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An In Vivo Comparison of Commercially Available Disposable Prophylaxis Angles

By Lisa S. Fleming, RDH, MA; Caren M. Barnes, RDH, MS; and Carl M. Russell, DMD, MS.

Abstract

A wide variety of disposable infection control products is being marketed including disposable prophylaxis angles. It was the purpose of this in vivo investigation to evaluate the clinical efficacy of five different brands of commercially available disposable prophylaxis angles. Utilizing a split-mouth design, 11 dental hygienists evaluated disposable prophylaxis angles while completing a routine oral prophylaxis. Fifty samples each of Brahler, Ash/Dentsply, Denticator, and Young Dental angles were compared to a control angle (Teledyne Getz). A questionnaire was completed by each operator following patient treatment (a total of 161 patients was treated). The questionnaire asked questions in which the four brands were compared to the Teledyne Getz disposable prophylaxis angle, followed by questions regarding individual performance characteristics of each brand of disposable prophylaxis angle. The comparative questions were analyzed utilizing a two-tailed z-test, and the individual performance characteristic questions were analyzed with a confidence interval. The results revealed that when the four brands of disposable prophylaxis angles were compared to the Teledyne Getz brand, the Teledyne Getz disposable prophylaxis angle performed better than the Brahler, Ash/Dentsply, and Denticator brands. However, the Young Dental disposable prophylaxis angle performed better than the Teledyne Getz brand. The results of the evaluation of the independent performance characteristics revealed that the Young Dental disposable prophylaxis angle performed more reliably than the other brands, while the Teledyne Getz disposable prophylaxis angle produced significantly less vibration than all of the other brands of disposable prophylaxis angles.

Introduction

A wide variety of new infection control products is being marketed as a result of the proposed infection control guidelines for dentistry mandated by the Occupational Safety and Health Administration and the Centers for Disease Control.[1-5] Of these many products, one that is of particular interest to dental hygienists is the disposable prophylaxis angle (DPA). Product reliability and durability have a major impact on disposable products, in that if disposable items do not function reliably or dependably and cannot be used throughout a procedure, cost and operator time-efficiency will be affected.

Because no objective analysis has been made of the mechanical or clinical efficacy of these disposable prophylaxis angles, this in vivo investigation was conducted to provide practitioners with comparative information. Specifically, it was the purpose of this in vivo investigation to compare five different brands of commercially available disposable prophylaxis angles: Brahler (Lawrence, KS), Denticator (Sacramento, CA), Ash/Dentsply (York, PA), Teledyne Getz (Elk Grove Village, IL), and Young Dental (Earth City, MO), for their efficacy and efficiency in routine polishing procedures. The disposable angles were compared for reliability, durability, heat production, vibration, and operator preference. This in vivo investigation followed an in vitro investigation of these same commercially available disposable prophylaxis angles.

Methods and Materials

Two hundred patients in need of an oral prophylaxis at the University of Alabama School of Dentistry were selected for the study. The patients were required to be in good health and at least 18 years of age, and have a minimum of 20 natural teeth.

Fifty samples of each of the Brahler, Denticator, Ash/Dentsply, and Young Dental disposable prophylaxis angles were compared to the Teledyne Getz DPA, which served as the control angle. Each brand of DPA and the control DPA were randomly assigned for use on the right or left side of the patient's mouth, and each different brand of DPA was randomly assigned for patient treatment. New Midwest Rhino XP slow-speed handpieces (Midwest Dental Products Corporation, Des Plaines, IL) and Nupro fine-grit prophylaxis paste (Johnson & Johnson, New Brunswick, NJ) were utilized for the polishing procedures.

Twelve registered dental hygienists served as operators in this study. None of the dental hygienists who participated in the study had prior experience with any disposable prophylaxis angles. The dental hygienists completed each questionnaire immediately following patient treatment, which consisted of a routine oral prophylaxis that included scaling and polishing.

The questionnaire asked that the dental hygienists classify the patient's stain and plaque as light, medium, or heavy. Further, the dental hygienists were asked to compare the control DPA to the other brand of DPA used on each patient for the following features: ability to work throughout the procedure, efficiency in removing stain and plaque, ability of the rubber cup to conform to the tooth surface, reliability, ease with which the angle fit onto the handpiece, comfort of holding the angles, ability to work

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Table I

Summary of results from comparative questions.

Summary of questions 5, 6, 7, 8, 9, 10, 11, 18
Pairwise comparison of Teledyne Getz angle to four other brands

Question and competing angles	Teledyne Getz effectiveness: More	Same	Less	Total	Of those more/ less effective than Teledyne Getz % More	Total	Significant difference from 50% (at .05 level)?
Ability to remove stain (Q5)							
Denticator	37.78	40.00	22.22	45	62.97	27	no
Young	7.89	57.89	34.21	38	18.74	16	yes
Brahler	59.46	21.62	18.92	37	75.86	29	yes
Dentsply	51.22	36.59	12.20	41	80.78	26	yes
Ability to remove plaque (Q6)							
Denticator	35.56	44.44	20.00	45	64.00	25	no
Young	7.89	63.16	28.95	38	21.42	14	yes
Brahler	59.46	32.43	8.11	37	88.00	25	yes
Dentsply	48.78	43.90	7.32	41	86.95	23	yes
Ability of the cup to conform to the tooth surface (Q7)							
Denticator	55.56	24.44	20.00	45	73.53	34	yes
Young	34.21	23.68	42.11	38	44.82	29	no
Brahler	70.27	18.92	10.81	37	86.67	30	yes
Dentsply	65.85	29.27	4.88	41	93.10	29	yes
Reliability (Q8)							
Denticator	48.89	24.44	26.67	45	64.70	34	no
Young	7.89	42.11	50.00	38	13.63	22	yes
Brahler	64.86	18.92	16.22	37	80.00	30	yes
Dentsply	58.54	29.27	12.20	41	82.77	29	yes
Ease of fit into the handpiece (Q9)							
Denticator	55.56	37.78	6.67	45	89.30	28	yes
Young	31.58	60.53	7.89	38	80.01	15	yes
Brahler	59.46	29.73	10.81	37	84.62	26	yes
Dentsply	39.02	58.54	2.44	41	94.11	17	yes
Ability to endure the pressure of polishing (Q10)							
Denticator	48.89	28.89	22.22	45	68.75	32	yes
Young	18.42	57.89	23.68	38	43.74	16	no
Brahler	62.16	27.03	10.81	37	85.19	27	yes
Dentsply	53.66	36.59	9.76	41	84.62	26	yes
Comfort of handling while in use (Q11)							
Denticator	48.89	33.33	17.78	45	73.33	30	yes
Young	13.16	60.53	26.32	38	33.34	15	no
Brahler	54.05	32.43	13.51	37	79.99	25	yes
Dentsply	48.78	39.02	12.20	41	79.99	25	yes
Overall, which do you prefer (Q18)							
Teledyne over Denticator	73.33			45			yes
Teledyne over Young	31.58			38			yes
Teledyne over Brahler	78.38			37			yes
Teledyne over Dentsply	90.24			41			yes

Table II

Summary of results from independent performance questions.

Summary of questions, 3, 4, 12, 13, 14, 15, 16, 17

Questions concerning independent performance of angles	% Yes	Total	95% confidence interval for % yes	
Did the angle work the entire time? (Q3, Q4)				
Teledyne	78.26	161	71.89	84.63
Denticator	91.11	45	82.79	99.43
Young	94.74	38	87.64	100.00
Brahler	72.97	37	58.66	87.28
Dentsply	70.73	41	56.80	84.66
Did the angle work without hesitation? (Q12, Q13)				
Teledyne	57.76	161	50.13	65.39
Denticator	66.67	45	52.90	80.44
Young	86.84	38	76.09	97.59
Brahler	35.14	37	19.76	50.52
Dentsply	48.78	41	33.48	64.08
Did the angle work without excessive heat production? (Q14, Q15)				
Teledyne	91.93	161	87.72	96.14
Denticator	97.78	45	93.48	100.00
Young	92.11	38	83.54	100.00
Brahler	86.49	37	75.48	97.50
Dentsply	95.12	41	88.53	100.00
Did the angle work without excessive vibration? (Q16, Q17)				
Teledyne	89.44	161	84.69	94.19
Denticator	33.33	45	19.56	47.10
Young	65.79	38	50.71	80.87
Brahler	21.62	37	8.36	34.88
Dentsply	24.39	41	11.25	37.53

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without hesitation, and heat and vibration production. Finally, each dental hygienist was asked his or her overall preference between the two angles used on each patient. The dental hygienists were asked to rate the different brands of disposable prophylaxis angles as better than the control angle, no different from the control angle, or not as effective as the control angle.

Results

The dental hygienists who participated in this study were instructed as to the use of the questionnaire. One of the participants misunderstood the instructions; therefore, those responses were not appropriate. The distribution of her responses was approximately balanced among the groups and thus could be deleted easily without affecting the study design. The working sample size was, therefore, 161 (originally 200).

Questions 5-11 and 18 all involved comparison of the four brands of disposable prophylaxis angles to the Teledyne Getz DPA. The questions asked the operator to evaluate whether each brand of DPA was more effective than, as effective as, or less effective than the Teledyne Getz DPA. (The percentages of responses in each category are presented in Table I.) Then, for the responses indicating a preference, it was determined if that percentage was significantly different from 50%. It was reasoned that this technique would test for a difference in the preference for the angles among those respondents who had a preference. (For this test, "the same" was not considered). The test for the significance of the difference from 50% was the normal approximation to the binomial (2-tailed z-test) set at a level of .05.

To summarize the comparison of preference between the Teledyne Getz DPA and the Denticator DPA, the Teledyne Getz DPA was preferred over the Denticator DPA to a statistically significant level for ability of the rubber cup to conform to the tooth surface (73.5%), ease of fit onto the handpiece (89.3%), ability to endure the pressure necessary for polishing (68.7%), comfort of handling (73.3%) and overall preference (68.7%). There was no statistically significant difference in the preference for the Teledyne Getz DPA or the Denticator DPA for ability to remove stain and plaque, or for reliability.

The Young Dental DPA, on the other hand, was found to be preferred to a statistically significant level over the Teledyne DPA for ability to remove stain (81.2%) and plaque (78.5%), reliability (86.4%), comfort of handling (86.7%) and overall operator preference (73.3%). There was no statistically significant difference in the operator preference when comparing the Young Dental DPA to the Teledyne Getz DPA, regarding the ability of the rubber cup to conform to the tooth surface and ability of the angle to

endure the pressure necessary for polishing.

In comparing the respondents' preference for either the Brahler DPA or the Teledyne Getz DPA, the Teledyne Getz DPA was preferred over the Brahler DPA at a statistically significant level for ability to remove stain and plaque, ability of the rubber cup to conform to the tooth surface, reliability, ease of fit onto the handpiece, ability to endure the pressure of polishing, comfort of handling, and operator's overall preference. Likewise, the Teledyne Getz DPA was preferred to a statistically significant level over the Ash/Dentsply DPA for all feature inquiries.

The questions 3, 4, and 12-17 all concerned the independent performance of the specific brands of disposable prophylaxis angles. The positive responses to these questions are presented in Table II. Additionally, 95% confidence levels were calculated for the positive responses to the questions and are also presented in Table II. The 95% confidence intervals assess the value range in which one might reasonably expect to find the true value, which is the percentage of positive responses in this case. The lower limit of the confidence interval is a point below which the true value is unlikely to be found. Analogously, the upper limit of the confidence interval is a point above which the true value is unlikely to be. Therefore, for questions 3 and 4, which asked if the control (Teledyne Getz) DPA and other specific brands of disposable prophylaxis angles worked throughout the procedure, it is evident that the trend from low to high is as follows: Ash/Dentsply—56.7%, Brahler—58.6%, Teledyne Getz—71.8%, Denticator—82.7%, and Young Dental—87.6%. As can be seen, the Young Dental DPA did not have any interval in common with Brahler DPA or Ash/Dentsply DPA, and was significantly better than either the Brahler DPA or Ash/Dentsply DPA.

Questions 12 and 13 inquired about the ability of the control (Teledyne Getz) DPA and all of the other specific brands of disposable prophylaxis angles to work without hesitation. The results of the confidence interval reveal the following trend (from low to high): Brahler—19.7%, Ash/Dentsply—33.4%, Teledyne Getz—50.1%, Denticator—52.9%, and Young Dental—76.0%. The Young Dental DPA did not share any interval in common with and was significantly better than the following brands of disposable prophylaxis angles: Teledyne, Ash/Dentsply, and Brahler, regarding this performance characteristic.

Questions 14 and 15 asked about the ability of the control DPA (Teledyne Getz) and all the other DPA brands to work without producing excessive heat. The trend in the confidence interval (from low to high) is as follows: Brahler—75.4%, Young Dental—83.5%, Teledyne Getz—87.7%, Ash/Dentsply—88.5%, and Denticator—93.4%. Results of the confidence interval reveal that all of the DPA brands are significantly different from each other regarding this particular performance characteristic and therefore can be expected to work consistently without producing excessive heat.

Finally, questions 16 and 17 inquired about the ability of the control DPA (Teledyne Getz) and all other DPA brands to work without producing excessive vibration. The trend (low to high) of the confidence interval for this performance characteristic is Brahler—8.3%, Ash/Dentsply—11.2%, Denticator—19.5%, Young Dental—50.7%, and Teledyne Getz—84.6%. The Teledyne DPA did not share any interval in common with any of the other DPA brands and was significantly better than all other DPA brands regarding the production of vibration.

Discussion

It was the purpose of this study to investigate the clinical efficacy of five different brands of disposable prophylaxis angles (Brahler, Ash/Dentsply, Denticator, Teledyne Getz, and Young Dental) in routine polishing procedures. Specific questions utilized in the questionnaire sought comparative information between a control DPA (Teledyne Getz) and all of the other brands of disposable prophylaxis angles investigated. Additionally, other questions sought information relative to independent performance characteristics exhibited by each brand of DPA. While it was never the intent of this investigation to rank the clinical performance of these brands of disposable prophylaxis angles, nevertheless some brands did perform consistently better than others. In reviewing results of the portion of the questionnaire that sought information regarding the comparison of the control DPA (Teledyne Getz) brand and all of the other brands investigated, the Teledyne DPA, in general, performed better and was preferred over the Brahler, Ash/Dentsply, and Denticator disposable prophylaxis angles. However, in general, the Young Dental DPA performed better and was preferred over the Teledyne Getz DPA.

When examining the data relative to the independent performance characteristics of each brand of DPA, the Young Dental DPA generally performed more reliably than all other brands of disposable prophylaxis angles, specifically regarding the ability to work throughout the procedure and without hesitation. All brands of disposable prophylaxis angles were consistent in not producing excessive heat, while the Teledyne Getz DPA produced significantly less vibration than all of the other DPA brands.

As the demand for disposable products increases due to infection control measures, it can be expected that the demand for disposable prophylaxis angles will also increase. Furthermore, it can be expected that manufacturers will continuously improve these disposable prophylaxis angles. As improvements are made in disposable prophylaxis angles, further investigations will be conducted in order to keep abreast of product reliability and durability.

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