# 實測不同手動牙刷對於去除牙菌斑之功效

# Research: 26 Different Manual Toothbrushes Tested for Efficacy

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由 Ryoko Otsuka、Yoshiaki Nomura 等人研究和撰寫的影響牙齒鄰接面牙菌斑去除的手動牙刷的特性研究中，研究了 26 種類型的手動牙刷，以確定哪種屬性最適合清潔牙齒的鄰接面，探討所有手動牙刷應具有哪些特性，才能提高其在清潔牙齒中的功效。

**齲齒和生物膜**

齲齒是一種感染性疾病，因牙菌斑堆積(生物膜)而聞名。適當的口腔衛生應針對牙菌斑並充分去除牙菌斑及其所攜帶的細菌、細菌代謝產物和病原體。日常生活中的牙菌斑控制是相當重要的。由於大多數家庭都使用手動牙刷來清潔牙齒，因此製造商應著重於製造的牙刷能夠解決此問題。市面上存在各式各樣的手動牙刷，但是並不是所有的牙刷都是一樣的。研究人員想知道哪種牙刷最能有效清除牙菌斑。

牙菌斑容易聚集在牙齒鄰接面以及靠近牙齒彼此相交的位置，因此清潔時應特別注意這些區域。日常的牙齒鄰接面清潔勢必不可少的，這對您有很大的幫助，但該過程僅能清潔齒間，並沒有真正接觸到角落裡堆積的牙菌斑，這就成為了牙刷的責任。在日本，已經開始大量建議使用牙線、牙籤和牙間刷來進行牙齒鄰接面的清潔，因為目前只有 30%的人口做到。

## 研究

在這項研究中，排除了牙線和牙籤的使用，因此可以獨立評估牙刷的清潔功效。所有的牙刷都可以在商店中購買到，並且任何人都可以輕鬆使用。每支牙刷的評估依據如下：

- 刷毛硬度（軟、半軟、中等和硬）
- 刷毛長度
- 頭部面積
- 刷毛區
- 刷毛簇數
- 刷毛直徑
- 牙刷的形狀（圓頂、扁平和鋒利）
- 牙刷的整體長度和角度

將一組人造牙套覆蓋在一個複製型實驗牙菌斑中，然後固定在一個模擬下顎，並由一位牙醫師使用每支牙刷刷牙。將刷毛設置成 90 度角，並在每顆牙齒的每側以水平刷牙方式刷 15 秒鐘。使用改進的刷牙技術，透過在特寫圖像中測量每組牙齒的清潔和無牙菌斑表面來計算結果。當然，要特別注意牙齒之間的區域。

## 牙刷的功效

一個正常、硬度中等刷毛的牙刷，對於去除牙菌斑最為有效，即使它確實會造成牙齦退縮。小簇的刷毛也比長簇的刷毛更有效，牙刷是長柄似乎也是重要的，因為它可以讓人更容易地控制刷毛施加在牙齒上的力量。實驗結果非常清楚，僅刷牙還不足以遏制和去除牙菌斑。對於每種牙刷，研究人員通常都感到失望，因為每種牙刷的清潔效率都很低。因此，他們不能推薦任何特定的牙刷。

刷毛的硬度、簇數以及它們的總體長度有助於最佳的鄰接面清潔。問題是沒有一種牙刷具有所有有益的特性。由於它們的有效性，這些數值應適用於所有新生產的牙刷。牙科衛生人員在進行定期回診時提供的免費牙刷應該要是最好的，並且應具有為口腔衛生提供積極影響的特性；但是，似乎沒有同時具備這些必要特性的牙刷。

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Properties Of Manual Toothbrush That Influence On Plaque Removal Of Interproximal Surface In Vitro researched and written by Ryoko Otsuka, Yoshiaki Nomura, et al., investigates twenty-six types of manual toothbrushes to determine what attributes are best to clean between the teeth, or interproximal, to discover what values should all manual toothbrushes have to increase their effectiveness between the teeth.

**Dental Caries and Biofilm**

Dental caries is an infectious disease that makes itself known with plaque buildup (biofilm). Adequate dental hygiene should consist of a practice that specifically targets biofilm and adequately removes it and the bacteria, bacterial metabolites, and pathogens it carries. Daily biofilm control is essential. As the majority of households clean their teeth with manual toothbrushes, manufacturers should concentrate heavily on making sure that their toothbrushes address this problem. A wide variety of manual toothbrushes exist, but not all are created the same. The researchers wanted to know which toothbrush addressed the biofilm problem the best.

Biofilm more easily collects in between the teeth and most right near where the teeth meet each other, and extra attention should always be paid to these areas. Regular interdental cleaning is essential, and it is a great help, but the process only cleans interproximally and doesn’t really touch the collected plaque in the corners. That becomes the responsibility of the toothbrush. Japan, specifically, has started heavily suggesting floss, toothpicks, and interdental brushes to combat the problem as only 30% of the population currently addresses the issue.

**The Study**

For the purposes of this study, the use of floss and toothpicks were left out of the procedure so that the toothbrush can be evaluated on its own. All toothbrushes were commercially available in stores and easily accessed by anyone. Each toothbrush was evaluated based on the following:

- Bristle stiffness (soft, semi-soft, medium, and hard)
- Length of bristle
- Head area
- Bristle area
- Number of tufts
- Diameter of bristle
- Form of the brush (dome, flat, and sharp)
- Length and angle of the toothbrush as a whole

Sets of artificial teeth were covered in a replicate type of experimental dental plaque and then secured in a fixed jaw simulation. The teeth were then brushed by a single dentist using each toothbrush. The bristles were set at a ninety-degree angle and used in a horizontal brushing pattern for fifteen seconds on each side of each tooth. The modified brushing technique was used, and the results were calculated by measuring the clean and plaque-free surfaces of each set of teeth in closeup images. Special attention was paid, of course, to the areas between the teeth.

**The Value of a Toothbrush**

A normal, medium bristle was the most effective strength to remove plaque even though it does cause gingival recession. Small tufts of bristles were also more effective than long ones, and a long handle appeared essential because it was easier to control the pressure a person put on the tooth by the bristles. The results of the experiment made it very clear that brushing alone is not sufficient to contain and eradicate biofilm. Researchers were generally disappointed with each toothbrush as each was very ineffective at its job. They cannot, therefore, recommend any particular toothbrush.

The stiffness of the bristles, the number of tufts, or groups of bristles, available, and their general length contributed to the best interproximal cleanings. The problem is that there was no one toothbrush that contained all the beneficial qualities. These values should be available on all newly manufactured toothbrushes due to their effectiveness. The free toothbrushes handed out by hygienists at preventative appointments should be the best and contain all the positive features available for ultimate dental hygiene; however, it doesn’t seem a toothbrush with these necessary qualities exists.

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