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## Report

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### Tooth Bleaching to Bring out the Patient's Smile

#### – Initiatives in Department of Cariology at Tokushima University Hospital –

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**Abstract :** In recent years, in our super-aged society, where people are striving for health and longevity, aesthetic awareness and interest in the oral cavity are increasing among men and women of all ages and both sexes. In particular, the number of patients requesting tooth bleaching procedures for discolored teeth has been increasing. Tooth bleaching is a minimally invasive esthetic dentistry that can make patients smile. To meet the needs of these patients, Department of Cariology at the University of Tokushima Hospital has reestablished a system for patients to receive tooth bleaching treatment for discolored teeth. Therefore, we would like to report on the bleaching procedures we are performing at our department.

#### 1. Introduction

Tooth whitening, in a broad sense, is a general term for tooth whitening procedures, including tooth cleaning, which removes pigment deposits on the tooth surface, but in a narrow sense, it refers only to tooth bleaching. This tooth bleaching method is one of the most tooth-preserving and patient-satisfying esthetic dentistry among the color-improving treatments for discolored tooth (Table 1), which attempts to achieve its effect by minimizing the invasion of the tooth and not grinding them in order to bring out the patient's smile.

According to a recent awareness survey of 10,000 Japanese men and women between the ages of 18 and 69, 67.7% of all respondents were interested in tooth bleaching, and 58.8% of those between the ages of 56 and 69, the oldest age group<sup>1)</sup>. Furthermore, 87% of the same respondents were aware of tooth bleaching, indicating that many people are interested in bleaching their teeth. In Tokushima University Hospital, Department of Cariology, we have been actively offering tooth bleaching as a treatment for discolored tooth to our patients since 2021. In fact, the number of treatments offered

to patients interested in tooth bleaching in 2021 increased dramatically compared to 2020, before we had established our practice to provide treatments to satisfy patients interested in tooth bleaching. Therefore, this paper describes how our department provides treatment for discolored tooth and its approach.

#### 2. Tooth bleaching procedures in Department of Cariology

Our Department provides consultation to patients who wish to bleach their teeth, based on the results of the interview and intraoral examination necessary for tooth bleaching procedures, to determine a treatment plan<sup>2)</sup> (Fig. 1). The consultation is a process in which the attending dentist proposes and discusses with the patient the results of the examination and diagnosis, treatment goals, and a treatment plan to reach those goals. Especially for patients who wish to bleach their teeth, it is very important to understand how concerned they are about the color of their teeth and how much they want to whiten their teeth, and then to propose

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Table 1 Tooth color improvement methods

<ul style="list-style-type: none"> <li>• Tooth Cleaning           <ul style="list-style-type: none"> <li>PMTC (Professional Mechanical Tooth Cleaning)</li> </ul> </li> <li>• Bleaching = Whitening (narrow sense)</li> <li>• Laminate Veneer Restoration           <ul style="list-style-type: none"> <li>- Indirect: Porcelain laminate veneer restoration</li> <li>- Direct: Same as composite resin restoration</li> </ul> </li> <li>• Prosthetic Treatment           <ul style="list-style-type: none"> <li>- Resin crowns, CAD/CAM crowns and Ceramic crowns</li> </ul> </li> </ul>
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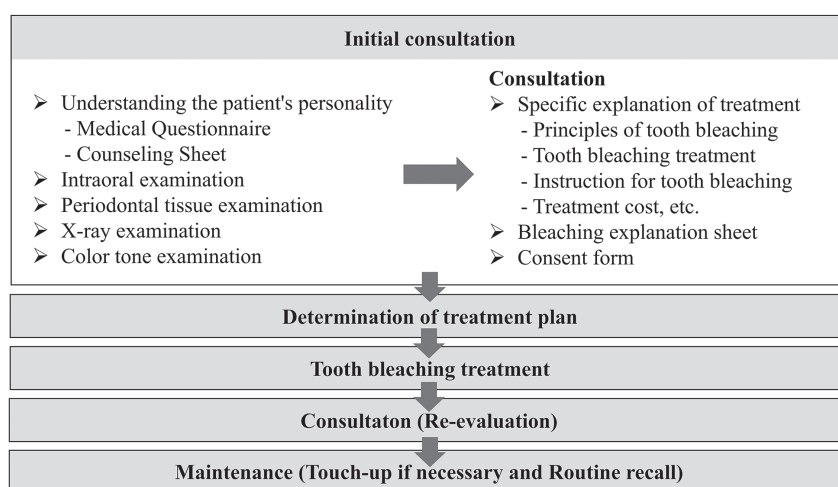


Fig. 1 Flow of tooth bleaching process at Tokushima University Hospital, Department of Cariology

treatment goals and share these goals with them.

In addition, because bleaching is a very subjective treatment of tooth color, it is possible that there will be differences in the predicted effect or the perception of color tones in each patient. Therefore, it is important to accurately measure and evaluate color tone. we use three methods of evaluation: intraoral photography before and after tooth bleaching, visual colorimetry, which uses a shade guide as a color sample to confirm color tone, and colorimetry, which measures and quantifies color tone using a colorimeter. These evaluations allow objective confirmation of the degree of color tone before the tooth bleaching procedure and the patient's desired or target color tone. These data are also very useful in explaining the post-bleaching results to the patient.

There are two types of tooth bleaching procedures for vital teeth: office bleaching, which is performed in the dentist's office using a high concentration of hydrogen peroxide, and

home bleaching, in which the patient is given bleaching material to perform at home (Fig. 2).

There are also two types of home bleaching: custom trays made by the dentist and filled with bleaching agent, and universal trays (Opalescence Go, Ultradent Japan) to which bleaching agent has already been added (Fig. 3 and Fig. 4). Whichever method is chosen, there is no difference in effectiveness<sup>3)</sup>. Our department selects the tooth bleaching method based on information obtained from the patient's interview and intraoral examination, including the degree and cause of discoloration, to predict the effectiveness of bleaching to some extent, and then makes a comprehensive judgment based on the patient's needs. For example, patients in their 60s and 70s, who are relatively older, often find it difficult or anxiety to add bleaching agent one by one to custom trays, and in such cases, we recommend the universal type.

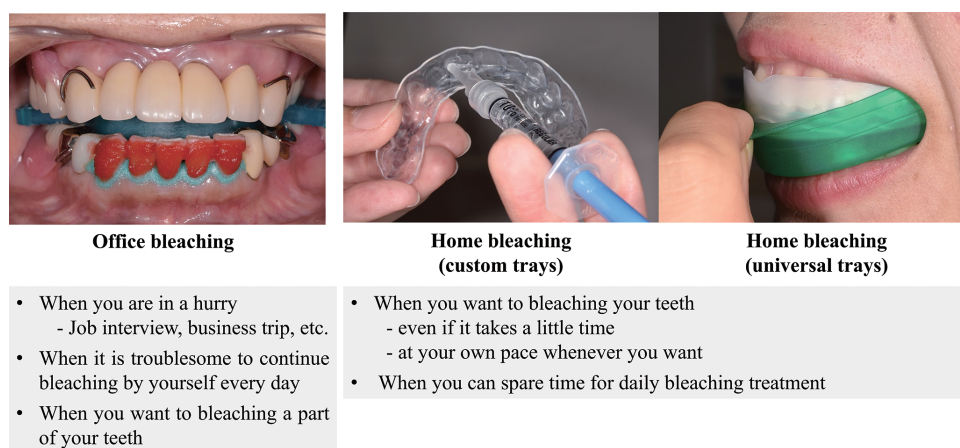


Fig. 2 Tooth bleaching method selection

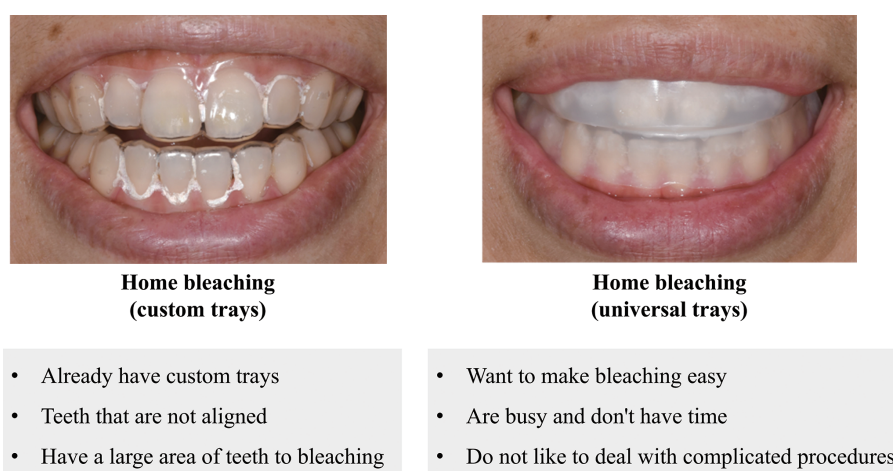


Fig. 3 How to choose between custom trays and universal trays

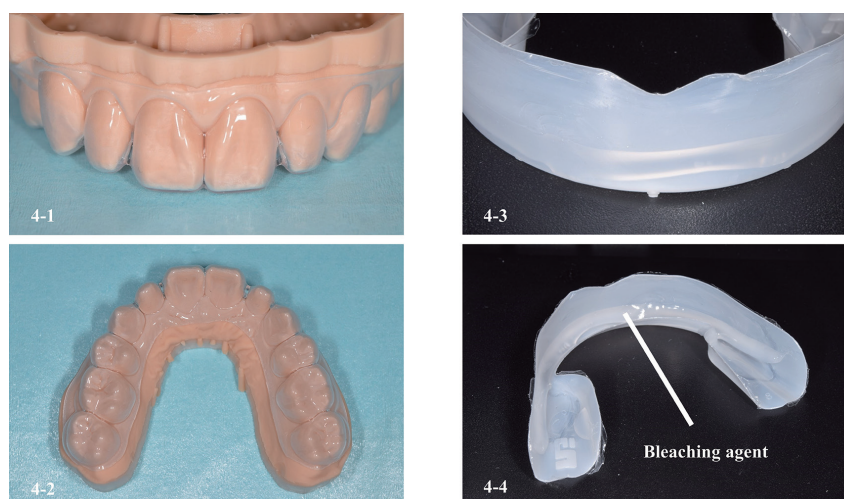


Fig. 4 Structure of custom trays and universal trays

Impressions are taken of the patient's dentition and custom trays are made from plaster casts. We usually design the margin morphology of the custom trays to be straight (4-1 and 4-2: custom trays). Universal trays are filled with bleaching agent. After the trays are placed, they are deformed to fit the dentition according to the temperature in the mouth (4-3 and 4-4: universal trays, Opalescence Go, Ultradent Japan).



Fig. 5 Case of home bleaching using universal trays

Prior to CR restoration to a tooth with a highly saturated and complex color tone, home bleaching using universal trays was performed for one month to improve color match (5-1: Before home bleaching, 32 years old, female, 5-2: After home bleaching). The CR restoration after bleaching was satisfactory to the patient (5-3: After CR restoration).

### 3. Necessity of tooth bleaching treatment

White teeth obtained through tooth bleaching not only give a clean and fresh image to others, but also bring about a positive change inside the person, such as a more self-confident and naturally beautiful smile. In addition, people with whiter teeth will become more concerned about their eating habits, tooth brushing habits, and other aspects of their mouths, which can be expected to lead to improved oral hygiene.

In order to provide patients with the benefits of tooth bleaching, Department of Cariology performs bleaching to 1) whiten teeth, 2) combination treatments (1) preoperative treatment before prosthetic treatment, (2) after orthodontic treatment, (3) improve color match in composite resin (CR) restorations, and 3) improve oral hygiene (secondary effects).

This case (Fig. 5), a 32-year-old female, was referred to our department by her family dentist for esthetic restoration treatment of an unfitted CR filling of a maxillary central incisor after orthodontic treatment was completed at our orthodontic department. Since the anterior teeth of the upper and lower jaws had a highly saturated and complex color tone due to discoloration, home bleaching was performed prior to CR restoration in order to decrease the tooth saturation and to achieve a better color match of the CR. After one month of home bleaching, CR restoration was performed, which resulted in high patient satisfaction with both morphology and color tone.

Thus, our department is involved in combination treatment with prosthetic, orthodontic, and CR restorations. The demand

for tooth bleaching procedures such as this case, performed in collaboration with other departments, is expected to increase in the future.

### 4. Dealing with tooth sensitivity

One of the discomforts associated with tooth bleaching procedures that should be of concern is tooth sensitivity. Tooth sensitivity can occur frequently during and after tooth bleaching procedures<sup>3,4</sup>. Tooth sensitivity symptoms that occur during tooth bleaching procedures can be caused by the condition of the patient's teeth, such as caries, tooth wear, or cracks, or by the tooth bleaching procedure, such as the concentration of the bleaching agent or the duration and frequency of the tooth bleaching procedure. Therefore, we always explain the possibility of tooth bleaching-induced sensitivity to our patients. Based on the results of the initial oral examination, we give priority to the treatment of teeth that may cause sensitivity symptoms. If sensitivity occurs during tooth bleaching procedures, the bleaching procedure is temporarily stopped until the symptoms disappear, and the number of days and time are limited according to the severity of the sensitivity symptoms. In addition, it is advisable to take as much prophylactic measures as possible before and after the procedure (Fig. 6).

Therefore, our department uses a gel containing 3% potassium nitrate and 0.25% sodium fluoride (UltraEZ, Ultradent Japan) and a fluoride varnish containing 5% sodium fluoride (Enamelast, Ultradent Japan) as a method to avoid the onset of sensitivity (Fig. 7).



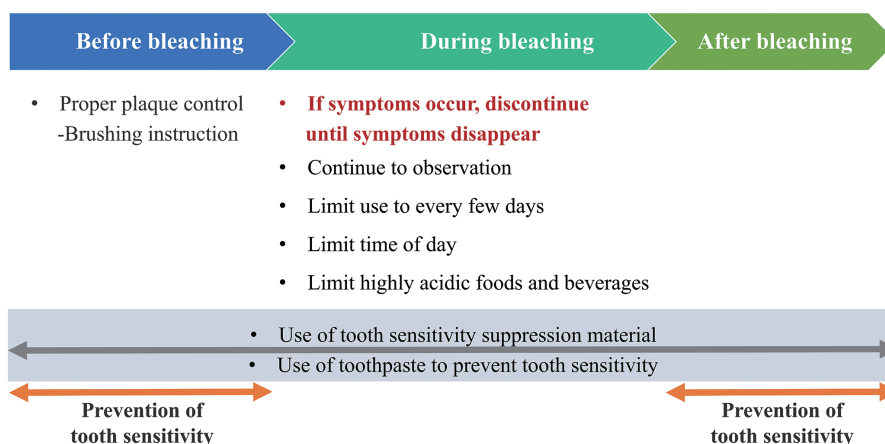


Fig. 6 Dealing with tooth sensitivity

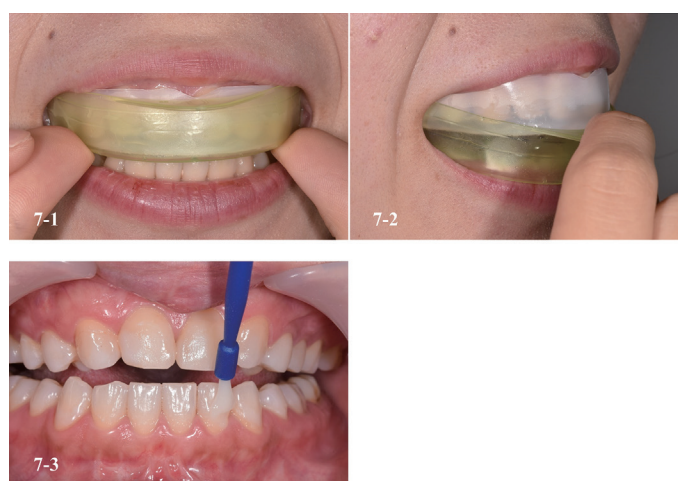


Fig. 7 Tooth sensitivity suppression material

To prevent tooth sensitivity, we use universal tray-type UltraEZ with added tooth sensitivity suppression material for 30 minutes before all bleaching procedures (7-1 and 7-2: UltraEZ, Ultradent Japan). Enamelast, a highly concentrated fluoride varnish, applied to the bleached area after bleaching is completed (7-3: Enamelast, Ultradnt Japan).

All bleaching cases are treated with UltraEZ, a universal tray-type tooth sensitivity suppression material, in the clinic for 30 minutes before bleaching<sup>5)</sup>. The selected tooth bleaching method is then performed, and once the target color tone is reached, a fluoride varnish is applied to the bleaching treated area. These prophylactic procedures are expected not only to act to reduce tooth sensitivity symptoms, but also to strengthen the dental structure by improving the acid resistance and promoting remineralization of the tooth structure due to the high concentration of fluoride after bleaching<sup>6)</sup>. In fact, we have noticed a decrease in the number of patients complaining of excessive sensitivity symptoms with the use of tooth sensitivity suppression material before and after bleaching procedures.

## 5. Importance of maintenance

As with dealing with tooth sensitivity, an essential point to explain to patients is the regression of tooth color after tooth bleaching procedures. The improved tooth color from bleaching gradually fades, and the effect is not permanent. Tooth color after bleaching procedures is stable for about a year, but often gradually reverts back to the color before the bleaching procedure<sup>7)</sup>. Some of the factors that influence this regression of tooth color include staining food and beverages and the patient's brushing at home. Preference for or frequent ingestion of staining-prone foods will gradually adhere to the tooth surfaces over time, causing changes in color tone.

In order to maintain the whiteness of bleached teeth, patients are asked to visit the department every three months

after the bleaching procedure for self-care instruction and regular professional care by the dentist. The color tone is also checked at each visit, and if necessary, a touch-up is suggested. This regular maintenance is expected to lead to the prevention of dental caries and periodontitis, and to the management of oral hygiene and oral function, in addition to the esthetic aspect of tooth color. Moreover, recent evaluations of how undergoing bleaching procedures affects patients' quality of life have reported that bleaching procedures elicit smiles and improve self-esteem in patients<sup>8)</sup>. If bleaching becomes an option for better oral health management for patients who have settled after treatment for caries and periodontitis and are undergoing regular maintenance, it will be an effective way to help them remain healthy and beautiful both inside and out in the age of 100 years of life.

## 6. Conclusion

Tooth bleaching procedures are minimally invasive, relatively cost-effective treatments that make patients smile. Currently, two dental hygienists certified as whitening coordinators work with us in our department to perform bleaching procedures on our patients. The whitening coordinator certification is granted by Japan Academy of Esthetic Dentistry for dental hygienists who have specialized knowledge and clinical skills in the field of dental aesthetics, particularly whitening. We believe that this leads to the provision of safe and secure quality treatment for bleaching procedures. In addition, we anticipate that in providing single oral dental treatment, combination treatment in collaboration with other departments, as described in this paper, will contribute to providing treatment that meets patient needs from both esthetic and functional perspectives. For this purpose, a comprehensive team approach with other departments will be more essential than ever before. We hope that our efforts at Department of Cariology will gain further recognition and contribute to the further development of esthetic dentistry in the future.

## COI statement

The authors declare no conflicts of interest associated with this manuscript.

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