

# International Journal of Advanced Research in Biological Sciences

[www.ijarbs.com](http://www.ijarbs.com)



## Research Article

### Chairside sterilization of endodontic hand files

Sameer Punathil<sup>1</sup>, Sham.S.Bhat<sup>2</sup> and Vidya Bhat S<sup>3</sup>

<sup>1</sup>Dept.Of Pediatric and Preventive Dentistry, Malabar Dental College and Research Centre,  
Malappuram,

<sup>2,3</sup>Yenepoya Dental College, Mangalore

\*Corresponding author e-mail: [viceprincipalydc@yenepoya.edu.in](mailto:viceprincipalydc@yenepoya.edu.in)

#### Abstract

**Objectives:** This study was conducted to analyse available methods of chairside sterilization procedures for endodontic hand file sterility, including metal shaft and plastic handle. **Study design:** Seven test groups of 12 endodontic files were studied using *Bacillus subtilis* as the test organism. Groups were sterilized by sodium hypochlorite immersion and glass bead sterilizer. **Result:** Immersion of contaminated files in 5.25% sodium hypochlorite for 5 minutes, when handle was not contaminated, sterilized the files. **Conclusion:** Cleaning and sterilization is mandatory to prevent cross infection. Immersing in 5.25% NaOCl for 5 minutes can effectively be used for chair side sterilization of endodontic hand files when handles are not contaminated

**Keywords:** Endodontic files, infection control, chair side sterilization.

## Introduction

Infection control is a major issue in medicine and dentistry because of concern over communicable diseases transmitted in health care settings. Since microorganisms have been shown to be the major cause of Endodontic pathology, sterilization of endodontic instruments is a mandatory step for maintaining asepsis in endodontics.<sup>1</sup>

Over the years, several methods have been used to sterilize endodontic instruments. Autoclave or dry heat oven are the most effective means of sterilization. However employment of either of these devices is impractical for chair side use.<sup>2</sup>

For decades clinicians have been searching for an ideal chair side sterilization method for root canal

files and several different mediums have been used. Most of the early sterilizers used molten metal as a medium. The effectiveness of this medium was supported in 1950 by Stewart and Williams who showed that the working end of files contaminated with spores and vegetative forms of the organisms could be sterilized by molten metal at 218°C in 2 seconds.<sup>3</sup>

However, the shortcomings of molten metal as a medium were addressed, and salt was introduced as a more appropriate medium for chair side sterilizers<sup>4</sup>. Over the years other mediums have also been tried including ball bearings, glass beads, and metal filings<sup>5</sup> etc.

A number of methods have been advocated for chair side decontamination of files and reamers. Ingle<sup>6</sup> inserts the instrument full length into the canal, rotates it half a turn, retracts it, and cleans it on the depressed end of a cotton roll moistened with germicide before it is reintroduced in to the canal. Grossman<sup>7</sup> states that the instrument should be thrust either into the end of a cotton roll or in to a foam rubber sponge moistened with an antiseptic, but in either case it should be sterilized in the hot salt sterilizer before being returned into the canal.

Very little attention has been addressed to the complete sterilization of files including the handles. Therefore the aim of this study is to evaluate chair side method of complete endodontic hand file sterility.

## Materials and Methods

Seven test groups of 12 endodontic hand files each were sterilized in an autoclave. The sterilized files were then intentionally contaminated with *Bacillus subtilis* spores by dipping them in to *B. subtilis* suspension.

The following procedures were then performed for each of the 7 groups.

Group 1: Completely contaminated files (working end and handle) were placed in 5.25% sodium hypochlorite solution for 5 minutes.

Group 2: Partially contaminated (working ends only) files were placed in 5.25% sodium hypochlorite for 5 minutes.

Group 3: Completely contaminated files were placed in 5.25% sodium hypochlorite for 3 minutes.

Group 4: Partially contaminated files were placed in 5.25% sodium hypochlorite for 3 minutes.

Group 5: Completely contaminated files were completely submerged in glass bead sterilizer for 1 minute.

Group 6: Partially contaminated files were completely submerged in glass bead sterilizer for 1 minute.

Group 7: No sterilization procedure was performed after contamination (positive control).

After these procedures, files were transferred into test tubes containing sterile Brain Heart Infusion (BHI) broth and incubated for 7 days at 37<sup>0</sup>C.

After 7 days the samples were analysed for growth by streaking onto Blood agar plates, incubated overnight and analysed to confirm the presence of test organism, *B.subtilis*.

## Results

Out of the seven test groups, only files that were immersed in 5.25% sodium hypochlorite for 5 minutes when handle was not contaminated showed less growth of organism. This was the most effective method of chair side sterilization of endodontic hand files. Analysis of positive samples confirmed the presence of test organism in all the samples.

## Discussion

The importance of rapid sterilization of Endodontic hand files during endodontic treatment to prevent the bacterial contamination of root canal is now widely recognized in endodontic practice. Organic debris adheres tenaciously to these instruments after clinical use. Hence, to remove the organic matter and debris completely from the files, effective disinfecting procedure must be carried out to achieve sterilization .Till date no satisfactory protocol for chair side sterilization has been formulated.

The efficacy of Sodium Hypochlorite (NaOCl) as tissue dissolving and disinfecting agent depends on its concentration and time of exposure<sup>8</sup>. In our study, NaOCl was used as it removes the organic debris completely during the cleaning procedure. But NaOCl has also been proven to be a corrosive to many metals and selectively removes Nickel from Nickel Titanium (NiTi) alloy<sup>9</sup>.The strength of NaOCl solution and duration for which the instrument should be exposed to NaOCl must be balanced against potential damage to the instrument

**Table.1** Analysis of positive samples confirmed the presence of test organism

Test Groups	Files	
	Contaminated	Not Contaminated
Group 1	9 (10.7%)	3 (03.6%)
Group 2	1 (01.2%)	11 (13.1%)
Group 3	10 (11.9%)	2 (02.4%)
Group 4	5 (06.0%)	7 (08.3%)
Group 5	12 (14.3%)	0
Group 6	12 (14.3%)	0
Group 7	12 (14.3%)	0
Total	61 (72.6%)	23 (27.4%)

by corrosion. Busslinger et al found 5.25% NaOCl to produce corrosion in NiTi files when used for 30 and 60 minutes. However, Haikel et al found no significant effect on NiTi files after immersion in 2.5% NaOCl for 12 to 48hrs. Various studies have proven that 1% NaOCl solution alone is ineffective in organic debris removal from the file.

The finding that glass bead sterilizer is an unreliable instrument for completely sterilization of endodontic hand files is not surprising. The results of this investigation corroborated the well documented findings of Findlay,<sup>11</sup> who found that the glass bead sterilizer fails to kill all the spores.

The heat resistant bacterial spore former *B. subtilis*, proved to be an acceptable test organism for this experiment. We chose *B. subtilis* because, the heat resistant spores of this organism are commonly used to test sterilization techniques<sup>12</sup>.

Studies have shown that stainless steel endodontic files, if properly handled, do not seem to be damaged significantly during use, cleaning and autoclaving<sup>13</sup>. Contrary to this another study showed that repeated autoclaving results in a reduction in the number of degrees of angular deflection a file will withstand before the fracture moment is reached.<sup>14</sup>

Some authors recommend that during treatment the working ends of files be wiped with gauze moistened with an antiseptic solution to remove the debris and to disinfect the files.

Current methods of chair side sterilization of handles of endodontic hand files did not produce sterility. 5.25% NaOCl can effectively be used for chair side sterilization of endodontic hand files when handle was not contaminated. There are no direct studies which correlated corrosion of endodontic hand files with instrument fracture due to fatigue. But it is likely that in clinical scenario pitting corrosion acts as localized area of stress concentration and crack propagation which leads to instrument fracture.

### Conclusion

Cleaning and sterilization is mandatory to prevent cross infection. Immersing in 5.25% NaOCl for 5 minutes can effectively be used for chair side sterilization of endodontic hand files when handle was not contaminated. Although autoclave is the gold standard for sterilization, it cannot be used as a chair side sterilization method. Further research is required to find a faster and improved method of chair side sterilization of endodontic hand files and feasibility of single use endodontic files.

### References

- 1.CDC. Guidelines for infection control in dental health-care settings.MMWR 2003; 52(No. RR-17):1-66,2003.
- 2.Savage NW and Walsh LJ. The use of autoclaves in dental surgery. Aust. Dent. journal 40: 197-200, 1995.

3. Stewart GG ,Williams NB. .A preliminary report on the efficacy of molten metal for sterilization of rootcanal instruments and materials. Oral Surg Oral Med Oral Pathol:3:256, 1950
4. Oliet S ,Sorin S,Brown H..A temperature analysis of thermostatically controlled rootcanal sterilizers using molten metal ,glass beads or salt. Oral Surg Oral Med Oral Pathol 11: 37-42, 1958.
5. Grossman .Hot salt sterilizer. Br. Dent. J :101:283. 1956.
6. Ingle ,J.I: Endodontics ,Philadelphia,Lea and Febiger,p.188,1965.
7. Grossman ,L.I, Endodontic Practice ed. 8,Philadelphia ,Lea and Febiger;pp 199-200, 1974,
8. Hand RE, Smith MI, Harrison JW. Analysis of the effect of dilution on the necrotic tissue dissolution property of NaOCl. Journal of endodontics 4: 60-64,1978.
9. M.Darabara, L.bourethis, S.Zinelis. Susceptibility to localized corrosion of stainless steel and NiTi endodontic instruments in irrigating solutions, International endodontic journal 37: 705-710,2004.
10. SommerF,Ostrander.F.D.andCrowley,M,C;clinical Endodontics,Philadelphia, ,W,B Saunders company pp 73- 74,1966.
11. Findlay ,J,A. A report of the Efficacy of Molten and Ball Bearings as media for sterilization.Br. Dent.J.98:318-323,1955.
12. Windler AS jr.Walter RG .The sporicidal activity of glass bead sterilizer. J.Endodon 1:273, 1975.
13. Hilt BR, Cunningham CJ. Torsional properties of stainless steel and NiTi files after multiple autoclave sterilization,Journal of endodontics 26:76-80,2000.
14. Mitchell BF ,James GA ,Nelson RC .The effect of autoclave sterilization on endodontic files. Oral Surg Oral Med Oral Pathol 55: 204-7,1983.