

# Exploitation of a Prosprosthetic Device for Dental Piling

Xue-Jing Lin<sup>1</sup>, Mei-Yan Zhou<sup>2</sup>, Jie Zhou<sup>1</sup>, Qing Yuan<sup>1</sup>, Ying-Ying Li<sup>1</sup>, Fei-Fei Wang<sup>1</sup>,  
Hao-Ying Fu<sup>1</sup>, Diwas Sunchuri<sup>3</sup>, Zhu-Ling Guo<sup>1,4,\*</sup>

<sup>1</sup>School of Dentistry, Hainan Medical University, Haikou, China

<sup>2</sup>Department of Dentistry, the First Affiliated Hospital of Hainan Medical University, Haikou, China

<sup>3</sup>School of International Education, Hainan Medical University, Haikou, China

<sup>4</sup>Department of Health Management Center, the First Affiliated Hospital of Hainan Medical University, Haikou, China

## Email address:

604569033@qq.com (Zhu-Ling Guo)

\*Corresponding author

## To cite this article:

Xue-Jing Lin, Mei-Yan Zhou, Jie Zhou, Qing Yuan, Ying-Ying Li, Fei-Fei Wang, Hao-Ying Fu, Diwas Sunchuri, Zhu-Ling Guo. Exploitation of a Prosprosthetic Device for Dental Piling. *International Journal of Dental Medicine*. Vol. 9, No. 1, 2023, pp. 11-13.

doi: 10.11648/j.ijdm.20230901.13

**Received:** December 4, 2022; **Accepted:** December 26, 2022; **Published:** April 11, 2023

---

**Abstract:** Objective: In order to solve the effective problem of removing the rotten material in the root canal, and can adapt to the various continuous surgical procedures in the root canal surgery. Methods: When it is necessary to clean the rotten tissue, place the device above the teeth after drilling, insert the inner tube into the hole and extend it to the required depth, and then further adjust the depth of the inner tube in the hole by adjusting the position of the outer tube of the driving mechanism. The driving mechanism is started so that the driving mechanism drives the elastic hollow part to rotate. Then, a liquid with a certain consistency is filled into the first cyst through a pipe so that the first cyst can be effectively propulsive and closely adhered to the corrupt tissue, while the inner tube is continuously pulled upward. The second capsule is continuously filled with liquid through the pipe, so that the second capsule can contact the tissue after cutting and fully contact the surface of the tissue after cutting and complete the sealing. In jecting the clean water into the hole on the teeth. The teeth can be filled through the cavity formed between the elastic hollow and the pipe by pouring the tooth filling material into the hole of the treated tooth. Results: The use of the device can adapt to a variety of continuous operation processes in root canal surgery, the use is more simple and convenient, and the operation is more efficient. Conclusion: The use of this device can adapt to a variety of continuous operation procedures in root canal surgery, which is simpler and more convenient to use, and more efficient to operate.

**Keywords:** Prosprosthetic Device, Dental Piling, Root Canal Cleaning

---

## 1. Introduction

During root canal surgery, it is necessary to clean the rotting tissue inside the tooth after perforation. However, uneven perforation often occurs in the surgical process, resulting in the incomplete circle of the cross section of the hole. The existing file needle will break in the hole during use, leading to further damage and difficult to take out. Moreover, the existing file needle cannot clean the rotten tissue according to the actual aperture after drilling [1]. In addition, the use of flexible materials may affect the stability of the removal of the rotten tissue due to the material limitations of the flexible materials, easy to cause additional wear to the teeth. In view of

the existing problems, a dental piling device is designed. The technical problem can be solved are that the bonded rotten tissue can be cleaned up according to the actual tooth aperture situation after the perforation, which can adapt to the continuous change of the aperture. In addition, it can avoid the secondary damage caused by the fracture and retention in the hole of the tooth. The cutting process is more stable, and it can adapt to a variety of continuous operation procedures in the root canal surgery simultaneously [2].

## 2. Materials and Methods

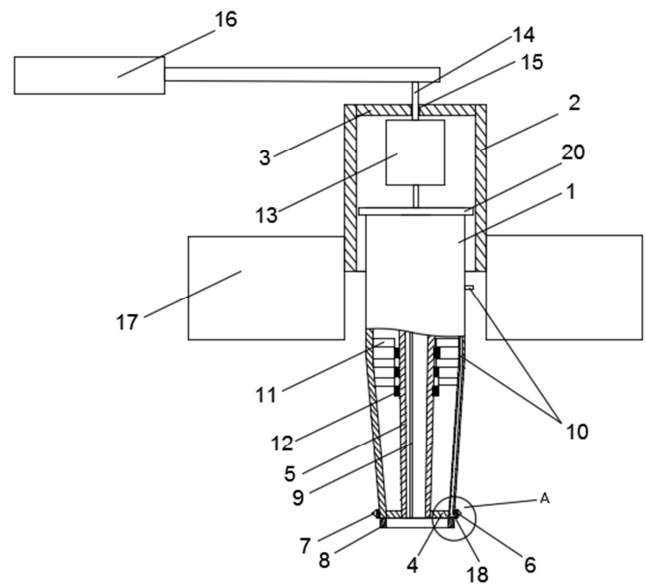
Oral prosthetic devices for dental piling include elastic internal and outer tubes, which are located in the outer

tube and can rotate relatively with outer tubes. The top of the outer pipe is equipped with a first partition plate, the second partition plate is provided with the bottom of the inner pipe, the outer pipe is equipped with the drive mechanism, the outlet of the drive mechanism is equipped with the elastic hollow member of the bottom opening, and there is a limit mechanism between the inner pipe and the elastic hollow member [3]. The outer wall of the inner tube is provided with a first capsule, the surface of the first capsule is provided with a number of cutting pieces, the inner tube is provided with a second capsule fixed connected to the inner tube, the inner wall of the elastic hollow part is provided with pipes and channels. The wall of the elastic hollow piece is equipped with channels, the cavity formed between the elastic hollow piece and the pipe is used to transport the tooth filling material, the pipe is connected to the first capsule, and the channel is connected to the second capsule. The top of the pipe passes through the inner pipe and the outer pipe and is connected with the external liquid source, the channel is connected with the external liquid source, the bottom of the elastic hollow part passes through the second partition and is flushed with it, the driving mechanism is electrically connected with the external power supply [4].

When the cleaning work of the rotten tissue is required, the device is placed above the punched tooth, the inner tube is inserted into the hole and extended to the desired depth, and then the depth position of the inner tube in the hole is further adjusted. After starting the driving mechanism, the driving mechanism drives the elastic hollow parts to rotate. With the help of the limiting mechanism, the shaking of the elastic hollow parts can be effectively avoided, which ensures that the shaking will not be too large and lead to the uneven cutting parts in the cutting process, and the cutting surface is not cluttered and affects the effect after cutting [5]. The first capsule is then filled with a certain viscosity of liquid through the pipe, so that the first capsule can be effectively opened and tightly bonded with the rotten tissue. Due to the limiting effect of the rotten tissue and the extrusion effect of the liquid mobility in the first capsule, the cutter can always fit closer to the rotten tissue during the movement of the inner tube [6]. At the same time, by continuously pulling the inner tube upward, the cutting piece can always fit the rotten tissue and carry out the corresponding cutting work in coordination with the first capsule, so that the shape of the first capsule can be adjusted according to the reason of fluidity when moving to different positions to adapt to the three-dimensional shape of the region, thus making the removal and cutting effect better [7]. The fluid is then continuously filled into the second capsule through the duct, so that the second capsule can contact with the cut tissue and fully contact with the tissue surface after the cutting work and complete plugging, and then the hole on the teeth continue to pour into the clean water, to ensure that the contaminated water generated by the washing process can effectively overflow from the hole of the teeth [8].

### 3. Results

A practical device for dental piling has been successfully designed, it can clean up the rotten tissue according to the actual tooth aperture after perforation, which can adapt to the continuous change of the aperture, and avoid the secondary damage caused by the hole of the tooth. The cutting process is more stable and can adapt to a variety of continuous operation procedures in the root canal surgery. This device can effectively adapt to a variety of continuous operation procedures in root canal surgery, which is easier to use and more efficient [9]. It can clean up the rotten tissue according to the actual tooth aperture after perforation, which can adapt to the continuous change of the aperture, and can avoid the secondary damage caused by the hole of the tooth. The cutting process is more stable, and can adapt to a variety of continuous operation processes in the root canal surgery. The insertion hole of the inner tube can further adjust the depth position of the inner tube in the hole, fill the first capsule with the fluid with a certain viscosity into the first capsule, so that it can be closely bonded with the rotten tissue [10]. The first capsule can also adjust the shape according to the cause of mobility, thus making the removal cutting effect better. The second capsule ensures that it washes the root canal clean. Dental filling is accomplished by a cavity formed between the elastic hollow piece and the pipe.



**Figure 1.** Structural design of a prosthodontic device for dental piling. 1. inside tube, 2. outer tube, 3. The first partition, 4. The second partition, 5. elastic hollow parts, 6. the first capsule, 7. cutting disk, 8. the second capsule, 9. piping, 10. passageway, 11. lantern ring, 12. the convex eaves, 13. electrical machinery, 14. link rod, 15. through-hole, 16. handpiece, 17. elastic fastener, 18. ring board, 19. adapting piece, 20. bail wire.

### 4. Discussion

When it is necessary to clean up the rotten tissue, the device is placed above the teeth after drilling, by inserting the inner tube into the hole and extending to the required depth, and then by adjusting the position of the driving mechanism in the

outer tube, then the depth position of the inner tube in the hole can be further adjusted. The elastic hollow parts are driven to rotate, and the liquid with a certain viscosity is filled into the first capsule through the pipe, so that the first capsule can be effectively stretched out and closely fit with the rotten tissue, and the inner tube is continuously pulled upward, so that the first capsule can play a good cutting effect [11-12]. The channel is communicated with the second capsule, and then the fluid is injected into the second capsule to fully contact the tissue surface after the cutting work and complete the sealing. The limiting mechanism of the device comprises a plurality of rings, and the surface of the elastic hollow part is provided with a plurality of convex eaves, the two spacing distribution and mutual contact, which can effectively clamp the elastic hollow part, avoid the occurrence of excessive shaking phenomenon [13]. The driving mechanism comprises a motor and a connecting rod, the surface of the first partition is provided with a through hole, the top of the connecting rod is provided with a fixed connection with the hand-held parts, through the connecting rod and the hand-held parts, so that the device in use can be more convenient to operate. The outer wall of the outer tube is provided with an elastic clamping part [14]. The elastic clamping part is used for clamping teeth and gums, which can effectively fix the device and facilitate the use of the device. The clamping part is provided with a connecting part, which can further improve the fastening ability and ensure the stability of the device [15]. The outer circumference of the inner tube is provided with a clamping ring which is fixedly connected with it, which can tighten the inner tube and the outer tube to a certain extent to avoid the phenomenon of easy relative sliding.

## 5. Conclusion

In conclusion, the dental prosthesis device used for dental piling proposed in this study can safely and effectively clean and remove the rotten tissue in the teeth in root canal surgery, and the device used can better adapt to the tooth aperture and other problems. In short, it is a better choice for cleaning root canal during prosthesis treatment.

## Fund

This research was funded by National Natural Science Foundation of China (82201080), Higher Education and Teaching Reform Research Project of Hainan Province (Hnjg2021-60), Course Construction Project of Hainan Medical University (HYZD202215).

## References

- [1] Li Yanjie, Han Xiao, Zhou Xiaojian, et al. Comparative study on cleaning the pulp of molar curved root canal with different instruments [J]. *Electronic Journal of General Practice and Oral Medicine*, 2020, 7 (05): 9 + 42.
- [2] Xiao Min, Liu Jin, Fan Xiaomin, et al. The scanning electron

microscopy method was used to analyze the effect of the acoustic wave-assisted root canal washing time on the cleaning effect of the stained layer [J / OL]. *Oral Medicine*: 1-6 [2022-12-23].

- [3] Cong Xinyu, Xue Ming. The effect of three kinetic energy washing techniques on clearingdebris in the interpipe gorge area [J]. *West China Journal of Stomatology*, 2022, 40 (05): 554-559.
- [4] Dominique Linden, Matthieu Boone, Mieke De Bruyne, et al. Adjunctive steps for the removal of hard tissue debris from the anatomic complexities of the mesial root canal system of mandibular molars: A Micro-Computed Tomographic Study [J]. *Journal of Endodontics*, 2020, 46 (prepublish).
- [5] Chubb David Wayne Ronald. A review of the prognostic value of irrigation on root canal treatment success. [J]. *Australian endodontic journal; the journal of the Australian Society of Endodontology Inc*, 2019, 45 (1).
- [6] Xiao Min, Liu Jin, Fan Xiaomin, et al. The effect of the acoustic wave-assisted root duct washing time on the cleaning effect of the stained layer was analyzed by scanning electron microscopy [J / OL]. *Oral Medicine*: 1-6 [2022-11-27].
- [7] Haupt Franziska, Meinel Michael, Gunawardana Asanka, et al. Effectiveness of different activated irrigation techniques on debris and smear layer removal from curved root canals: a SEM evaluation. [J]. *Australian endodontic journal; the journal of the Australian Society of Endodontology Inc*, 2020, 46 (1).
- [8] Xu Chengyu, Ge Jiuyu. In vitro study on the efficiency of root canal wall stain layer cleaning by auxiliary root canal washing instruments [J]. *Chinese Journal of Practical Stomatology*, 2017, 10 (08): 488-492.
- [9] Buchanan L. S. Closed-system negative pressure irrigation: A serious inflection point in root canal cleaning [J]. *Dentistry Today*, 2020, 39 (4).
- [10] Ajina Mahdi, Billis Georgios, Chong Bun San. The Effect of Glide Path Preparation on Root Canal Shaping Procedures and Outcomes. [J]. *European endodontic journal*, 2022, 7 (2).
- [11] Di Spirito Federica, Pisano Massimo, Caggiano Mario, et al. Root Canal Cleaning after Different Irrigation Techniques: An Ex Vivo Analysis [J]. *Medicina*, 2022, 58 (2).
- [12] Vazquez Natividad I, Alegre Domingo T, Faus Matoses V, et al. Efecto de irrigantes in the intracanal cleaning after post space preparation [J]. *Journal of Clinical and Experimental Dentistry*, 2017.
- [13] Owen T A, Barber M. Direct or indirect post crowns to restore compromised teeth: a review of the literature. [J]. *British dental journal*, 2018, 224 (6).
- [14] Haralur Satheesh B. Fracture resistance of endodontically treated teeth restored with various esthetic posts. [J]. *Technology and health care: official journal of the European Society for Engineering and Medicine*, 2020, 29 (2).
- [15] Walsh Ryan M, Attar Sayeed, Turner Casey L, et al. Clinical outcomes of non-surgical root canal obturations using NeoMTA: A retrospective series of case reports. [J]. *Australian endodontic journal: the journal of the Australian Society of Endodontology Inc*, 2022.