JOURNAL OF PURE AND APPLIED MICROBIOLOGY, April 2013. Vol. 7(Spl. Edn.), p. 173-178

Observation on Clinic Effect of Root Canal Preparation using Three Different Instruments

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(Received: 03 March 2013; accepted: 14 April 2013)

To compare the observation and analyzed on clinic effect of root canal preparation using Protaper ultrasonic machine Ni-Ti files (A group), Protaper hand Ni-Ti files (B group) and standard hand stainless steel K-files (C group). A total of 180 teeth of 159 elder patients were randomly assigned to three groups, and then root canal preparation is taken for 60 teeth of each group respectively. The Protaper ultrasonic machine Ni-Ti files (A group) made good root canal shape after preparation in a safe and labor-saving method within a shorter time, and removed the debris and contamination level in the root canal thoroughly, It got significant differences from hand Ni-Ti files (B group) and hand stainless steel K-files (C group). As to dentine debris pushed out of apical foramen and solution quality and intraoperative reaction, Protaper ultrasonic machine Ni-Ti file group was less than Protaper hand Ni-Ti file group ($P<0.05$); Protaper hand Ni-Ti file group was less than stainless steel K-file group ($P<0.05$). Significant differences existed among them. Compared with Protaper ultrasonic machine Ni-Ti files (A group), hand files (B0C group) can save more labor and time with less medical complications in the process of elder root canal preparation, as well as less substances pushed out of apical foramen. Root canal treatment high success rate.

Key words: Protaper ultrasonic machine Ni-Ti files instruments, Root Canal Preparation, Clinic Effect.

The increasement of the patients' requirement of the RCT's effect which forces the root canal preparation methods constantly improve,make root canal preparation equipment of physical and chemical performance more perfect and root canal treatment level improve inceasingly,and laid a solid foundation for the preserve of tooth . Root canal treatments are divided into root canal preparation, root tube cleaning and disinfection and root canal filling, which preparing the root canal is the key factors of the success of root canal therapy. Root canal therapy (RCT) is the most efficient method of treating pulpitis and periapical periodontitis as well as of storing teeth in recent years. Perfect root canal preparation and root canal filling is the key to the success of root canal treatment. Is the most effective method to preserve tooth . Pain and swelling often occur in the process of the patients' RCT. Smaller blocked pulp cavity root canal, which is resulted from aging change of dental pulp and other reasons, and improper early treatment cause blocking in the entrance, calcification deposition in the root canal and canal stenosis. All of the above have increased RCT difficulty and easily cause pains and discomforts (acute) after RCT. How to reduce acute reaction after RCT shall be more discussed. The text pass use Protaper ultrasonic machine Ni-Ti files and tradition hand stainless steel K-files, to take calcified root canal preparation in clinic,

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Protaper ultrasonic Ni-Ti files is a new big taper root canal preparation appliance, analyzes which method can reduce acute reaction from clinic comparative observation.

MATERIALS AND METHODS

Instruments and Materials

Root Canal files

6 Protaper universal machine Ni-Ti files and hand Ni-Ti files (Made by Densply Co., Ltd. from Germany)ÿStandard hand stainless K-files (MANI Co., Ltd. from Japan) ÿ

Root Canal Instruments

'a) Machine Motor made by Densply Co., Ltd. : 16:1 reducing gear with 250~300 $r \cdot min^{-1}$ rotary speed (Made by Densply Co., Ltd. from Germany).

b) 17%EDTA root canal lubricant (Made by Densply Co., Ltd. from Germany).

c) VDW root canal length measurement instrument, Raypex 5 (Made by Densply Co., Ltd. From USA).

d) Taper gutta percha point 04#006#(Made by Densply Co., Ltd. from Germany).

e) Standard gutta percha point (Beijing).

e) Root Canal Sealing Material : AH-Plus cataplasm, belong resin kind (Made by Densply Co., Ltd. from Germany).

f) 2% Column yaming solution liquid to wash root canal, ShangHai Tooth Material Co., Ltd. From China.

Clinic Data

Elder patients aged over 58 years old who needed RCT chronic periapical periodontitis and acute or chronic pulpitis during April 2007 to April 2012 in the First Affiliated Hospital of Zhengzhou University were randomly assigned to ProTaper Universal machine Ni-Ti file preparation group (A group), hand Ni-Ti file preparation group (B group), and standard hand stainless steel K-files (C group) with **60** teeth in each group for preparation clinic observation.

Selection Standard

1) Affected teeth got no severe periodontitis; PD<5mm, Mobility<a!°.
2) No essential human disease;
3) No root canal therapy record;
4) Acute and chronic pulpitis and periapical periodontitis patients.

Method of Preparation

Operating Steps

All patients with preoperative perturbation X ray film understand periodontal, root canal and root length, estimation work, Local anesthesia (1.7ml made by Produits Dentaires Pierre Rolland) shall be taken for all patients in normal odontotrypy, opening pulp top and removing crown and root pulp, and use 8#, 10# or 15# K-files were used to triple root canal and establish root canal passageway. VDW root canal position indicator combined with root canal wire inserting X chip to determine root canal working length; 17%EDTA solution was adopted while each file entered into the root canal.

Operation Method

T*o Protaper instrument according to the Crown - down preparation technology principle of root canal preparationÿProtaper ultrasonic machine Ni-Ti file+ Root canal effective cleaning+ K file at the same time effectÿBoth Protaper ultrasonic machine and hand Ni-Ti files adopted step down root canal preparation. ZSO standard hand stainless steel K-files (Japan) adopted step back root canal preparation.*

Both Protaper ultrasonic machine and hand Ni-Ti files *is a new type of non-standard equipment,* adopted step down root canal preparation. Shaping files was used to finish upper root canal preparation, and S1 entered into the root canal and quitted when it encountered resistance; then SX was used to triple the upper 2/3 root canal. S1 forward and reverse rotation made root canal tripled to working length and then take 1/3 apical preparation; meanwhile S2 was used to take 1/3 root canal preparation and finish 2/3 apical preparation. Patching file F1 was used to triple to working length and 20# file to dredge the root canal and quit when it encountered resistance and the root canal preparation was finished completely; otherwise, F2 was used continuously until working length was tripled.

ZSO standard hand stainless steel K-files (Japan) adopted step back root canal preparation. 15#-25# files were firstly used and then 30#-35# files for preparation.

All the above root canal preparation methods were used together with EDTA lubricating root canal, with 2% Column yaming solution washing root canal by inserting washing needle

into root canal each quit of the files. 10# or 15# files were used to dredge root canal so as to prevent root hole plugging from blockage.

Response Evaluation Criteria:

Criteria for judgment concerning pain and discomfort after root canal preparation: Four grades were divided according to criteria for judgment concerning pain brought forward by Mohd Sulong etc[010]. Root canal treatment during emergency from behind both (IAE).

Grade **0**: No pain;

Grade **I**: Mild pain and discomfort, no need for acute treatment;

Grade **II**: Pain, need for medicine or occlusal reduction;

Grade **III**: Severe pain and swelling.

One month after curative effect evaluation

Recent studies suggest that strict apical sealing is the indispensable factors in guaranting the success of treatment .The success rate is mainly evaluated through the clinical symptoms and X ray film performance.

Success

No clinical symptoms, good bite function , the X ray film which shows fit filling, disappearment of the periapical sparse area

Failure

Symptoms or X ray film which shows overfilling or underfilling, expandation of the periapical disease or sparse area .

RESULTS

According to statistical analysis, SPSS 10.0 software shall be used for statistical treatment, $\chi 2$ inspection adopted for comparison between groups, and $P<0.05$ considered as significant differences.

Table 1. Time Comparison of Root Canal Preparation Using Three Different Instruments min(x±S)

Group	Time for Back Teeth Preparation Using Single Root Canal	Time for Front Teeth Preparation Using Single Root Canal	Totally
Machine Ni-Ti Root Canal File A	2.98±1.50	2.89±1.08	2.94±1.29
Hand Ni-Ti Root Canal File B	6.15±1.31	4.80±1.12	5.48±1.21
Common K Root Canal File C	12.99±2.40	8.72±2.11	10.86±2.24

Comparison between two groups adopted $\chi 2$ inspection, then as to time comparison of back teeth root canal preparation using different instruments, the time of Group A was lower significantly than that of Group B and Group C, and that of Group B significantly lower than that of Group C, $P<0.05$ considered as significant differences. (refer to Table 1).

Table 2. Pain Response Comparison of Root Canal Preparation from 1 weeks Using Three Different Instruments (Teeth Amount)

Group	Teeth Amount (Totally)	No Pain		Pain		Pain Incidence
		Grade 1	Grade 2	Grade 3	Grade 4	Rate (%)
Machine Ni-Ti Root Canal File A	158	150	3	3	2	3.16%
Hand Ni-Ti Root Canal File B	158	149	5	2	2	2.53%
Common K Root Canal File C	158	114	24	24	16	12.60%

Comparison among three groups adopted χ^2 inspection, then pain incidence rate was compared, $P<0.05$, difference was of statistical significance (refer to Table 2).

Table 3 shows, between the three groups after 1 month of different root canal preparation instrument root canal line after root canal filling, return rate in comparison, GroupA and GroupB with prepared root canal 3D filling perfect, beyond fill rate is lower, *which* success rate 94 %, Group C success rate of 76.04%, success rate of Group A and Group B were significantly higher than that of Group C, among three groups adopted χ^2 inspection, $P<0.05$, difference was of statistical significance.

Table 3. Response Comparison of Root Canal Preparation Root Canal Preparation Using Three Different Instruments

Group	Return Visited Teeth Amount	Percent of Return Visit	Succeeded Teeth Amount	Success Rate (%)
Group A	101	63.92%	95	94.06%
Group B	88	55.70%	83	94.32%
Group C	96	60.76%	73	76.04%

DISCUSSION

With the development of the dreservement, life rhythm speeding up and people to medical knowledge, need to do a one-time root canal treatment teeth is more and more, however during treatment of pain often makes treatment prolonged, see a doctor to the patient number increase, bring a lot of trouble. Therefore, controlling the pain of the dent during root canal therapy in disposable root canal treatment is crucial, and the effect of root canal therapy are largely influenced by the quality of root canal preparation and the effect of filling.

RCT is the most efficient method of treating pulpitis and periapical periodontitis for its high recovery rate and good long-term effect. Perfect root canal preparation and root canal filling is the key to the success of root canal treatment. Elder teeth are featured by difficult treatment and reduced recovery rate owing to aging narrowness and calcification as well as root canal disposal that is hard to reach effective part. Bacteria and residual pulp in the root canal may be the main reasons for RCT. It is difficult point for clinic RCT that root canal systematic infection of back teeth especially molar teeth often exists in narrow and curved calcified root canal which is hard to dredge and shape.[1]

The pain after root canal preparation is resulted from root canal contents, dentin ort, rinses or drugs that pushed out of apical foramen in the preparation process, which provoke the periapical tissue and cause inflammation reaction [2]. So try to reduce substances pushed out of apical foramen is the key to avoid pain. Based on the analysis of the results of table 2 and the usage, the incidence of pain caused by the standard stainless steel K-file after one week is obviously higher than ProTaper Universal ultrasonic machine with nickel titanium .It dues to the restrict of the shaping of root tube, difficult debris' removal, uncomplete flushing, unperfect filling root, high overfilling rate and time-consuming.

Traditional stainless steel K-files are ISO standard instruments made of hard and inflexible material, with small taper and concentrated screw thread, debris generated by pulling and expanding files hardly getting out of root canal. Its transversal surface is a square, sharp part possesses great cutting force, all cutting planes of the files take part in working arduously, so instruments must be changed frequently and curved in advance, which will take more time, for thin or curved calcified root canal forming conoid. Traditional K-file standard preparation fails to clean effectively and thoroughly the elliptical root canal, and leave a great many debris and thick contamination level (debris and solution generated from root canal preparation cannot be removed effectively due to K-file defects).

Protaper ultrasonic machine and Hand Ni-Ti files are not ISO Ni-Ti instruments, consist of three shaping files SX, S1 and S2 and completing files F1, F2 and F3, and possess better flexibility, cutting ability and security compared to traditional RCT instruments because of multiple taper blade design and convex triangular transversal surface structure. Generally, curved and complex root canal preparation can be finished only with four files. ProTaper Ni-Ti root canal file the crown to deep root canal preparation method, due to a variety of taper blade of part design, and root canal preparation when rely on positive and negative rotation cutting root dentin wall will be out of the debris, which will greatly reduce the clastic attached to root tube wall or root the occurrence of embolism. After the preparation of root tube taper larger, be helpful for root canal flushing fluid into the depths of the root canal, improve the washing

effect, reduce the necrotic material and dentin clastic push root hole and cause postoperative pain. Root canal preparation using Protaper ultrasonic machine Ni-Ti files is more efficient than using Protaper hand Ni-Ti files and traditional ISO stainless steel K-files and accordingly reduces operating time of root canal preparation. [3]

Protaper ultrasonic Machine Ni-Ti files work with effective cleaning of root canal and K-files, ultrasonic wave of root canal preparation is transmitted to the root canal through ultrasonic file shaking, and the energies in the root canal transmitted to root canal dentine through liquid dielectric solution; cutting ability of dentine is better than that of hand instruments. Especially ultrasonic method takes better cleaning effects on thin and curved root canal, root furcation and accessory root canal. Besides mechanical action, it can take cavity effect together with solution so as to remove contamination level on root canal dentine and kill bacteria in suspension.[4] Ultrasonic wave accelerates chemical action of 2% Column yaming in root canal and accordingly improves antimicrobial activity. [5]

Based on the analysis of the results in table 1, can see, Protaper ultrasonic machine with nickel titanium file group (group A) obviously saves time and effort. Three groups of different root canal preparation equipment after root canal used time is, the chi-square test, $P < 0.05$, A statistically significant difference, A group was significantly lower than time distinctness for group B and groupC. Protaper ultrasonic machine with nickel titanium file group shorten the root canal preparation time, simplify the chair side operation time and improve the work efficiency.

Protaper ultrasonic Machine Ni-Ti files has removed resistance and infectious substance on coronal before preparation of 1/3 root tip so that substance is avoided to be pushed out of apical foramina in the process of preparation and pain after therapy is reduced. Furthermore, it can make a good root canal shape with little complication in a safe, time-saving and labor-saving method within a shorter time and is good for recovery of periapical lesions. It is reported by literature that bad clearing and insufficient root canal preparation can cause residual pulp directly and root canal preparation surpassing apical foramina shall be avoided, which has been confirmed by relation of bad clearing, insufficient root canal preparation, root canal preparation surpassing apical foramina and untreated root canal therapy. [6] The clinical root canal super expansion of the vast majority of cases there will be pain. The author thinks that such shall be deemed to have failed to prepare caused root tip trauma irritable inflammatory pain, so in the design model to study root canal treatment period pain can't acquisition such cases. Based on the results of table 3 analysis shows that the three groups of different root canal preparation equipment after root canal filling root effect return rate effect, A 0B groups comparison of more than 94%, and the power of C groups success rate 76.04%ÿ A0B groups success rate obviously higher than that of group C , three groups adopted $\div^2$ inspection, $P<0.05$, difference was of statistical significance the chi-square test, with significant difference ($P<0.05$). Protaper ultrasonic machine Ni-Ti files prepared root canal behind root canal treatments high success rate.

In conclusion, standard stainless steel K-file taper small, together with pulling type expansion file way easy to necrotic material and dentin debris out of root tine hole, cause acute apicitis . Hand root canal file each root file according to the different positions of the root canal with specific cutting purpose, have a strong sense of purpose, through the use of each a file, use different cutting sites, and finally reach the final file form consistent smooth root canal morphology, avoid root canal migration and complications, such as the formation of the steps. In a word, Protaper hand Ni-Ti files can keep better original shape of root canal in rapid root canal preparation, especially possess good root canal shaping ability for curved root canal; machine Protaper Ni-Ti files possess excellent metallicity, good flexibility, continuous and effective root canal preparation resulting in no excessive cutting of dentine, and good root canal shaping effect, as well as are good for effective washing and filling of root canal. [7] Greatly improve the success rate of root canal therapy, and at the same time avoid teeth to infection, prolong the service life of teeth. Make ready root canal morphology more ideal, be helpful for root canal filling, make more teeth with preserved. In order to guarantee the quality of root canal therapy, reduce the pain of patients, it is recommended to use Protaper ultrasonic machine with nickel titanium

file + root canal effective clean + K file and action, and root canal decides more perfect, clean more thoroughly, for root canal filling three-dimensional lay a good foundation.

In addition, for root canal treatment a method and the method of many times, there has been a debate. AoHui research results show that: the root canal healing a method postoperative emergency incidence than conventional method high,[8] but years of clinical application and experience Protaper found in ultrasonic machine with nickel titanium file instrument have excellent root canal preparation ability, the presence of residual marrow even inevitable, even if does not take place during root canal therapy emergency (IAE) should also suggest line double or multiple cleaning ready, in order to prevent possible residual pulp left hidden trouble, visible root canal treatment method of many times more reliable. Of course also is not deny a root canal treatment method, clinical according to the concrete circumstances, and root canal treatments quality and physician operation methods and skills, and use of the equipment, and so on are directly related. Can make the work efficiency, save time, relieve the patient preparation for mouth for a long time produce fatigue, and at the same time, improve the success rate of root canal therapy. Prolong service life of teeth. According to the above analysis, the author believes that, in the majority of molar root canal oval, Protaper ultrasonic root canal equipment clean cannot achieve satisfied effect, needs to be oral scholars further study.

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