

REVIEW ARTICLE



Toothbrush, its Design and Modifications : An Overview

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Abstract

Tooth brush has been an integral part of a daily routine across many cultures around the world from the times of antiquity to the 21st century. Over the years, several types of toothbrush has been invented. Some of the them are useful for physically and mentally handicapped children The aim of this review article is to describe toothbrush design and various modifications that have been made in the several years.

Keywords: Bristle,Cleaning, Head,Toothbrush



1 | INTRODUCTION

Effective plaque control facilitates good gingival and periodontal health, prevents tooth decay and preserves oral health for lifetime. (1) The various methods commonly used for plaque removal include chemical and mechanical methods. Among the various mechanical aids available toothbrushing is the primary and most widely accepted method of plaque removal. (2) Toothbrushing carried out with effective technique and for adequate duration of time has been found to be highly effective measure of plaque control. The design of a toothbrush especially with regard to its size and contour should be such that it aids in mechanical removal of plaque. The efficacy depends on types,

design of brush, method of brushing, time taken and also on supervision in care of small children. (3) Over its long history, the toothbrush has evolved to become a scientifically designed tool using modern ergonomic designs and safe and hygienic materials that benefit us all. (4) Due to variety of brushes currently available and constant development of new

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brushes, the dental professional must maintain a high level of knowledge of these products and advise the patients appropriately. (5) Hence this review article emphasizes on tooth brush designs.

2 | DISCUSSION

Among the various mechanical aids available, Toothbrushing is the primary and most widely accepted method of plaque removal (Loe 1979). (6) Various tooth brushing methods have been advocated. Each has been designed for specific need of patient as dental and periodontal conditions. The basic fundamentals have not changed since the times of the Egyptians and Babylonians which includes a handle to grip, and a bristle-like feature to clean the teeth. Using modern ergonomic designs and safe and hygienic materials, toothbrush has evolved to become a scientifically designed tool that benefit all of us during its long history. (7)

Types of toothbrushes (8)

- (a) Manual Toothbrush
- (b) Powered Toothbrush
- c) Superbrush
- d) Single-tuft toothbrush
- e) Interdental brush
- f) Sulca toothbrush
- g) Ecological toothbrushes
- h) chewable toothbrushes.

New age toothbrushes

- sonic toothbrush
- ionic
- disposable toothbrush

Desirable Characteristics of a toothbrush (Wilkins 1983) (9)

- 1) Conforms to individual's requirements in size, shape and texture.
- 2) Be easily and efficiently manipulated.
- 3) Be readily cleaned and aerated, impervious to moisture.
- 4) Be durable and inexpensive.

5) Have prime functional property of flexibility, softness and diameter of bristles or filaments and strength, rigidity and lightness in the handle.

6) Be designed for utility, efficiency and cleanliness.

I) Conventional or manual toothbrush design

The ideal toothbrush design is specified as being user-friendly, removes plaque effectively and has no deleterious soft tissue or hard tissue effects. (9) Conventional manual tooth brush design mainly consists of (10)

Head, bristles and handle.

ADA specifications for acceptable toothbrush are (11)

- 1) Brushing surface- Length : 1-1.25 inches and 5/16-3/8 inches wide
- 2) Surface area : 2.54-3.2cm
- 3) Number of rows : 2-4 rows of bristles
- 4) Number of tufts : 5-12 tufts per row
- 5) Number of bristles : 80-85 bristles per tuft

1) Head: It is designed for effective cleansing of every tooth surface. Each brush head, is divided into 2 parts: the toe, located at the extreme end of the head, and the heel end closest to the handle. (12) Toothbrush heads are composed of tufts, which are individual bundles of filaments secured in a hole in the toothbrush head. (5) Filaments within the tufts are known as bristles.

Toothbrush heads usually comes in different (8) shapes and sizes.

a) Shapes : There are variety of shapes such as rectangular, oblong, oval, almost round and diamond shape.

Every tooth surface can be cleaned effectively with the conventional toothbrush head designs. Diamond shaped toothbrush is convenient for posterior teeth cleaning as its head is narrower than conventional. Round head/oblong shaped head is easier to guide around brackets and wires. (5)

b) Size : There are usually three types of head size: medium, large and small. The size of head is usually chosen based on size of the individual's mouth.¹³ For adults, large or medium sized heads would be sufficient. Small size heads are recommended for children as their teeth and mouth are generally smaller. (5)

Based on the size of oral cavity, different sizes of heads are available according to the age. (7)

0-2 years : Brush head size should be approximately the diameter of a Hong Kong 10- cent coin (~15mm)

2-6 years

Brush head size should be approximately the diameter of a Hong Kong 20 – cent coin (~19mm)

6-12 years

Brush head size should be approximately the diameter of a Hong Kong 50 – cent coin (~22mm)

12 years and above

Brush head size should be approximately the diameter of a Hong Kong one dollar coin (~25mm)

Latest toothbrush heads are flexible. The head is splitted into two parts and join together by a rubber portion, so that it bends and curves to follow the curvature of our teeth as we brush. It also helps us to access places which are hard to reach. (13)

2) Bristles : Toothbrush heads are composed of tufts, which are individual bundles of filaments secured in a hole in the toothbrush head. Filaments within the tufts are known as bristles. (14) Bristles are vital because they directly contact the teeth and gum tissue. (15)

Bristles usually varies in (16)

a) Texture

b) Number and length of the filaments in a tuft

c) number of tufts

d) arrangement of tufts

e) brushing plane that may be flat with all filaments the same length, bilevel, multilevel, rippled or crisscrossed with tufts angled in at least 2 different directions.

ADA Specification for bristle (17)

2 - 4 rows of bristles

5 -12 tufts per row

80-86 bristles per tuft

Diameter of commonly used bristles are :

Soft = 0.007 inch (0.2mm)

Medium = 0.012 inch (0.3mm)

Hard = 0.014 inch (0.4mm)

Bristle type : Toothbrush bristles ranges from very soft to soft in texture, although harder bristle versions are available. (4) Soft bristle toothbrush are preferred because, Firstly, many people don't follow a proper technique of toothbrushing, also hard toothbrush bristles cause abrasion of the surface and tend to remove the surface enamel of the tooth. Secondly the gingival damage by hard bristles pull it down towards to root, which leads to sensitivity of the teeth while drinking cold liquids, even water. (17)

Pattern (14)

The different bristle designs include flat trim, multi-level, wavy design, zigzag design etc. The firmness of a bristle depends on three factors i.e. Materials, diameter and length.

Bristle Shape

Toothbrush bristles with sharp edges (also known as burrs) are more destructive to oral tissues than end-rounded bristles. The soft-bristled brushes that are ADA approved are end-rounded. (5)

Bristle arrangement

Multitufted brushes usually offer assorted bristle sizes and shapes and are engineered for better cleaning. (5)

3) Handle : Handle is that part of the brush from where we hold the brush. The most recent toothbrush models include handles that are straight, angled, curved, and contoured with grips and with soft rubber areas to make them easier to hold, use and control. (4) The handle should provide a good grip to the hand. (17)

II) Powered toothbrush

Mechanical devices were patented in the mid- 19th century with the goal of addressing the limitations of manual toothbrushes. (18) Ritsert and Binns and Grossman and Proskin found that an electric toothbrush was more effective in removing plaque than a

manual toothbrush when used by children and adolescents (6) The power toothbrush as we recognize it today has its roots in prototypes first commercially available in the 1960's.

With the introduction of the Oral-B Plaque Remover 'D5' and its novel, prophylaxis-inspired oscillating-rotating mode of action, a major milestone in the development timeline of power toothbrushes occurred in 1991. With brush head being cup-shaped and end-rounded bristles which provides robust plaque removal with 5600 oscillations per minute, this was the first clinically proven power toothbrush technology which clean teeth better than a manual toothbrush. It also featured new compliance-enhancing features, including a two minute light timer to boost brushing frequency. (18)

In 2007, the Oral-B Triumph with Smart Guide was the first power toothbrush with clinically proven combined oscillating/rotating/pulsating technology, alongwith an innovative new wireless remote display feature (Smart Guide) for continuous visible brushing feedback.

Since their debut in the early 1990s, sonic power toothbrushes have continued to evolve. Oral-B introduced a new sonic power brush (Sonic Complete™) in 2004 followed by the Pulsonic™ in 2008, targeting consumers who favored sonic brushes but wanted a quieter, slimmer/lighter option with maximum cleaning performance. Most recently, DiamondClean™ by Philips boasts a redesigned handle and high-density, diamond-shaped bristles that should improve cleaning and whitening. (18)

Differences in Power Toothbrush Technologies (5, 7, 18)

Three variables which can distinguished commercially available power toothbrushes are : Brush head, Power source, Cleaning technology modality.

A) Power Source : All power toothbrushes marketed today are powered in one of two ways:

1) disposable battery-operated; or 2) rechargeable power source.

B) Cleaning Technology Modalities : Power toothbrushes can be categorized by the manner in which the brush head moves which differ in their cleaning technology mechanisms in addition to their power

source.

C) Brush Heads : The small, round brush head is designed to perfectly cup and wrap the tooth surface. Brush heads customized for specific patient desires/needs has been offered by sonic toothbrush manufacturers.

Basis for Professional Recommendation of Power Toothbrushes (19)

There are three key reasons why a power toothbrush is a wise choice.

1) Patient Compliance and Preference : Power toothbrushes overcome these barriers to maintain good oral hygiene through increased self-feedback and ease of use and have been shown to enhance motivation and compliance.

2) Clinical effectiveness : Many current-generation power toothbrushes have shown convincing evidence of efficacy in reducing plaque, gingivitis, stain and calculus in clinical research of varying study designs, lengths and patient populations.

3) Safety : The safety of modern power toothbrushes is not a matter of concern as it has been researched extensively.

The recommendation should be based on clinical effectiveness in plaque, gingivitis, stain, and calculus control and safety, with allowances for patient preference. (20, 21)

- Rechargeable brushes : Rechargeable brushes have many features which include, cost variation based on the extent of high-tech options to monitor safety, brushing time and ensurance of best brushing experience. Some models (e.g., Oral-B premium brushes).
- Oscillating-Rotating Brushes : An extensive independent review has also concluded that oscillating- rotating power toothbrushes have been shown to be as gentle on teeth and gums as a manual toothbrush.
- Multi-Directional Brushes : This brush was designed for patients who prefer a manual-like brushing experience, but still want better cleaning results than a regular manual or a leading sonic power technology.

- **Sonic Brushes :** Sonic toothbrushes are widely available, and recent clinical research has shown the effectiveness of sonic power technology in plaque, gingivitis and stain reduction.
- **Battery-Powered :** These brushes represent the lowest end of the cost spectrum and valued by those seeking a budget-friendly power brush option or who want to test the waters with power toothbrushes with a minimal cost investment.

General instructions for power toothbrushes include (5, 22)

- 1) Select brush with soft, end-rounded filaments and RDA range accepted dentifrice (<250 ADA recommended limit).
- 2) Patient is instructed to spread the dentifrice over several teeth before starting to brush to prevent splashing of the dentifrice.
- 3) Not turning the power brush on until the brush is in the oral cavity also reduces the spattering of toothpaste.
- 4) The patient should vary the brush position to reach each tooth surface, including the distal, facial, mesial and lingual surfaces. The angulation may need to be altered for access to malposition teeth. Be sure to instruct the patient to “feel” the toothbrush on all surfaces of the teeth. This will become second nature after a while, so the patient will not have to think about it. Toothbrush is placed with filaments pointing into the occlusal pits at a right angle for brushing the occlusal surfaces. The brush head is moved in a slight circular motion whereas the filaments are in the occlusal pits or can press moderately (not bending the bristles) so the filaments go straight into the pits and fissures. Sharp and quick strokes for the occlusal surfaces. To dislodge any loosened debris, the toothbrush should be lifted after each stroke.
- 5) With power toothbrush, tongue cleaning can also be done as it retards plaque formation and total plaque accumulation. For tongue cleaning, some toothbrushes have specific brush head design. With the tongue extruded, the brush head should be placed at a right angle to the midline of the tongue with the bristles pointing toward the throat. The sides of the filaments are drawn forward toward the tip

of the tongue. with light pressure. This should be repeated 3-4 times till the tongue surface is clean.

III) *Other different types of toothbrushes*

1. **Proxabrush :** The interdental brush is slender, so it is only effective over a small surface area per stroke. These shortcomings call for a specially designed brush, that can remove plaque, easily and efficiently, from the critical surfaces which bound residual ridges in the partially edentulous subject. These brushes are known as proxabrush. Its design facilitates access to proximal surfaces, even as far back as third molars. This brush has the advantage that it carries the head of the brush at right angles to the handle, and it is thus easy to apply to distal and mesial surfaces of posterior teeth. (6)
2. **Soladey-2 :** A new toothbrush called Soladey 2[®] has been recently introduced and is claimed to have better plaque removing potential than conventional toothbrushes due to a photo-electrochemical effect with incorporation of an N-type semiconductor of Titanium dioxide (TiO) at the neck of the brush. It is possible that the reported photocatalytic property of the semiconductor may be involved in some way in the observed reduction of plaque (Niwa & Fukuda 1989). (23)
3. **The traveler's toothbrush :** The current traveler's toothbrush includes a toothbrush that houses toothpaste in a cylindrical handle. It uses a mechanical device consisting of a twist knob attached to a string and rubber gasket. The redesigned toothbrush also includes toothpaste within its handle, but possess an ergonomically shaped handle allowing a comfortable grip while brushing. (24)
4. **HyG ionic toothbrush (Hukuba Dental) :** The HyG toothbrush has a 3-V lithium battery located under the metal band on the handle. The important ionic exchange, along with the normal mechanical action of the bristles on the tooth and gingival surfaces, may enhance

- plaque removal. Teeth are normally negatively charged and plaque is positively charged. Opposite charges attract and bond to each other. Plaque, therefore, is attached to the tooth surface by ionic bonding. (25)
5. Sulcus toothbrush: This has a narrow head with only two rows of bristles. This may help clients to overcome the 'gagging' reflex when cleaning the back teeth. It can also be used to clean gums and teeth in difficult or hard to reach area. Recently double-acting sulcus toothbrush having two double rows of relatively long sulcus bristles which are spaced from one another and mutually divergent at an angle of about 30° is introduced. The advantage of angled bristles is that at any position in the mouth, the upper and lower gum crevice may be cleansed simultaneously resulting in the reduction of brushing time by about half (26)
 6. Suction toothbrush : This was identified by nurse managers as a potential tool for managing daily dental plaque build up and oral secretions during a mouth care training session. Yet, its effectiveness had not been investigated in the research. (27)
 7. CBT: Collis Curve (Collis-Curve Inc., Minneapolis, Minnesota, USA) : It is a specially designed toothbrush with curved bristles on the lateral aspect of the brush head and short straight bristle. This uniquely designed toothbrush 'hugs' the teeth to clean three tooth surfaces and gum line all at the same time. (12)
 8. Finger brush (I-Brush) I-Brush (I-Brush, Tootec Gesellschaft für Dental produkt emb H, Tübingen, Germany) is a new approach in toothbrush design. It is a new manual brushing method for people to control the amount of plaque. It could also be used as possible adjunct to oral hygiene, particularly when the necessary facilities for toothbrushing with tooth paste are not available. It uses the agility and sensitivity of the finger. Consequently, it could permit a better control over the finger pressure because the finger can actually feel the tooth and gingival surfaces and help positioning the brush for more effective scrubbing. (4)
 9. Twist 'n' Brush : It is an innovative new toothbrush that rotates through 360 package. Twist 'n' Brush also makes it easier to brush the tongue and inner cheek areas— helping to remove the bacteria that causes bad breath. With its 360 degree rotation, the Twist 'n' Brush is perfect for cleaning your teeth, your mouth and your braces – by getting under wires where the brackets are stuck on to your teeth. (28)
 10. Double headed toothbrushes : The new double-headed toothbrush (Geminus Dental Prophylaxe GmbH, Wünlchingen, Germany) brush measured 14 mm long, 10 mm wide and contained 20 tufts, each with 90 bristles 8 mm long and 0.15 mm diameter. Studies have shown that double-headed toothbrushes were more effective in removing plaque in adults (Bay et al. 1967, Bastiaan 1984). (29)
 11. Musical toothbrushes : De La Rosa suggested that an average child removes only about 50% of the plaque present on teeth. This tooth brush consists of the handle that is available in different animal shape and also when we press the button the music will play for 3 min. When music starts, the child will start the brushing when the music stop the child will stop the brushing. (30)
 12. End-tufted group: End-tufted toothbrush (Kolyon end-tufted brush) used as a 'broom that would sweep the occlusal surface from inside out', i.e. from the centre of tooth towards to buccal and lingual surfaces. An end-tufted toothbrush was very effective in occlusal plaque removal in erupting mandibular first permanent molars. Kiche et al, 2002; Scheidegger and Lussi, 2005 found that an end-tufted toothbrush was very effective in occlusal plaque removal in erupting mandibular first permanent molars. (31)
 13. Chewable toothbrush : A chewable toothbrush is a miniature plastic moulded toothbrush which can be placed inside the mouth. They are useful

to travelers and are sometimes available, from bathroom vending machines. They are available in different flavors such as mint or bubblegum and should be disposed of after use. (32)

IV) Speciality toothbrushes (33)

Clinically proven products to meet the needs of patients undergoing more specialised care such as orthodontics, implants and periodontal surgery.

a) Orthodontic Toothbrush: The Orthodontic toothbrush has been developed for safe and effective brushing of teeth fitted with orthodontic appliances including braces, brackets, tubes and wires.

b) Post-Surgical Toothbrush: After oral surgery, it is important that patients keep their mouth clean, especially to help the wound heal uneventfully. The Post-Surgical toothbrush has been designed with those instructions in mind – to help keep the healing wound clean. The post-surgical toothbrush is highly effective in removing dental plaque and food debris near the healing wound and any sutures that kept the wound closed. These brushes are designed to be used until the surgical site is fully healed.

c) Denture Toothbrush : It is recommended for the daily care of removable dentures and acrylic retainers. The Denture brush consists of two differently configured brush heads: a flat bristled head for smooth surfaces and a single-tufted head for hard-to-reach areas. It is recommended that removable dentures and orthodontic retainers are brushed at least twice a day, especially after meals.

3 | SUMMARY & CONCLUSION

Plaque control is one of the key elements of practice of dentistry. Mechanical plaque removal with tooth brushes remains the primary method of maintaining good oral hygiene. Keeping in mind the main purpose of brushing, any toothbrush with a simple design following ADA specifications, that provides access to all areas of the mouth should be the suitable one, provided the patient uses proper brushing technique. It is certain that for a motivated, well-instructed person with the time and skill, mechanical plaque control measures are sufficient

to attain complete dental health. Toothbrushing and interproximal oral hygiene aids proves the optimal method of controlling plaque accumulation, whereas gingivitis can be prevented by daily toothbrushing. Powered toothbrushes are superior to their manual counterparts in their ability to remove plaque from the approximal areas but show equality on the flat or facial surfaces of the teeth. An oral hygiene training program has to be based on risk analysis and tailored to the individual needs by diagnosis, education and training, and needs-related oral hygiene.

REFERENCES

1. Aruna K, Rosaiah K, Muktishree M. Comparative evaluation of clinical efficacy of manual and powered tooth brush. Indian J Stomatol;2011;2(4),233-237.
2. Weijden GA, Timmerman MF, Danser MM, Piscoara M, Jzerman IY, Velden U. Approximal brush head used on a powered toothbrush. J Clin Periodontol 2005; 32: 317-22.
3. Ajmal Y, Nadia A, Manzoora AM, Rehana Y. Comparison of powered and manual Toothbrushes in removal of plaque. Pak Oral Dent J 2012;32(1): 120-123.
4. History of Toothbrushes.
5. Baruah K, Thumpala VK, Khetani P, Baruah Q, Tiwari RV, Dixit H. A review on toothbrushes and toothbrushing methods. Int J Pharmaceut Sci Invent 2017;6(5): 29-38.
6. Ghamrawy EL. A toothbrush designed for proximal surfaces adjacent to toothless spaces in the partially edentulous patient; J Oral Rehabilitat 1979;6: 323-25.

7. Tadinada A, Kilham J, Bysani P, Gopalakrishna A. The evolution of a tooth brush from antiquity to present-a mini-review. *J Dent Health Oral Disord Ther* 2015;2(4): 127-30.
8. Oral Care Products-Toothbrush.
9. Claydon NC. Current concepts in toothbrushing and interdental cleaning. *Periodontol* 2008;48: 10-22.
10. Biesbrock AR, Bartizek RD, Walter PA. Improved plaque removal efficacy with a new manual toothbrush; *J Contemp Dent* 2008;9(4): 1-8.
11. Samanthaloh. Ideal toothbrush and toothbrushing methods part 2 (<http://www.intelligentdental.com/2010/02/09/ideal-toothbrushand-toothbrushing-methods-part>).
12. Williams NJ, Schuman NJ. The curved-bristle toothbrush: an aid for the handicapped population, *J Dent Child*; 1988.
13. Gupta P, Gupta G. Toothbrush and tooth brushing, *Indian J Dent Sci* 2009;1(2):1-8.
14. Sripriya NA, Hyder S, ALI KHB. A comparative study of the efficacy of four different bristle designs of tooth brushes in plaque removal; *J Indian Soc Pedod Prev Dent* ; 2007: 76-81.
15. The Manual Toothbrush and Oral Hygiene. <http://www.dentistrytoday.com/hygiene/1231-the-manual-toothbrush-and-oral-hygiene;2004>.
16. Voelker MA, Bayne SC, Ying Liu, Walker MP. Catalogue of toothbrush head designs. *J Dent Hyg* 2013;87(3): 118-33.
17. Graveland MP, Rosema NAM, Timmerman MF, Van der Weijden GA: The plaque removing efficacy of a finger brush (I-Brushes). *J Clin Periodontol* 2004;31: 1084–1087.
18. Terezhalmay GT, Biesbrock AR, Walters PA, Grender JM, Bartizek RD. Clinical evaluation of brushing time and plaque removal potential of two manual Int *J Dent Hygiene* 2008;6: 321-27.
19. Ng C, Tsoi JKH, Lo ECM, Matinlinna JP. Safety and design aspects of powered toothbrush-A narrative review. *J Dent* 2020;8(1): 1-25.
20. Yaacob M, Worthington HV, Deacon SA, Deery C, Walmsley AD, Robinson PG et al. Powered versus manual toothbrushing for oral health. *Cochrane Libr* 2014;(6).
21. Aparna KS, Puranik MP, Sowmya KR. Powered toothbrush- A review. *Int J Health Sci Res* 2018;8(5): 299-306.
22. Imfeld T, Saxer UP. Anleitung zur zahnreinigung mit elektrischen zahnbursten. *Swiss Dent Soc* 2001: 1-813.
23. Hoover JN, Singer DL, Pahwa P and Komiyama K: Clinical evaluation of a light energy conversion toothbrush. *J Clin Periodontol* 1992; 19: 434-436.
24. Adewunmi A, McGrath D, Ouimet A. The Traveler's Toothbrush. 2003 *ME* 499-501.
25. Ronald L, Van Swol, Donald E, Scotter V, Jeffrey J, Andrew PR. Dentino-Clinical evaluation of an ionic toothbrush in the removal of established plaque and reduction of gingivitis; *Quintessence Int* 1996;27(6).
26. Mescher KD, Brine P, Billet I. Ability of elementary school children to perform sulcular toothbrushing related to their hand function ability: *Pediatr Dent* 1979;2(1).
27. Yakiwchuk CA, Bertone M, Ghiabi E, Sarah Brown, Liarakos M, Brothwells DJ. Suction toothbrush use for dependent adults with dysphagia: A pilot examiner blind randomized clinical trial 2013; 47(1): 15–23.

28. Bajaj A. What's new Br Dent J 2007;203(11).
29. Gibson MT, Bechal JS, Smales FC. Clinical evaluation of plaque removal with a double-headed toothbrush. J Clin Periodontol 1988;5: 94-98.
30. Ganesh M, Shah S, Parikh D, Choudhary P, Bhaskar V. The effectiveness of a musical toothbrush for dental plaque removal: A comparative study; JISPPD 2012; 2 (30)-139-145.
31. Das UM, Singhal P. Tooth brushing skills for the children aged 3-11 years; J indian soc pedod prevent dent 2009, 2(27),104-107.
32. Pandit, IK, Gugnani, N. "Plaque removal efficacy of powered and manual toothbrushes under supervised and unsupervised conditions: A comparative clinical study". Journal of Indian Society of Pedodontics and Preventive Dentistry 2011 29 (3): 235–8.
33. Specialty Toothbrushes. www. gunz. co. nz.

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