinion about the treatment procedure and the clinician himself. In this regard, Instagram has become one of the most frequently used platforms for clinicians to share their cases and experiences with other clinicians and patients and show their abilities. In line with the above-mentioned information, this study aimed to make a detailed analysis of the parameters such as tooth type, localization of the broken instrument, methods, and equipment used in the treatment, presence of follow-up and magnification, the purpose of sharing, type of account, and interaction rate regarding the management of broken instruments.

It was found that the majority of the posts included in this study were published in 2020-2021. The increasing percentage of the use of social media in recent years has led clinicians to be active on this platform. Another important point on the basis of these years is that clinicians could not transfer information face-to-face and share their experiences by organizing courses due to the coronavirus pandemic. This extraordinary situation also might have led them to use Instagram for the management of broken instruments more frequently.

The literature has reported that instrument breakage is higher in molars, especially in the mesial canals of mandibular molars and mesiobuccal canals of maxillary molars, compared to anterior and premolar teeth.[23,24] The higher incidence of instrument breakage in molars can be explained by complex anatomical factors such as accessibility to the root canal system, the diameter of the root canal, and the degree of curvature of the root canals.[25] In the included posts, it was also found that the broken instruments were mainly in the mandibular molars, followed by maxillary molars in line with the literature. The frequent instrument breakage, especially in the mandibular molars, might have been observed due to root curva-

tures that are not noticed on the dental x-ray but are likely to be positioned proximal direction.[26] In the shared posts, it can be concluded that there is a positive correlation between the incidence of broken instruments and the difficulty of anatomical variations in the root canal system of the related teeth, and therefore, mandibular and maxillary molars are more prone to anatomical complications.[27,28]

The localization of the broken instrument is another factor affecting the method and success of the endodontic treatment. It has been indicated that endodontic instruments tend to break in the apical part more often.[29,30] This can be explained by the fact that the narrow canal diameter, the inability to lubricate this part via insufficient irrigant delivery, increased torsional or cyclic fatigues of endodontic instruments, and canal curvatures.[31] Consistent with this information, it was also found that the broken instruments were generally in the apical part in shared posts. Furthermore, the management of the broken instruments in the apical part is more difficult than in the middle and coronal parts of the root canal system for the above-mentioned reasons.[32,33] Although it was found that the majority of the broken instruments located in the apical part were removed, the removal rate was less than in the middle and coronal parts. However, the number of posts where the broken instruments in the apical part could not be removed or bypassed on Instagram was very low. Thus, it is difficult to determine the success rate in the management of the instruments in this region.

Visibility and accessibility of the broken instrument are two important key factors for successful treatment. It has been noted that removing or bypassing a broken instrument with an ultrasonic device under a DOM or loupe is an effective and relatively safe method.[32] In this regard, the use of DOM has been reported as more beneficial than dental loupes in cases that require a high degree of sensibility.[34] Interestingly, more than half of the posts included in the study did not declare any information about the use of magnification, and DOM was used in all shared posts reporting the use of magnification. However, in most of the shared posts, it can be concluded that magnification might have been used even if it was not specified, since the broken instruments were located in the middle and apical parts where management is difficult. Especially in photographs, the use of equipment and methods was not demonstrated adequately. Thus, it is considered that this kind of missing information may reduce the scientific value of the shared post and cause conflicting results.

Another interesting point is that only 3.8% of the shared posts have been followed up after treatment. Although the removal or bypass of the broken instrument is necessary for the complete disinfection of the root canal system, how the applied methods during the treatment process affect the tooth integrity is an issue that should be evaluated regarding the survival of the teeth. It has been reported that the methods used for instrument removal inevitably result in a certain amount of dentin loss which may increase the risk of root fracture.[35] Therefore, although successful results have been shown after the removal or bypass of broken instruments in shared posts, it is still unclear which treatment method increases the long-term survival of the tooth. Follow-ups with dental X-rays are crucial feedback for both clinicians and patients, so the lower rate of follow-up percentage observed in this study could be highlighted as an important limitation.

In this study, it was found that the majority of the posts were shared for demonstrating experience by clinicians, and the below information was written in the English language. In this regard, Instagram can be considered a platform that allows clinicians to be self-realized as well as provides information transfer. Moreover, the reason for writing in English can be to reach out to a larger population through this language since English is one of the most spoken in the world. Moreover, the study identified Russia and Türkiye as the countries with the highest number of shared posts. Reasons such as cultural differences, political and regulatory factors, technological infrastructure and access, and social media usage patterns might influence the quality of shared content warrant further discussion. These variations can have a significant impact on the quality and accuracy of shared information, as regional preferences and access to resources may affect the content creation process.

The GQS and CS values of the videos in which the clinical experience was shared were significantly higher than other sharing purposes. In these videos,

the reflection of the used technique and equipment more clearly and the full-time display of the broken instrument removal might have increased the quality, accuracy, and reliability of the content. In addition to this, the number of visualization and the GQS and CS values did not differ among the type of publisher. This can be explained by the fact that publishers tend to share in line with their main purposes and similar to other posts.

Several limitations should be considered when interpreting the findings of this study. First, the review of shared posts was conducted over a one-week period, which may have led to variations in the number of likes, comments, and views across posts, potentially affecting the data's consistency. Additionally, the search strategy focused on only the 3 most commonly used hashtags, which may not encompass all relevant posts on the topic. This raises the possibility that certain posts, particularly those from users who did not utilize hashtags or who employed less common ones, may have been overlooked. Furthermore, posts on Instagram can be edited or altered by the publishers after being uploaded, which could impact the reliability of the content, especially in terms of the accuracy of information regarding broken instrument management. These changes might result in discrepancies between the originally posted content and its current form. In addition, sharing patient photos or case studies on Instagram, even with consent, raises ethical and privacy concerns. Thus, while Instagram posts provide valuable visual data on broken instrument management, they may not always offer the level of detail or reliability necessary for drawing definitive conclusions. To obtain more comprehensive and scientifically sound information, consulting peer-reviewed articles and clinical studies would be more advantageous.

CONCLUSION

Instagram is a frequently used social media platform that allows the sharing of variable quality information and experiences about broken instrument management to clinicians and patients. Based on the present limitations of this study, the contents with a clear and transparent methodology could guide practitioners in adopting best practices and avoiding common pitfalls, while long-term follow-ups could shed light on the effectiveness and potential complications of various treatment strategies. This can bridge the gap between social media content and evidence-based clinical practice, fostering safer and more effective management of broken instruments in endodontic procedures.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Sıla Nur Usta, Zeliha Uğur Aydın;* ***Design:*** *Sıla Nur Usta, Zeliha Uğur Aydın;* ***Control/Supervision:*** *Sıla Nur Usta, Zeliha Uğur Aydın;* ***Data Collection and/or Processing:*** *Sıla Nur Usta;* ***Analysis and/or Interpretation:*** *Sıla Nur Usta;* ***Literature Review:*** *Sıla Nur Usta;* ***Writing the Article:*** *Sıla Nur Usta;* ***Critical Review:*** *Zeliha Uğur Aydın;* ***References and Fundings:*** *Sıla Nur Usta, Zeliha Uğur Aydın.*

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