

An Epidemiological Study on the Selection, Usage and Disposal of Dental Burs among the Dental Practitioner's

SUMEET SHARMA¹, RAVI SHANKAR², K. SRINIVAS³

ABSTRACT

Aim: The purpose of this cross sectional study was to understand and evaluate local practitioner's knowledge on dental bur selection, its usage, sterilization procedures undertaken and the method of disposal of dental burs in restorative procedures.

Materials and Methods: A questionnaire proforma was prepared with each question having 4 answers. A total of 20 questions were framed and were sub-divided into 3 categories namely selection, usage sterilization and disposal. These questionnaires were sent to all the local practitioners by mail and to ensure a high response rate as they were followed up by telephone calls. The results were analyzed statistically and were represented in the form of percentage.

Results: A total 131 out of 150 practitioners answered the

questions, a response rate of 87%. Most of the practitioners preferred diamonds (75%) over tungsten carbide (15%) burs. Most of the dentists used burs till they were worn out (85%) and many of the dentists agreed that the cutting efficiency of bur decreased with usage (33%). Clinicians usually sterilized burs either once daily (35%) or for every patient (35%). Almost every practitioner discarded their worn out burs into dustbin (100%).

Conclusion: From the survey we came to know the operators' attitude towards one group of burs in terms of cutting efficiency. In terms of cutting efficiency diamond burs predominated the choice irrespective of the grit size. Burs were used repeatedly till they were worn out and minimal coolant was used during tooth preparation and believed that it didn't have any effect on the cutting efficiency.

Keywords: Diamond burs, Tungsten carbide burs, Cutting efficiency, Cross sectional study

INTRODUCTION

The removal and shaping of tooth structure is an essential aspect of restorative dentistry. Initially this was a difficult process accomplished entirely by the use of hand instruments [1]. To maximize esthetics, improve fracture resistance, optimize laboratory artistry and maintain soft tissue health meticulous tooth preparation is required. Most of the dental restorations are either extra-coronal restorations (crowns and fixed partial dentures) or intra-coronal restorations (inlays, amalgam restorations) or a combination of the above.

There are basically four mechanical methods of removing tooth structure with ease and this has led to increased patient acceptance. The successful clinical use of the air abrasive, ultrahigh-frequency vibration, high-speed belt-driven rotary cutting instruments, and the air and water turbines indicates their effectiveness [2]. Even though new techniques such as lasers, air abrasion and chemical dissolution are being advocated for the removal of dental hard tissue during tooth preparation, it seems probable that the use of rotary instruments will continue for some time [3]. They are used for refining margins, enameloplasty, gross tooth reduction, removing cast restorations [4].

The term bur is applied to all rotary cutting instruments that have bladed cutting heads which remove the tooth structure either by cutting or by abrading. In restorative dentistry, there exists a range of cutting instruments namely from steel burs to carbide burs to diamond abrasives. Bur selection is probably based on several factors: tradition, shape, clinical procedure being done, substrate being cut, their method of sterilization and disposal [5]. The rationale for bur selection and its application is not addressed in the literature or in standard operative and prosthodontic texts. Moreover, this selection is complicated by the availability of these dental drills in different sizes and coarseness. Bur selection and use are complicated by the fact that cutting efficiency tends to decrease as bur wears out and as debris accumulates on the bur [6].

We undertook the present survey to understand the use, misuse

and the applicability of the dental burs in daily practice. A questionnaire was constructed and sent to all private practitioners to address bur selection, usage, sterilization and disposal for tooth preparation in restorative dentistry.

MATERIALS AND METHODS

The present cross sectional study was carried by the Department of Prosthodontics, crown and bridge and implantology, at GITAM Dental College and Hospital, Visakhapatnam, India to assess the usage of rotary cutting instruments in restorative dentistry. Accordingly, a questionnaire was prepared based on the selection of bur, its usage, methods of sterilization and its disposal after use. The questionnaires were of closed end type and carried out four answers and the personnel participating in the study was asked to choose one answer among the four. This study was done among local general dental practitioners in Visakhapatnam, India and the questionnaires were posted to their respective clinics through mail. A total of 150 dentists participated in the study and out of which 131 answered the questionnaire and returned them back. The proforma was divided into three sections and each section had questions pertaining to that topic. The three sections were

1. Selection
2. Usage
3. Sterilization and disposal

In the selection category, a total of six questions were framed which were aimed at evaluating the criteria for choosing a dental abrasive. Questions were framed based on the availability of the dental burs in the market to the basis of their individual selection. The practitioners were questioned whether they followed any sequential order during tooth reduction and if so, what was the basis/ reason for it. They were also questioned about the various color coding available and what it meant to them.

In the usage criteria, a total of eight questions were framed which were aimed for evaluating the applicability of the dental drills.

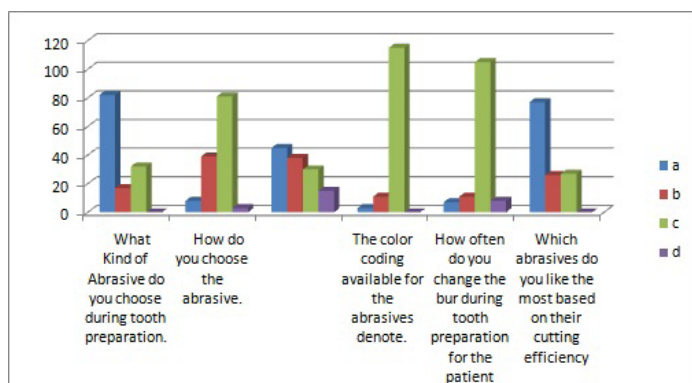
Questions were framed for knowing how many times the burs were used, how was the cutting efficiency, how was the handpiece behaving on usage of worn out burs, whether there was any improvement in cutting efficiency by using coolant, whether a same bur was used for removal of cast restorations or they used any special drills and also to know whether the operator was aware of the direct relation ship between the pressure application during tooth preparation and the abutment tooth being prepared.

In the sterilization category questions were framed on the various sterilization protocols available for dental burs and the operators preferred method of sterilization. How many time did they carried out the sterilization proctols and was there any improvement in the cutting efficiency of the dental drills after sterilization. Questions were also framed about truing and dressing of the dental burs.

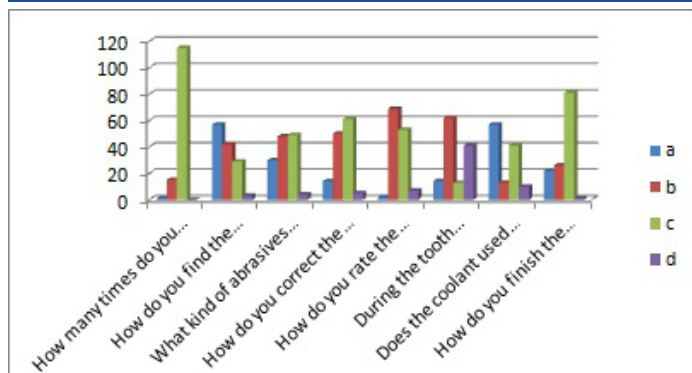
The questionnaires were sent to the practioner's and were asked to choose the answer one among them. The data was collected and analyzed statistically. The most common answer was represented in terms of percentage.

RESULTS

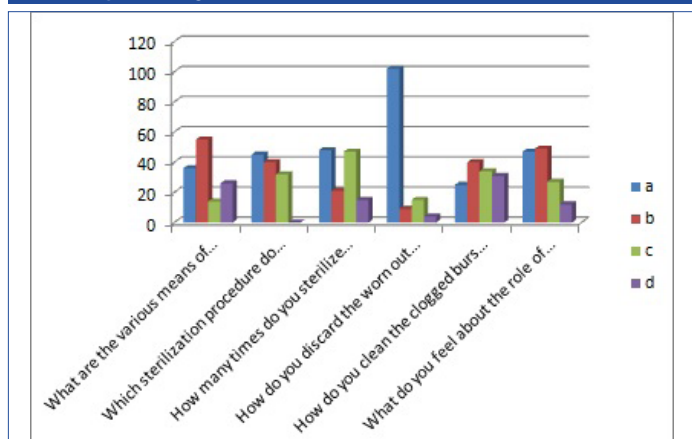
A total 131 out of 150 practioner's answered the questions, a response rate of 87%. The data was represented graphically and the frequency was represented in terms of percentage. The data is discussed as follows [Table/Fig-1-3]:



[Table/Fig-1]: Selection



[Table/Fig-2]: Usage



[Table/Fig-3]: Sterilization and disposal

DISCUSSION

In clinical practice, diamond points are used under arduous and varying conditions. It should be borne in mind that, in addition to exacting the technical requirements involved in the use of high circumferential speeds, the methods and techniques of removal should be taken into account [7]. These, to a great extent, depend on the individual approach and skill of each dentist. The literature provides few guidelines on bur selection, and standard texts differ in their recommendations on bur selection for clinical procedures.

The present epidemiological study was initiated to serve three purposes. First, to evaluate the operators knowledge on bur selection for restorative procedures and which would enable dental educators to evaluate their recommendations relative to their peers and facilitate evidence-based clinical teaching and research. Second, a database on bur usage is necessary if laboratory-based cutting studies are to provide useful information for the dental practitioner. And the last being the mode of infection control and disposal awareness among the practitioners.

Most dentists base their clinical practice on the techniques and methodologies learned in dental school, including the need for water cooling and handpiece selection during tooth preparation procedures, the type of bur to be used. When a patient has decay (caries) in a tooth, the carious matter must be removed and the tooth then shaped, so that it can be restored to normal function. Similar considerations apply to the preparation of teeth for crowns and bridgework. These restorative procedures require the use of a dental bur held in a mechanically or air-driven handpiece. Bur selection and use are complicated by the fact that cutting efficiency or CE tends to decrease as bur wears out and as debris accumulates on the bur. Studies have shown that CE depends on both the diamond bur grit size and duration of the cutting procedure. Over short cutting periods, medium, coarse and super coarse have comparable cutting rates. More prolonged the cutting, the efficiency decreases [8]. In our survey most of the practioner's showed a positive affinity towards the diamond burs followed by the tungsten carbide burs for tooth reduction. The color coding signifies the coarseness of the bur where green or black color is super coarse and yellow color being smoother. In our survey, the operators preferred the sequential color coding during gross tooth reduction. However, only 35% of the population showed likeness towards the super coarse. Large particles which protrude above the bonding material may penetrate deeper into the surface of the grinding substrate than fine particles. The density of the particles, i.e., the number of particles per unit area on coarse disks is lower than on fine disks. Therefore, at constant loads a greater force will be exerted on the substrate by each particle of a coarse disk, causing deeper penetration and the removal of more material than by the particles of fine disks [9].

During tooth preparation energy that was not used in cutting process is mostly transformed in to heat. The amount of heat transmitted to the tooth typically depends on the type of the bur, pressure applied, cutting time and rate, cooling techniques and speed and torque of the rotary instrument [10]. Moreover, studies have shown that various ways of improving the cutting efficiency of the diamond burs irrespective of their grit sizes, these ranging from using chemo-mechanical sprays (adding diluted alcohol or glycerol) to the coolant, using more amount of coolant directed towards the bur either by single port or by multiple ports [11-13]. During grinding debris accumulates on the surface of the bur decreases the cutting efficiency, because this partially blocks the penetration of the abrasive particles into the substrate. Clogging is enhanced by increased particle density and the presence of "undercuts" on the protruding part of the particles. Coolant helps in the prevention of accumulation of debris and improves the cutting efficiency.

Studies have shown that most dentists apply pressure ranging from 50 gm to 150 gm on the tooth while using high speed handpiece [14]. In our study most of the practioner's showed a positive affinity

towards the diamond abrasives and believed that coarseness is directly related to the cutting efficiency. Clinically, dentists often press harder when resistance to cutting is encountered, typically when the handpiece speed decreases or if "dulling" of the bur is sensed. The perception is that greater pressure will compensate for these effects and maintain CE. However, differences in bur CE became apparent only when higher or lower loads than the operative "norm" are used.

Manufacturers have introduced single-patient use diamond burs as a partial solution to the dental profession's concerns regarding infection control. Although disposable diamond burs have been marketed for years, limited information is available regarding cutting rates and durability [15]. Thus, if a diamond bur is not thoroughly cleaned of debris, or if it has been used for procedures with several patients and sterilized several times, it may not be an efficient cutting instrument. Studies have shown that with longer duration cutting efficiency decreases because of clogging of the bur. In our study, it was found that most practitioner's disposed their worn out burs into dustbins but actually these burs should have been sent back to the factory for recycling. So, thorough focus should be laid in educating the dentists to help in recycling old worn out burs.

Diseases may be transmitted by indirect contact when dental instruments contaminated by one patient are reused for another patient without adequate disinfection or sterilization between uses. The process of sterilization is designed to render instruments free of all microbial life, including bacterial spores, which can be very difficult to kill. Resterilization is simply the repeated application of a sterilization procedure to an instrument or device to remove contamination, allowing for its use in treating multiple patients. Dental burs come in a variety of shapes and sizes, all with very complex and detailed surface features. Ultrasonic cleaning can also be an effective and time-saving method of cleaning instruments, although it is not capable of removing all contamination [16]. This technique makes the debris to be removed and prevent clogging. Cold sterilization is an effective way of rendering the burs free of bacterial contamination. However, it will be wise to use single patient use bur as they not only provide an effective way of sterilization but also the cutting efficiency is good.

CONCLUSION

From the survey we came to know the operators attitude towards

one group of burs in terms of cutting efficiency. However, the need of the hour is to formulate the guidelines for bur selection, use and their disposal as it not only will standardize the choice, but misuse and applicability will be reduced. In terms of cutting efficiency tungsten carbide burs have better cutting rate than diamonds. Single patient burs should be the choice of burs as they have effective cutting efficiency and strict sterilization protocols can be followed.

REFERENCES

- [1] Theodore M. Roberson, Herald O Heymann, Edward Swift. Strudivant's Arts and science of operative dentistry. 4th edition. Mosby Publications. page 330.
- [2] Alfred Schuchard, Charles E. Watkins, comparative efficiency of rotary cutting instruments. *J Prosthet Dent.* 1965;15:5:908.
- [3] Watson TF, D Flanagan and DG Stone. High and low torque handpiece: cutting dynamics, enamel cracking and tooth temperature. *Br dent. J.* 2000; 188: 12: 680-86.
- [4] Sharon C. Siegel, Anthony Von Fraunhofer. Dental cutting with diamond burs: heavy-handed or light – touch? *J prosthodont.* 1999;8:3-9.
- [5] Sharon C. Siegel, Anthony Von Fraunhofer. Dental burs-what bur for which application? A survey of dental schools. *J Prosthodont.* 1999;8:258-26.
- [6] Sharon C. Siegel, Anthony Von Fraunhofer. Effect of handpiece load on the cutting efficiency of dental burs. *Machining Science and Technology.* 1997;1(1), 1-13.
- [7] Miroslav Janota, Use of scanning electron microscopy for evaluating diamond points. *J Prosthet Dent.* 1973; 29: 1: 88.
- [8] Sharon C. Siegel, Anthony Von Fraunhofer. Cutting efficiency of three diamond bur grit sizes. *J Am Dent Assoc.* 2000;131:1706.
- [9] Rafael Grajower, Arie Zeitchick, Joseph Rajstein. The grinding efficiency of diamond burs. *Jour Prosthet. Dent.* 1979;42:4:422.
- [10] Daniel F Galindo, Carlo Ercoli, Paul D Funken busch, Thomas D Greene, Mark E. Moss, Han- Joo Lee, et al. Graser and izchak Barzilay. Tooth preparation: a study on the effect of different variables and a comparison between conventional and channeled burs. *J prosthodont.* 2004;13:1:3-16.
- [11] Anthony Von Fraunhofer, Sharon C. Siegel. Using chemo-mechanically assisted diamond bur cutting for improved efficiency. *J Am Dent Assoc.* 2003; 134:53.
- [12] Sharon C. Siegel, Anthony Von Fraunhofer. The effect of handpiece spray patterns on cutting efficiency. *J Am Dent Assoc.* 2002;133: 184.
- [13] Sharon C. Siegel, Anthony Von Fraunhofer. Irrigation rates and handpieces used in prosthodontic and operative dentistry: Results of a Survey of North American Dental School Teaching. *J Prosthodont.* 2000;9:82-86.
- [14] Sharon C. Siegel, Anthony Von Fraunhofer. Assessing the cutting efficiency of dental diamond burs. *J Am Dent Assoc.* 1996;127:763.
- [15] Elizabeth S Pilcher, James D Tietge, Robert A. Draughn. Comparison of cutting rates among single-patient-use and multiple-patient-use diamond burs. *J Prosthodont.* 2000; 9: 66-70.
- [16] Archie Morrison and Susan Conrod. Dental burs and endodontic files: are routine sterilization procedures effective. *J Canadian Dental Assoc.* 2009;75:1:39.

PARTICULARS OF CONTRIBUTORS:

1. Senior Lecturer, Department of Prosthodontics, Crown and Bridge, GITAM Dental College and Hospital, Rushikonda, Visakhapatnam, India.
2. Professor and HOD, GITAM Dental Collage and Hospital, Visakhapatnam, India.
3. Reader, GITAM Dental Collage and Hospital, Visakhapatnam, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sumeet Sharma,
GITAM Dental Collage and Hospital, Visakhapatnam, India.
E-mail: sumeetsharma14@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Feb 19, 2013**

Date of Peer Review: **Apr 22, 2013**

Date of Acceptance: **Nov 12, 2013**

Date of Publishing: **Jan 12, 2014**

APPENDIX:

questionnaires proforma

A. SELECTION:
1. What Kind of Abrasive do you choose during tooth preparation.
(a) Diamonds.
(b) Tungsten Carbide.
(c) Both.
(d) Steel burs.
2. How do you choose the abrasive.

(a) From the catalogue provided by the manufacturer.
(b) By experience.
(c) Both a & b.
(d) By picking it up from the lot randomly.
3. The kind of sequential color coding do you follow while selecting the abrasives for tooth preparation.
(a) Green>Blue>Red>yellow.
(b) Blue>Red>Yellow.
(c) Both a & b.
(d) Blue>yellow.
4. The color coding available for the abrasives denote.
(a) Life of the bur.
(b) Its usage in particular area.
(c) Coarseness of the bur.
(d) None of the above.
5. How often do you change the bur during tooth preparation for the patient.
(a) Once.
(b) Twice.
(c) Multiple times.
(d) Never change the bur.
6. Which abrasives do you like the most based on their cutting efficiency? (- 1 person did not answer.
(a) Diamonds.
(b) Tungsten carbide.
(c) Both.
(d) Steel burs
B. USAGE:
1. How many times do you use the same bur.
(a) Discard after single use.
(b) Discard after using twice.
(c) Use the bur till it is worn's out.
(d) Never discard the bur.
2. How do you find the cutting efficiency of the bur with usage.
(a) Decreases with usage.
(b) Increases with usage.
(c) Remains static.
(d) Don't Know.
3. What kind of abrasives do you use for removal of metal crowns, old composite restoration and other restorative fillings.
(a) Tungsten carbide.
(b) Diamonds.
(c) Both.
(d) Steel burs.
4. How do you correct the high points on the restorations.
(a) By using TC burs.
(b) By using diamonds.
(c) Both.
(d) None of the above.
5. How do you rate the relationship of the hand piece with the old burs.
(a) Hand piece starts producing vibrations with old bur.
(b) Need to apply more pressure during tooth preparation.
(c) Both.
(d) Doesn't effect.
6. During the tooth preparation abutment can be damaged either because of
(a) Applying more pressure during tooth preparation.
(b) Not using proper coolant.
(c) Using old worn out burs.
(d) All of the above.
7. Does the coolant used during the tooth preparation has any significance in the cutting efficiency of the bur.
(a) Increases the cutting efficiency.

(b) Decreases the cutting efficiency.
(c) Doesn't play any significance.
(d) Obstructs the vision.
8. How do you finish the final teeth preparations
(a) Use special burs.
(b) Use end cutting burs.
(c) Use hand instruments and finishing burs.
(d) Use only hand instruments.
C. STERILIZATION AND DISCARDING OG THE BURS:
1. What are the various means of sterilization available for sterilizing the burs.
(a) Heat sterilization.
(b) Cold sterilization.
(c) Glass bead sterilization.
(d) All of the above.
2. Which sterilization procedure do you follow for sterilizing the tooth preparation burs.
(a) Cold/chemical sterilization.
(b) Glass bead sterilization.
(c) Dry heat sterilization.
(d) None of the above.
3. How many times do you sterilize the burs.
(a) Do it for every patient.
(b) Do once a day.
(c) Twice a day.
(d) Never do it.
4. How do you discard the worn out burs.
(a) Throw them in dustbin.
(b) Send them for recycling.
(c) Burn them away.
(d) None of the above.
5. How do you clean the clogged burs before subject to sterilization.
(a) Keep them under running tap water.
(b) Wipe them with a cotton / gauge.
(c) Never clean the clogging.
(d) Both A & B.
6. What do you feel about the role of sterilization in preserving the life of tooth preparation burs.
(a) Remain static.
(b) Increases the cutting efficiency of the bur.
(c) Decreases the cutting efficiency of the bur.
(d) Don't know.