

Absorbency Properties of Different Brands of Standardized Endodontic Paper Points

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A comparative study of the absorbency properties of different endodontic paper points has been conducted. Twenty standardized absorbent paper points, size 30, from 13 bands (Dentaline, Zipperer, Kerr, Diadent, Roeko novo, Roeko color, Maillefer, P.D., Schein, Spectrapoint, Proclinic, Euronda, and Alpro) of 12 manufacturers were tested. Each dry paper point was weighted using an electronic laboratory balance. A length of 16 mm from the tip was then lowered in distilled water for 5 s, the paper point was weighted again, and the difference between both measurements was taken as the value of the fluid absorbed. Diadent, Kerr, and Dentalite showed significantly higher absorbencies ($p < 0.05$) than standardized paper points of the remaining brands. The study demonstrates a wide variation in the absorbency properties of this dental accessory.

Three-dimensional root filling, an indispensable condition to isolate the root canal system in endodontic therapy, cannot be achieved if the extirpated and machined canal is not dry before obturation. Drying of the root canal is therefore an important step for successful hermetic sealing, given that the adhesion and physicochemical properties of filling materials are altered by moisture.

Although different instruments have been designed for drying root canals (1), standardized absorbent paper points are extensively used in endodontic therapy, not only to dry root canals after irrigation, but also to carry antiseptic or disinfecting dressings, and to transfer bacteriological samples from the root canal to the culture medium. However, little attention has been paid to the assessment of biological, physical, and mechanical properties of this dental accessory (2-4). The purpose of the present study was to compare the absorbency properties of different brands of standardized endodontic paper points available on the market.

MATERIALS AND METHODS

Standardized endodontic absorbent paper points, size 30, from 13 different brands of 12 manufacturers were used for this study (Table 1). Twenty absorbent paper points from each brand were selected at random from packages with assorted points. A total of 260 points were tested.

Each dry absorbent paper point was weighted using an electronic laboratory balance (Sartorius, model 1712 MP8; Göttingen, Germany). A length of 16 mm from the tip was then lowered in distilled water for 5 s, the paper point was weighted again, and the difference between both measurements was taken as the value of the fluid absorbed.

To determine which brands presented the highest absorbency, a statistical analysis of the results obtained was conducted using the Kruskal-Wallis test and the Mann-Whitney *U* test. Differences in relation to the standard deviation were assessed by means of the *F* test (Fisher-Snedecor). The relationship between the variables dry weight and fluid absorbed was analyzed with the Pearson's product-moment correlation coefficient (*r*).

RESULTS

Three brands of standardized endodontic paper points (Diadent, Kerr, and Dentalite) showed significantly higher absorbencies than

TABLE 1. Brands and manufacturers of standardized absorbent paper points used in the study

| Name | Manufacturer | City, Country |
|--------------|-----------------------------|-------------------------|
| Diadent | Diamond Dental Industrial | Chongiu City, Korea |
| P.D. | Produits Dentaires | Vevey, Switzerland |
| Maillefer | Les fils d'August Maillefer | Ballaigues, Switzerland |
| Euronda | S.P.A. | Montechia, Italy |
| Roeko novo | Roeko | Langenau, Germany |
| Roeko color | Roeko | Langenau, Germany |
| Zipperer | Vereignite Dental Werke | Munich, Germany |
| Dentalite | Dentalite, S.A. | Madrid, Spain |
| Kerr | Sybron Kerr | Romulus, MI, USA |
| Alpro | Dental Produkte | Munich, Germany |
| Proclinic | Proclinic S.A. | Barcelona, Spain |
| Shein | Henry Shein | New York, NY, USA |
| Spectrapoint | The Hygenic Corporation | Akron, OH, USA |

TABLE 2. Mean value, standard deviation (SD), and coefficient of variation (CV) of dry and postimmersion standardized endodontic paper points and for fluid absorbed

| Name | Dry Weight | | Postimmersion Weight | | Fluid Absorbed | |
|--------------|----------------------------|--------|---------------------------|--------|---------------------------|--------|
| | Mean \pm SD (in g) | CV (%) | Mean \pm SD (in g) | CV (%) | Mean \pm SD (in g) | CV (%) |
| Dentalite | 0.0045848 \pm 0.0001779 | 3.57 | 0.0128455 \pm 0.0006453 | 5.02 | 0.0078670 \pm 0.0006329 | 8.04 |
| Zipperer | 0.0035900 \pm 0.0000747 | 2.08 | 0.0090620 \pm 0.0002932 | 3.23 | 0.0054720 \pm 0.0002588 | 4.72 |
| Kerr | 0.0051000 \pm 0.0003067 | 6.01 | 0.0135530 \pm 0.0010069 | 7.42 | 0.0084530 \pm 0.0007543 | 8.92 |
| Diadent | 0.0057765 \pm 0.0002490 | 4.31 | 0.0148190 \pm 0.0007242 | 4.88 | 0.0090425 \pm 0.0005607 | 6.20 |
| Roeko color | 0.0040845 \pm 0.0001194 | 2.92 | 0.0087070 \pm 0.0004278 | 4.91 | 0.0046225 \pm 0.0003457 | 7.47 |
| Maillefer | 0.00322095 \pm 0.0001293 | 4.02 | 0.0082630 \pm 0.0003998 | 4.83 | 0.0050535 \pm 0.0003413 | 6.75 |
| Roeko novo | 0.0044355 \pm 0.0002666 | 6.01 | 0.0085315 \pm 0.0005394 | 6.32 | 0.0040960 \pm 0.0004993 | 12.19 |
| P.D. | 0.0032560 \pm 0.0001130 | 3.47 | 0.0087605 \pm 0.0006264 | 7.15 | 0.0055045 \pm 0.0005890 | 10.70 |
| Shein | 0.0042200 \pm 0.0002286 | 5.41 | 0.0072965 \pm 0.0005377 | 7.36 | 0.0030765 \pm 0.0005542 | 18.01 |
| Spectrapoint | 0.0042345 \pm 0.0001074 | 2.53 | 0.0067395 \pm 0.0004561 | 6.76 | 0.0025050 \pm 0.0004569 | 18.24 |
| Proclinic | 0.0064495 \pm 0.0002688 | 4.16 | 0.0088895 \pm 0.0004625 | 5.20 | 0.0024400 \pm 0.0004277 | 17.52 |
| Euronda | 0.0052445 \pm 0.0002839 | 5.41 | 0.0078055 \pm 0.0004016 | 5.14 | 0.0025610 \pm 0.0004642 | 18.12 |
| Alpro | 0.0050240 \pm 0.0001907 | 3.79 | 0.0098350 \pm 0.0009414 | 9.29 | 0.0048110 \pm 0.0009281 | 19.29 |

TABLE 3. Correlation between dry weight of standardized endodontic paper points and fluid absorbed

| Name | r Coefficient | p Value |
|--------------|---------------|---------|
| Dentalite | -0.0700 | 0.385 |
| Zipperer | 0.3463 | 0.067 |
| Kerr | 0.7579 | 0.0001 |
| Diadent | 0.5305 | 0.008 |
| Roeko color | 0.5958 | 0.003 |
| Maillefer | 0.3016 | 0.098 |
| Roeko novo | -0.1107 | 0.321 |
| P.D. | 0.2451 | 0.149 |
| Shein | -0.2772 | 0.118 |
| Spectrapoint | -0.1552 | 0.299 |
| Proclinic | -0.1795 | 0.224 |
| Euronda | -0.5114 | 0.011 |
| Alpro | -0.0322 | 0.446 |

DISCUSSION

Standard deviations of mean values of absorbency varied between 0.0002588 to 0.0009281, depending on the brand of endodontic paper points tested. Accordingly, this finding indicates that there are some brands, such as Alpro, with poor homogeneity in its standardization because of the high dispersion in the results obtained (SD = 0.0009281). However, paper points with the highest absorbing capacity (Diadent, Kerr, and Dentalite) showed high SD values.

No correlation was found between dry weight and absorbing capacity for any brand of endodontic paper points, except for Kerr, Diadent, and Roeko color. Based on the different substances added to absorbent paper points for their conservation (CMC-natriumsal, carboxymethylcellulose, Baumharze resin, and alcohol), it may be hypothesized that absorbency would be more related to the structure and chemical composition of fibers than to the amount of paper. These results partially agree with those reported by Edwards and Bandyopadhyay (2), who found no correlation between the size and absorbency of the points. Silva (4) observed that some brands, such as Maillefer and Kerr, showed a greater absorbing capacity than absorbency that would relate to their own dry weight. In Silva's study, however, greater sizes were tested and a different methodology was used. In our study, Euronda paper points showed a statistically significant inverse correlation between dry weight and fluid absorbed, which may be attributed to a difference in the trabecular density of cellulose fibers. Absorbency would be impaired by high trabecular density when the tip of the absorbent paper point was lowered into distilled water for a short period of time, as in our study. The present results suggest that better quality control is needed during the manufacture of these dental accessories.

Under the experimental conditions of the present study, we conclude that absorbency of standardized absorbent paper points of three brands (Diadent, Kerr, and Dentalite) was significantly higher ($p < 0.05$) than that of the remaining 10 brands tested. Differences among these three brands were also statistically significant. By contrast, Euronda, Spectrapoint, and Proclinic paper points showed the poorest performance. Lower standard deviation values of Zipperer, Maillefer, and Roeko absorbent paper points indicate a better standardization control, whereas more disperse values were obtained for P.D., Dentalite, Kerr, and Alpro endodontic absorbent paper points.

the remaining 10 brands tested ($p < 0.05$) (Table 2). Differences in the mean value of fluid absorbed among Diadent ($9,045 \times 10^{-7}$ g), Kerr ($84,530 \times 10^{-7}$ g), and Dentalite ($78,670 \times 10^{-7}$ g) were also statistically significant ($p < 0.01$). There were no statistically significant differences between Zipperer and Maillefer absorbent paper points, between Maillefer and Alpro, and between Alpro and Roeko color. However, the absorbency of Roeko color ($46,225 \times 10^{-7}$ g) was significantly higher than that of Roeko novo ($40,960 \times 10^{-7}$ g) ($p = 0.0001$). Mean values of absorbed fluid for Spectrapoint, Proclinic, and Euronda were similar ($p > 0.05$). When standard deviations of the mean values of fluid absorbed were considered, Maillefer, Zipperer, and Roeko color paper points showed a significantly higher level of homogeneity in the 20 samples tested ($p < 0.05$) than points from brands with better results in absorbing capacity. With regard to the coefficients of variation, Zipperer, Diadent, and Maillefer showed the lowest values (4.72, 6.20, and 6.75, respectively), whereas for Shein, Spectrapoint, Diadent, Euronda, and Alpro paper points, 3-fold to 5-fold greater values were found.

There was a statistically significant positive correlation between dry weight and fluid absorbed for paper points from Kerr ($r = 0.7579$, $p = 0.0001$), Roeko color ($r = 0.5958$, $p = 0.003$), and Diadent ($r = 0.5305$, $p = 0.008$) (Table 3). A positive correlation that was not statistically significant was also observed for Zipperer, Maillefer, and P.D. points. By contrast, a negative correlation was found for Euronda paper points ($p = 0.011$) and the remaining brands ($p > 0.05$) (Table 3).

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A Word for the Wise

Sleazy and tawdry have similar meanings and interesting origins. A poor quality cloth imported into England from Silesia evolved as "sleazy." Fairs were held on saints' days, and one held on St. Audrey's Day attracted annually a group of peddlers who sold shoddy goods. So, "bought on St. Audrey's" became "tawdry."

A. Mercer