

# Research on the Application of Hyaluronic Acid in the Treatment of Periodontal Disease

Fei Meng\*, Yang Chen

North China University of Science and Technology, Tangshan 063000, China

## ABSTRACT

Hyaluronic acid, as a widely used polymer material in clinical practice, has been proven to have numerous biological functions. In dentistry, the application of hyaluronic acid also has certain advantages and can be used to treat oral diseases. However, there are still many issues that need to be explored in research. Therefore, this article aims to explore the current application status and existing problems of hyaluronic acid in periodontal disease, and further test the effectiveness and safety of hyaluronic acid in the treatment of periodontal disease, in order to propose a more reasonable and effective treatment plan for periodontal disease.

## KEYWORDS

Hyaluronic acid; Dentistry; Periodontal disease

## 1. INTRODUCTION

Hyaluronic acid, as a natural polysaccharide, has always been a focus of attention in the fields of medicine and beauty. In dentistry, hyaluronic acid is also a highly valued substance. The presence of hyaluronic acid can help maintain the hydration of oral mucosa and soft tissues, and can enhance the body's immune system in the oral cavity. Therefore, the application of hyaluronic acid in the field of dentistry has gradually become increasingly common. Oral ulcer is a common oral disease, and patients often feel unbearable oral pain. As is well known, hyaluronic acid is a good moisturizer that can alleviate oral ulcers by increasing the level of oral mucus.

## 2. THE CHARACTERISTICS OF HYALURONIC ACID

### 2.1. Chemical Structure

Hyaluronic acid (hereinafter referred to as HA) is a kind of macromolecular polysaccharide naturally existing in human tissues. It is composed of Malic acid and Gluconic acid alternately. It is a kind of non sulfated collagen like protein complex. Its molecular weight is large, ranging from approximately 5000 to 2000000Da. Due to its high molecular weight and polarity, it has a wide range of applications as a carrier in drug delivery, enhancing tissue adhesion, and maintaining water molecule stability. This substance with a unique chemical structure has unique functions [2]. However, the molecular weight, viscosity and water solubility of hydrogels are different in different species and sources. For HA substances, the differences in their physical and chemical properties also have a significant impact on their clinical application. Therefore, in clinical applications, scientists study a single source of HA to ensure its efficiency and safety.

## **2.2. Physical Properties**

Hyaluronic acid is a colorless and odorless viscous liquid with high water solubility and viscosity. Due to its special chemical structure, hyaluronic acid can absorb water and form a delicate gel like substance, thus producing excellent moisturizing effect. The viscosity and molecular weight of hyaluronic acid are related to its concentration. The higher the concentration, the greater the molecular weight, and the higher the viscosity. Hyaluronic acid is widely used in the medical field, especially in the field of Oral medicine. Due to its unique properties, hyaluronic acid is widely used to repair defects in oral soft and hard tissues, and can even replace traditional artificial materials. For example, hyaluronic acid can be used for repairing tooth surfaces, filling missing teeth, improving tooth appearance, and so on. Similarly, hyaluronic acid can also be used for the repair of oral soft tissues, such as the repair and reconstruction of oral mucosa, reducing oral dryness, and improving oral environment.

## **2.3. Biological Functions**

Hyaluronic acid plays various important biological functions in organisms [3].

Firstly, hyaluronic acid is a water retaining agent. Its chemical structure contains a large number of hydroxyl groups, which are easy to form hydrogen bonds, making hyaluronic acid have strong water retention properties. A hyaluronic acid with a molecular weight of 1 million can absorb water about 1000 times its own weight, making it an important guarantee for maintaining normal levels of cells and tissues due to its moisturizing properties. Especially in terms of skin health, hyaluronic acid can help maintain skin moisture balance, enhance skin softness and elasticity.

Secondly, hyaluronic acid helps to maintain the stability of the extracellular matrix. Extracellular matrix refers to the three-dimensional structure that exists outside the cell, which is an important component of the extracellular matrix. It contains various proteins, sugars, and molecules to maintain cells in a certain size and shape, and hyaluronic acid is one of the most important components. It can strengthen the connectivity and stability of extracellular matrix, keep cells in balance under the environment of quotient density, promote the interaction between various cells, and play the role of cell gel.

In addition, hyaluronic acid also has the effect of regulating cell proliferation and differentiation. It can mediate the recruitment and transmission of cell growth factors in the extracellular matrix, regulate cell proliferation and differentiation, and promote the repair and regeneration of various tissues. Research has found that hyaluronic acid plays a particularly important role in brain and lymphatic tissues, regulating the development and morphology of neurons, and enhancing the proliferation and function of lymphocytes.

Finally, hyaluronic acid can also promote wound healing and tissue repair. Hyaluronic acid can accelerate wound healing and tissue repair through various biological functions such as moisturizing, stabilizing extracellular matrix, regulating cell proliferation and differentiation [4]. Hyaluronic acid is widely used after orthopedic surgery, with the effects of reducing infection, reducing pain, and accelerating bone healing.

## **3. APPLICATION PROGRESS OF TRIHYALURONIC ACID IN THE TREATMENT OF APHTHOUS STOMATITIS**

Hyaluronic acid is mainly used in the treatment of Aphthous stomatitis in the form of oral spray and mouthwash. During the treatment process, the main function of hyaluronic acid is to protect the oral mucosa and promote the healing of ulcer wounds.

When Aphthous stomatitis occurs, oral mucosa is damaged, resulting in dry, burning and other uncomfortable symptoms in the mouth. Hyaluronic acid, as a natural moisturizer, mainly adsorbs moisture from the air, keeping the oral mucosa moist, and alleviating the symptoms of dry mouth.

In addition, hyaluronic acid can also increase the viscosity of oral mucus and reduce the damage caused by irritating foods to ulcers. At the same time, hyaluronic acid can also combine with the water molecules on the surface of oral mucosa cells to form a protective film, which can prevent the erosion of bacteria and other foreign substances on the ulcer site and help promote ulcer healing.

The treatment of Aphthous stomatitis is a lasting process, which requires long-term adherence to the application of hyaluronic acid. In the process of applying hyaluronic acid, correct methods should be used, such as spray or mouth wash. For patients with severe Aphthous stomatitis, it is recommended to rinse the mouth with oral solution to speed up healing.

In conclusion, hyaluronic acid has a good effect in the treatment of Aphthous stomatitis, which can alleviate oral pain and promote the healing of oral mucosa. Therefore, hyaluronic acid should be an important part of the treatment plan for Aphthous stomatitis.

## **4. SAFETY AND SIDE EFFECTS OF HYALURONIC ACID**

### **4.1. Safety**

Hyaluronic acid is a kind of biomaterial widely used in Oral medicine treatment, and its safety is a key issue concerned by researchers and patients. Currently, there is a large amount of clinical data and research indicating that hyaluronic acid is a safe and effective material when used and operated correctly.

Firstly, hyaluronic acid is a substance that naturally exists in the human body and does not produce harmful byproducts in human metabolism. That is to say, hyaluronic acid itself is a safe material. Moreover, in clinical applications, the concentration and dosage of hyaluronic acid are strictly controlled, so it is unnecessary to worry about its negative effects on the human body.

Secondly, the use mode and technology of hyaluronic acid in Oral medicine treatment are also important factors that determine the treatment effect and safety. For example, when injecting hyaluronic acid gel, attention should be paid to the injection speed and injection site to avoid local swelling and pain. At the same time, during the treatment process, it is also necessary to carefully observe the patient's physiological reactions and allergic symptoms, and promptly adjust the treatment plan or interrupt treatment.

In addition, the production and quality control of hyaluronic acid are also one of the key links affecting its safety. There are numerous low-quality hyaluronic acid products on the market, which have issues such as safety and side effects. Therefore, it is very important to choose a supplier of hyaluronic acid products with reliable quality.

### **4.2. Side Effects**

Although hyaluronic acid has many advantages in Oral medicine, it may have some negative effects in certain situations [5].

Firstly, hyaluronic acid may cause mild allergic reactions, and in some sensitive individuals, hyaluronic acid may cause symptoms such as skin itching, redness, and numbness. Although this type of allergic reaction is rare, it is necessary to carefully check for any allergic history in advance to avoid serious consequences caused by allergic reactions. If allergic symptoms occur, immediately stop using hyaluronic acid and seek further treatment under the guidance of a doctor.

Secondly, hyaluronic acid may cause some side effects such as mild fever, swelling, pain, and local congestion during use. These side effects are usually temporary and quickly disappear. However, if these symptoms persist for too long or worsen, it is necessary to consult a doctor immediately.

In addition, the long-term use of hyaluronic acid may lead to some adverse effects. For example, the binding of hyaluronic acid to collagen may affect the degradation of collagen, leading to facial skin relaxation and irregular lines. Therefore, before using hyaluronic acid, it is necessary to understand its side effects and potential risks of long-term use.

## 5. CONCLUSION

Overall, hyaluronic acid is considered a safe and effective treatment in dentistry, but there are also some side effects during use. Therefore, before using hyaluronic acid, it is necessary to carefully read the product manual and consult a doctor for advice. Meanwhile, during the use of hyaluronic acid, close attention should be paid to bodily reactions. If any discomfort occurs, it is recommended to immediately stop using and consult a professional doctor for advice.

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