

SECTION 5. PREVENTIVE MEDICINE: THE CURRENT STATE AND PROSPECTS

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REMOVING MICROBIAL BIOFILM WITH ULTRASONIC TOOTHBRUSHES

ВИДАЛЕННЯ МІКРОБНОЇ БІОПЛІВКИ УЛЬТРАЗВУКОВИМИ ЗУБНИМИ ЩІТКАМИ

Vakhovskiy V. V.

*Doctor of Philosophy in Dentistry,
Assistant at the Therapeutic
Dentistry Department,
National Pirogov Memorial
Medical University
Vinnytsya, Ukraine*

Ваховський В. В.

*доктор філософії у стоматології,
асистент кафедри терапевтичної
стоматології,
Вінницький національний медичний
університет імені М. І. Пирогова
м. Вінниця, Україна*

Aleksyeyenko N. S.

*Assistant at the Therapeutic
Dentistry Department,
National Pirogov Memorial
Medical University
Vinnytsya, Ukraine*

Алексєєнко Н. С.

*асистент кафедри терапевтичної
стоматології,
Вінницький національний медичний
університет імені М. І. Пирогова
м. Вінниця, Україна*

Ivanov R. O.

*PhD student at the Department of Sports
Medicine, Physical Education
and Rehabilitation,
National Pirogov Memorial
Medical University
Vinnytsya, Ukraine*

Іванов Р. О.

*аспірант кафедри спортивної
медичини, фізичного виховання
та реабілітації,
Вінницький національний медичний
університет імені М. І. Пирогова
м. Вінниця, Україна*

Oral microbiology has been an interesting area of research in recent years. Dental plaque is increasingly referred to as microbial biofilm, which is a highly organized colony of microorganisms that is tightly attached to the teeth. The role of biofilm is still being studied, but we do know that it is a major etiologic factor in caries and periodontal disease [1, p. 36–45]. Due to their characteristics, the microorganisms in plaque are 1000 times more resistant to external influences than planktonic forms [2, p. 1065–1070]. But there is currently no home remedy that can completely remove microbial

biofilm. However, it is possible to disrupt the structure and reduce pathogenicity by restoring normal microflora.

Today, there are many methods and tools available for removing dental plaque, but the toothbrush remains the most effective. In the early 1960s, electric toothbrushes were first introduced as an alternative to manual toothbrushes. Electrically powered toothbrushes can provide better removal of plaque due to higher frequencies. However, ultrasonic toothbrushes are now available on the market. They have an even higher operating frequency of more than 20 kHz. These frequencies are not audible to the human ear, but the hydrodynamic forces are significantly increased by them [3, p. 50–51].

One of the main physical processes that helps to remove plaque when using ultrasonic toothbrushes is the cavitation effect: the formation, enlargement and collapse of bubbles. An analysis of recent studies shows that the main technology of ultrasonic toothbrushes is the vibration of the bristles [4, p. 21–22].

Bussher et al. have shown in their studies that acoustic waves generated by toothbrushes can be transmitted up to 6 mm and more effective plaque removal occurs at small distances between bristles, between bristles and tooth surface, and at higher frequencies. However, acoustic waves alone are not sufficient to remove plaque, and it is desirable to combine several different effects on the microbial biofilm [5, p. 19–21].

If we consider patients with periodontal tissue pathology and the presence of pockets, then of course, an ultrasonic toothbrush should be the option of choice, because the depth of the pockets can be different and no bristles can mechanically cleanse these areas from microorganisms. An additional acoustic microflow is required [6, p. 17–24].

In addition to ultrasonic toothbrushes, sonic toothbrushes are also available on the market, but no differences in effect have been found in the literature. Both types of toothbrushes have shown good effectiveness. Some manufacturers offer a combination of the two effects, which shows the best results [7, p. 173–174].

Therefore, attempts to combine ultrasound exposure are made in various systems, and if earlier this exposure could be used only in the dentist's chair for professional oral hygiene, today we are trying to integrate such systems into home use products as much as possible.

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