



# A Rubber Protective Barrier for Oral Protection Against Accidental Swallowing

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**Abstract:** Background: During dental treatment, it is often necessary to isolate the teeth from the oral environment with a rubber barrier so that saliva does not flow into the doctor's operating area, and to prevent the tongue from being scratched by dental instruments during treatment, and to prevent the inhalation or swallowing of foreign bodies due to human error. Objective: To provide an oral anti-swallowing rubber protection barrier for medical procedures without the need for wetting the tooth surface. Method: The oral anti-swallowing rubber protective barrier includes a pharyngeal barrier body, a tongue sleeve body, a bracket, a first elastic fixing member and a second elastic fixing member. With this new oral anti-swallowing rubber protective barrier, on the one hand, the support frame is used to support the pharyngeal barrier body to form a protective barrier for the pharyngeal passage to prevent inhalation or swallowing of foreign bodies; on the other hand, the tongue sleeve body is used to cover the tongue to prevent dental instruments from accidentally injuring the tongue. The use of the telescopic and spring-loaded connecting bar ensures that the curved bar is held against the palate while the height is adjusted according to the size of the patient's opening, extending the range of application; the use of the elastic fixing member stuck to the posterior area of the molar not only holds the rubber protective barrier in place but also assists in holding the mouth open. Results: The use of the rubber barrier in oral treatment is clinically effective and can significantly improve patient comfort and reduce treatment complications. Conclusion: An oral anti-swallowing rubber shield is provided to solve the problem of inadvertent swallowing of foreign objects such as instruments during medical operations without wetting the tooth surface.

**Keywords:** Rubber Barrier, Anti-Swallowing, Oral Therapy

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## 1. Introduction

Aerosols containing biological particles, such as bacteria and viruses, are called bioaerosols, which can be carried by the air and spread diseases. Herpes simplex virus and other viruses can be transmitted by aerosols [1-3]. Many dental procedures generate aerosols. These aerosols facilitate the circulation of bioaerosols in the dental office, posing a risk for transmission of infection between dentists and patients. Recent studies have

found that the use of rubber barrier can reduce bacterial air pollution. Rubber dam isolation is a technique that uses the elastic rubber cloth, which is punched and set over the neck of the tooth as a barrier to isolate the treated crown from the oral cavity. At present, the use of rubber dam is mainly focused on the needs of clinical treatment. The use of rubber dam is mandatory in dental pulp therapy and vital pulp therapy to isolate the infection of bacteria in oral saliva to the pulp cavity and dental pulp tissue. In other dental treatments, rubber dam is

only required to be used as much as possible to improve the success rate of dental treatment. It can effectively protect both doctors and patients, and provide patients with a more professional, safer and more comfortable diagnosis and treatment experience [1]. During dental treatment, it is often necessary to isolate the teeth from the oral environment with a rubber barrier so that saliva does not flow into the doctor's area of operation, to prevent the tongue from being cut by dental instruments during treatment, and to prevent the inhalation or swallowing of foreign bodies due to human error, for example. With the development and innovation of technology, the rubber barrier technique has become the most effective isolation method available and is an essential and crucial step in the treatment process. Therefore, it is important to know how to apply the rubber barrier to improve the success rate of treatment and reduce the occurrence of complications [2-3]. However, conventional rubber barriers are not suitable for certain applications such as dental implants, periodontal surgery and scaling where a wetted surface is not required. Therefore, a new type of protective rubber barrier for anti-swallowing in dentistry needs to be designed.

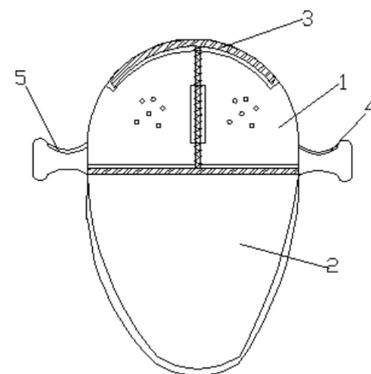
## 2. Materials and Methods

In this paper, an oral anti-swallowing rubber barrier is used, comprising a pharyngeal barrier, a tongue sleeve, a bracket, a first elastic fixation member and a second elastic fixation member [4]. The pharyngeal barrier and the tongue sleeve are integrally formed, the pharyngeal barrier is supported by a bracket, one end of which is interlocked with the first elastic fixing member and the other end with the second elastic fixing member, wherein the pharyngeal barrier is provided with a first sleeve on the diameter line, a second sleeve on the axis line and a third sleeve on the circumference edge, the bracket includes a fixing rod matching the first sleeve, a connecting rod matching the second sleeve and an arc-shaped rod matching the third sleeve. The connecting rod consists of a sleeve and an inner rod, the sleeve slides outside the inner rod, the connecting rod is covered with a spring ring, under the rebound force of the spring ring the sleeve is connected to the arc-shaped rod to drive the pharyngeal barrier body upward sliding. The first sleeve has a first opening upwards in the middle and the third sleeve has a second opening downwards in the middle, the curved rod has a first fixing slot downwards in the middle for the connecting rod to fix and the fixing rod has a second fixing slot upwards in the middle for the connecting rod to fix. The tongue sleeve body comprises an upper tongue cover piece, a right stopper, a left stopper and a tongue tip piece. The upper tongue cover piece closely covers the upper surface of the tongue body and forms a holding cavity for the tongue sleeve with the upper tongue cover piece, the right stopper, the left stopper and the tongue tip piece cooperating. The first resilient fixing member is provided with a slot for interference with the fixing bar at the end facing the fixing bar and a convex end at the other end, and the first resilient fixing member is provided with a concave part at the waist that snaps into the posterior area of the molar. The end of

the first resilient fixing member facing the fixing bar is provided with a slot for interference with the fixing bar, the other end is convex and the waist of the first resilient fixing member is provided with a concave part that snaps into the posterior area of the molar. The pharyngeal barrier body is semi-circular and the pharyngeal barrier body is provided with a number of breathable micro-perforations. The edge of the lingual piece is provided with an elastic cord. A first restriction block and a second restriction block are provided at the opposite ends of the sleeve and the inner bar, respectively. The first elastic fixation and the second elastic fixation have the same structure and are made of medical silicone. The end of the first elastic fixation facing the fixation bar is provided with a slot for inserting the fixation bar into the interference fit and the other end is provided with a convex end.

The fixed bar is first inserted into the first pocket and the two ends are fixed with the first elastic fixation member and the second elastic fixation member respectively; the curved bar is then inserted into the third pocket, the connecting bar is inserted into the second pocket and the connecting bar is fixed with the curved bar and the fixed bar respectively, the whole rubber protective barrier is assembled and placed in the mouth, the first elastic fixation member and the second elastic fixation member are respectively aligned with the posterior zone 6/7 of the molar and stuck in place, the fixed bar is pressed against the heel of the tongue. The curved bar is held against the palate and the connecting bar can be adjusted according to the size of the patient's opening. Under the action of the support frame, the pharyngeal barrier body blocks the pharyngeal passage and prevents accidental aspiration and swallowing of foreign bodies; the tongue sleeve body is placed over the tongue to prevent accidental injury to the tongue during dental treatment procedures.

## 3. Results



**Figure 1.** 1. Pharyngeal obstruction; 2. Tongue cover; 3. Stents; 4. The first elastic fixator; 5, the second elastic fixator.

Rubber dam isolation can keep the operation area clean, dry and free of stains, effectively improve the treatment effect of the affected teeth, and improve the quality of restoration. As a basic dental skill, it not only improves the curative effect, but also greatly enhances the chair-side work efficiency and ensures the safety of both doctors and patients [5]. In

summary, with the use of an oral anti-inadvertent swallowing rubber protective barrier provided herein, on the one hand, the pharyngeal barrier body is supported using a support frame to form a pharyngeal passage protective barrier to prevent inhalation or swallowing of foreign objects; on the other hand, the tongue sleeve body is used to cover the tongue to prevent dental instruments from accidentally injuring the tongue [6-7]. Further, the use of the telescopic and spring-loaded connecting bar ensures that the curved bar is held against the palate while the height is adjusted according to the size of the patient's opening, extending the range of application; the use of the elastic fixation piece stuck to the posterior area of the molar not only secures the rubber protective barrier but also partially assists in holding the mouth open. The use of the rubber barrier in oral treatment is clinically effective and can significantly improve patient comfort and reduce treatment complications [8].

#### 4. Discussion

The rubber barrier isolation technique originated in 1864 and was introduced to dentistry by Dr. Barnum, a New York dentist, and is currently the most desirable method of isolation during oral treatment [9-10]. Rubber dam isolation helps isolate saliva and blood contamination or splatter production. The study found that the introduction of rubber dam isolation reduced particulate matter in the air by 70% around a diameter of about 1m. The rubber barrier can isolate treatment instruments, unbounded stakes and crowns, removed or loose fillings, etc. from the oral cavity to prevent these objects from slipping and falling into the oral cavity during treatment, causing medically-induced injuries or accidental swallowing and aspiration into the gastrointestinal and respiratory tracts [11]. It also prevents irritating chemicals or rinsing agents (e.g. sodium hypochlorite) from coming into direct contact with oral tissues and burning the mucosa [12-13]. Rubber barrier isolation can keep the operative area clean, dry and free of contamination, effectively improving the treatment effect of the affected tooth and improving the quality of the restoration [14-15]; it is a basic dental skill that greatly enhances chair side work efficiency and ensures the safety of both the patient and the doctor while improving the therapeutic effect.

#### 5. Conclusion

The rubber barrier technique is a technique that uses the elasticity of rubber sheeting, which is perforated and placed over the neck of the tooth as a barrier to isolate the treated crown from the oral cavity. The rubber barrier can effectively protect both the patient and the practitioner, providing a more professional, safe and comfortable experience for the patient.

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