

The Development of Periodontal Probing Locator and Its Guidance in the Domain of Dental Education

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Abstract: Background: As the needle is a sharp instrument, it can easily injure soft tissue, a syringe without a needle is generally used for drug injection in clinical practice, and the liquid in the syringe is poured into the periodontal pocket under the guidance of probe. However, there is a problem that the liquid cannot be accurately delivered to the periodontal pocket for spot injection, resulting in poor therapeutic effect. Objective: To explore a kind of periodontal probe can detect the depth of the periodontal pocket and also can locate the injection liquid. Method: Through the literature review, a periodontal probe for positioning injection was proposed to accurately detect the periodontal pocket depth and accurately release the medicine in the periodontal pocket. So that students can understand the knowledge of traditional Chinese medicine and oral cavity and familiar with a series of processes of invention patents. Enable students to participate in the whole cycle of personnel training process. Result: A device was successfully designed. It can not only export the drug liquid by using the pressure liquid guide mechanism with repeated piston movement, but also locate the position of the drug on through the spherical probe of the probe to achieve accurate drug delivery. It can also prevent soft tissue damage and improve the safety. Conclusion: A localized injection of periodontal probe is introduced to solve the problem that the traditional periodontal probe type may affect the accuracy of probing and have a certain impact on the patient's comfort, and to improve the direction of accurate drug delivery during detection. It also stimulate the students' enthusiasm for learning.

Keywords: Periodontal Probe, Injection, Positioning, Periodontal Disease, Dental Education

1. Introduction

Periodontal disease is a common and frequently-occurring oral disease, including gingivitis along with gingival tissue and periodontitis affecting periodontal tissue. Drugs (such as iodine glycerin) are injected into the periodontal pocket with an injection needle after using the periodontal probe to investigate the depth of the periodontal pocket, gingival bleeding and periodontal attachment [1]. Periodontal probing usually refers to the use of a periodontal scale probe to detect the depth of the periodontal pocket. Clinical periodontal

probing examination also includes the detection of gingival bleeding, periodontal attachment level, dental calculus on the inner root surface of the periodontal pocket, root bifurcation lesions and other conditions. The traditional periodontal exploration operation is all based on the doctor's experience and feel, light can not be explored to the end, heavy damage to the gums, accuracy and experience are lacking [2]. Clinical statistics show that periodontitis accounts for the highest percentage of adults with missing teeth due to oral diseases in China. The clinical diagnosis and treatment of periodontitis is based on the results of periodontal probing,

and the type of probes often used in periodontal probing not only affects the accuracy of the probing, but also has a certain degree of influence on the comfort of the patient. Patients with periodontitis or gingivitis need to choose to use drugs such as iodoglycerin or iodophenol after periodontal scaling, depending on the gingival condition, to allow the flow of the drug into the periodontal pocket under the guidance of the probe [3]. Therefore, it is necessary to design a periodontal probe that can detect the depth of the periodontal pocket while enabling the positioning of the injected medicament.

Furthermore, the design of such periodontal probes can better enable dental students to review previously acquired dental knowledge, integrate theoretical knowledge with practical application, and ultimately apply it to the design of periodontal probes.

2. Method

A periodontal probe for positioning injection comprises a pressing liquid guide mechanism, a probe and a liquid storage tube. One end of the pressing liquid guide mechanism is connected with the liquid storage tube through a thread, and the other end is connected with the probe through a U-shaped limit block [4].

The probe includes an integrated press part, probe body and probe. The press part is arranged on the outer side of the probe body near one end of the pressing liquid guide mechanism [5, 6]. The probe body and probe are 120°, the probe body is provided with a liquid tube cavity and the probe is provided with a scale on the outer surface. It can detect the depth of the periodontal pocket and prevent the excessive penetration of the blind pocket resulting in trauma. The end of the probe is spherical to prevent tissue injury during operation; A rinsing surface is arranged on the spherical body, and the rinsing surface is uniformly provided with a microhole with a diameter of 0.1mm. A wall is arranged between the end of the cavity and the rinsing surface, and the rinsing surface and the wall form a curved surface cavity [7]. After locating the probe, the spray area is expanded and the drug drops are refined, thus enhancing the drug effect. The end of the probe is a spherical body. The globular body is provided with a washing surface, the washing surface is uniformly provided with a laser made microhole, the end of the tube cavity and the washing surface is arranged between the wall, the washing surface and the wall form a curved surface cavity [8].

Pressing liquid guide mechanism includes connecting cover body, connecting cover body is provided with piston, outlet valve, spring and liquid intake valve, the liquid intake valve is located in the connecting cover body close to the liquid storage cylinder side of the liquid intake port, the liquid intake valve is located in the spring at the lower end, the liquid outlet valve is located in the spring, the piston is connected with the probe body end [9]. Piston with spring sliding in the buffer chamber, outlet valve and intake valve are plastic balls. Liquid storage cylinder is used to hold the liquid, the liquid storage cylinder is equipped with a scale

outside which helps to observe the amount of medicine easily [10].

3. Result

A multifunctional periodontal probe was successfully designed, including accurate positioning, drug administration, and better protection of soft tissue. The pressing part is arranged on the outer side of the probe body near one end of the pressing liquid guiding mechanism. The probe body is provided with a liquid tube cavity, and the outer surface of the probe is provided with a scale, which can detect the depth of the periodontal pocket. After the probe is used to detect the depth of the periodontal pocket and locate the position, the limit block is removed. The finger presses the pressing part, the piston moves downward, and the spring is compressed to close the liquid inlet valve and open the liquid outlet valve. After the finger is released, each part moves in the opposite direction, making the liquid flow into the periodontal pocket located by the probe.

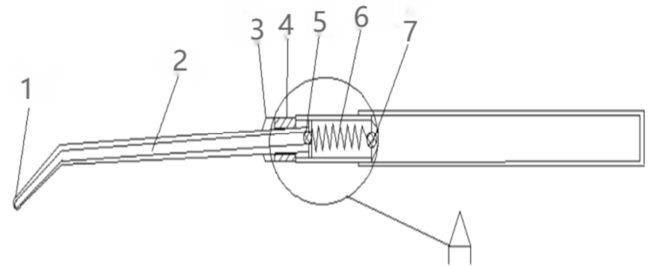


Figure 1. Structural design of a locable periodontal probe for injection. 1. limit block, 2. the liquid valve, 3. mechanical spring, 4. Input valve, 5. press part, 6. probe body, 7. probe.

4. Discussion

The periodontal probe which can be positioned and injected comprises a pressing liquid guide mechanism, a probe and a liquid storage tube [11, 12]. One end of the pressing liquid guide mechanism is connected with the liquid storage tube through a thread, and the other end is connected with the probe through a U-shaped limit block. The probe comprises an integrated pressing part, a probe body and a probe, and the pressing part is arranged on the probe body near the outer end of the pressing liquid guide mechanism. A scale is arranged on the outer surface of the probe. The liquid in the liquid storage cylinder can be imported into the liquid tube cavity in the probe body by pressing the liquid guiding mechanism, and the drug is sprayed out through the probe. Not only the liquid is extracted by the pressing liquid guiding mechanism with repeated piston motion, but also the position of the drug is located by the spherical probe of the probe to achieve precise drug delivery [13].

Application method of this probe: first positioning the probe, removing the limit block after detecting the depth and locating the periodontal pocket using probe, then tilting the fluid in the reservoir to the side of the connecting body. By pressing the fingers, the piston moves down and the spring is

compressed to close the inlet valve. After this, the outlet valve opens, the fluid flows in the reservoir from the buffer chamber into the fluid lumen in the probe body. When the fingers are loosened, the spring returns to its natural state, the piston moves upward and outlet valve closes, Inlet fluid valve opens which allows liquid to move from the inlet port into the buffer chamber. By pressing and repeated up and down motion of the piston, the fluid is pushed into the periodontal pocket positioned by the probe.

The periodontal probe can be positioned, and the medicine liquid can be extracted by the pressing liquid guiding mechanism with repeated piston movement, and the medicine position can be located by the spherical probe of the probe, so as to achieve precise drug delivery. By disassembling and setting the limit block, the probe can be fixed, and the drug can be given as needed to prevent the drug from being given by pressing while detecting the depth of the periodontal pocket. The probe is spherical to prevent soft tissue injury and improve safety. The surface of the spherical body is provided with micropores, which can refine the medicine liquid and improve the drug effect [14].

In addition, some periodontal probes have broken through the shackles of traditional periodontal probing. The operation of the first generation of probes is all based on the doctor's experience and hand feel, which can not explore the bottom or damage the gums. The accuracy and experience are lacking [15]. On the basis of the first generation of periodontal probe, the second generation of periodontal probe was developed; and then combined with computer technology, the third generation of periodontal probe was born, realizing the automatic reading, preservation and presentation of periodontal probing results, the typical product is the American Florida probe. Florida periodontal probe can play a good auxiliary role, belongs to the third generation of periodontal probe, is a new generation of invention and computer-linked pressure-sensitive electronic probe. It can accurately measure the measurement results, use the hand feel of the sleeve to feel the position of the enamel bone boundary, reduce the error caused by the probe pressure of the equipment and operator, and make the measurement results more objective and accurate [16, 17].

Our dental school has always attached great importance to the cultivation of students' innovative ability, and is gradually achieving the integration of basic professional competence with innovative basic competence, the integration of professional project production capability with innovative project production capability, and the integration of comprehensive professional competence with innovative entrepreneurial competence. In addition, through guiding students to participate in innovative entrepreneurial projects and exploring innovative points for patents, we are shaping a campus culture of "everyone should innovate, everyone can innovate, and everyone will have achievements." We strive to enable every graduate to enter the workforce with both professional and innovative capabilities, which is an invaluable asset in their lives.

5. Conclusion

In summary, the periodontal probe provided by the utility model can be positioned and injected. The medicine liquid can be extracted by the pressing liquid guiding mechanism which can be moved repeatedly by the piston, and the medicine can be positioned through the spherical probe. In addition, the limit block is disassembled and set to act as a fixed probe to ensure that no liquid is deflated when detecting the depth of the periodontal pocket. This equipment can also successfully stimulate students' learning enthusiasm and innovation consciousness, and better combine theory with practice.

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Conflicts of Interest

The authors declare no conflicts of interest.

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