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The magnetic pole fixed or moving? A P Dias* and B W Darvell Faculty of Dentistry The University of Hong Kong

The theoretical force distance (f d) relationship between a magnetic dipole and a magnetically permeable plane has been shown at a previous meeting to be according to the inverse square law at small separations and an inverse fourth power relationsn p when the separation is larger However, attempts at experimental verification of such relationships with commercial dental magnets as well as with thin long magnetic rods were not entirely successful One problem seemed to be the location of the magnetic pole within a magnetic assembly especially with a non magnetic cladding Different models with offset distances and scaled force were tried but were inadequate to describe the f d relationship throughout the range of separation The problem was partly soluble if it was assumed that the position of the magnetic pole within a magnet was movable when the magnet acted against a magnetically permeable plane – the pole moving as if it were attached to a spring fixed at one end The best fit to data was obtained with the separation d given by $d = k \log(F) + q / 2\sqrt{F} - x$ From plots of the fitted parameters, it was apparent that the greater the pole strength the deeper the pole appeared to be within the magnet As the magnet was moved nearer the permeable plane the pole appeared to move nearer the end of the magnet but the logarithmic dependancy of this was equivalent to the spring becoming progressively stiffer The moving pole model, however although relevant to thin long dipoles, did not fit the data for commercial dental magnets (short dipoles), the behaviour of which appeared to be more complex.

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Compressive Profiles of Condensable Resin Composite Restoratives E HUGET* (University of Tennessee Memphis Tennessee)

The aim of this study was to compare the compressive properties of three condensable resin composites The test materials were Alert™ (Jeneric®/Pentron®) Solitaire®Polyglas® (Heraeus Kulzer) and 3M™ Restorative Z100™ Before testing all specimens were aged in water at 37 C for seven, or 28 days Compressive strength (CS) Young s modulus (E) and toughness (T) were measured by axial compression of light cured specimens (dia = 5 mm and height = 8 mm) Strain values for calculation of E and T were obtained by a crosshead travel method Each 10-specimen data set was subjected to a two-way Model I ANOVA Thereafter one way factorial ANOVA s and Scheffé F tests were used to compare multiple means The effect of material on CS ($p = 0.0001$) E ($p = 0.0001$), and T ($p = 0.0002$) was highly significant Conversely the effect of aging time was not significant as shown by p values ranging from 0 4866 (E) to 0 9051 (T) Interactions of the two fixed factors on CS ($p = 0.3059$) E ($p = 0.8889$) and T ($p = 0.9748$) were not significant Group means and standard deviations are shown in the table Identical letters in the same column denote means that are not statistically different (alpha = 0 05)

Material and Age	Compressive Strength (MPa)	Elastic Modulus (GPa)	Toughness (mMN/m³)
Z100 7d	393 ± 21 a	21 5 ± 1 58 a	6 2 ± 0 97 a b
Z100, 28d	390 ± 24 a	21 1 ± 1 08 a	6 2 ± 0 89 a b
Alert 7d	337 ± 10 b	10 1 ± 0 68 b	5 7 ± 0 76 b
Alert, 28d	342 ± 20 b	9 9 ± 0 82 b	5 8 ± 0 92 b
Solitaire, 7d	303 ± 19 c	6 5 ± 0 92 c	7 2 ± 1 16 a
Solitaire, 28d	293 ± 14 c	6 5 ± 0 64 c	7 3 ± 1 05 a

Overall, the findings reflect differences in compositional and structural features among the three resin composites Supported by a grant from the University of Tennessee Dental Alumni Association

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Shelf Life of Dental Restorative Composites A KARMAKER*, A PRASAD, (Jeneric/Pentron, Inc , Wallingford, CT, USA)and P P PAUL (Southwest Research Institute, San Antonio, TX, USA)

The shelf life of dental restorative materials is greatly influenced by the conditions under which they are stored and shipped, sometimes, conditions of high temperature and high humidity are encountered that dramatically reduce the shelf life of these materials The objective of this investigation was to monitor changes in flexural properties (strength and modulus as per ISO 4049 and 10477) of four different composite formulations that were aged for different times in a chamber maintained at 60°C and 90% humidity The compositions involved a visable light curable direct composite (A), a catalyst paste of dual cure composite resin cement (B), a base paste of dual cure composite resin cement (C) and a visable light/heat curable indirect composite (D) The results indicate that formulations containing BPO (B) or Azo compound (D) do not have long shelf life under the above storage conditions, as they polymerized in one week The light curable pastes (A&C) however, show no degradation in properties even after 12 weeks of aging at 60°C and 90% humidity Previous study on chemical cured composites suggests an accelerated aging of 15 days at 55°C being equivalent to about 55 months of real-time clinical-condition storage It is concluded that light curable composites have a much longer shelf life in comparison to either dual-cure or light/heat activated restorative materials under conditions of high heat and high humidity

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Microhardness of different materials based on resins Six Months Results I SOLER J ELLACURIA J M PRADO* N MINGUEZ, C LLENA and L FORNER Universities of the Basque Country and Valencia (Spain)

The objective of this study was to use the Vickers indentation technique to measure the effect of aging time in the microhardness of different definitive restorative materials based on resins Five materials were used Two flowable composites Revolution® and Tetric Flow® Two sealants Delton Plus® and Heliosеal® and one flowable compomer (polyacid-modified composite resin) Compoglass Flow® Three cylindrical specimens of each material, 4 mm of thickness and 4 mm of diameter were prepared Each sample was mounted in epoxy resin and the tested surfaces were ground and polished until 0 3 µ alumina powder The specimens were stored in deionized water at 37°C for six months Nine Vickers indentations were realized and measured on the surface of each specimen at the 24 hours, 7 days and 1 3 and 6 months under a load of 100 g for 15 sec with a Leco hardness tester machine The data were analyzed by Anova and Tukey tests for multiple comparison among the means, p<0 05 Results are summanzed as follows

MATERIAL	24 Hours	7 Days	1 Month	3 Months	6 Months
CGLASS FLOW	23 (0 45)	22 (0 45)	25 (0 45)	27 (0 45)	26 (0 45)
DELTON PLUS	20 (0 45)	21 (0 45)	19 (0 45)	18 (0 45)	20 (0 45)
HELOSEAL	20 (0 45)	22 (0 45)	20 (0 45)	22 (0 45)	22 (0 45)
REVOLUTION	39 (0 45)	39 (0 45)	39 (0 45)	39 (0 45)	38 (0 45)
TETRIC FLOW	40 (0 45)	40 (0 45)	40 (0 45)	40 (0 45)	39 (0 45)

These results suggest that the storage in water for six months does not cause significant variations in the surface hardness of the studied materials

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Influence of Storage For One Year on Microhardness of Compomers J ELLACURIA I SOLER C PRADO* E GUINEA P CEARRA and F GARCIA-GODOY Universities of The Basque Country (Spain) and San Antonio, Texas (USA)

Previous studies (*JDR* 77 #459 #460 1998) have shown there are variations in the microhardness of different glass ionomer cements The purpose of this study was to investigate the time-dependent changes of the Vickers microhardness of different polyacid-modified composite resins or compomers Six materials were used Hytac® Compoglass® Dyract® Compoglass F® Dyract AP® and F2000® Three cylindrical specimens of each material 4 mm of thickness and 4 mm of diameter were prepared and mounted in epoxy resin The tested surfaces were ground and polished until 0 3 µ alumina powder The specimens were stored in deionized water at 37° C for one year Nine indentations were realized and measured on the surface of each specimen at the 24 hours at 7 and 30 days and at 3 and 12 months under a load of 200 g for 20 sec with a Leco hardness tester machine The data were analyzed by Anova and Tukey tests for multiple comparison among the means p<0 05 Results are summarized as follows

MATERIAL	24 Hours	7 Days	30 Days	90 Days	365 Days
HYTAC	104 (0 96)	95 (0 96)	87 (0 96)	82 (0 96)	75 (0 96)
F 2000	105 (0 96)	106 (0 96)	89 (0 96)	99 (0 96)	100 (0 96)
COMPOGLASS	78 (0 96)	70 (0 96)	68 (0 96)	71 (0 96)	58 (0 96)
COMPOGLASS F	61 (0 96)	55 (0 96)	49 (0 96)	48 (0 96)	48 (0 96)
DYRACT	76 (0 96)	74 (0 96)	72 (0 96)	78 (0 96)	61 (0 96)
DYRACT AP	59 (0 96)	53 (0 96)	55 (0 96)	52 0 96)	48 (0 96)

These results suggest the Vickers microhardness of all the materials suffers variations in time except for F2000 The microhardness is lower at the 12 months than at the 24 hours for all of them except for F2000®

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Effects of Fluoride Varnishes on Surface Roughness of Esthetic Restorative Materials M L WETMORE*, D P WARREN, J M POWERS (Houston Biomaterials Research Center, University of Texas-Houston Dental Branch, Houston, TX, USA)

Fluoride varnishes are an alternative to 1 23% APF treatment for those patients with esthetic restorations This study determined the effect of fluoride varnishes (Duraphat, DP, Fluor Protector, FP) and water (control) on the surface roughness of 3 esthetic materials (composite, TPH, compomer, DAP hybrid ionomer, FLC) Disks of each material (2 mm x 10 mm) were prepared in split molds Groups were immersed in DP, FP or water for 4 h Specimens were brushed with a soft bristled toothbrush and toothpaste using gentle strokes for 2 min Measurements of surface roughness (Ra, µm) were made using a surface profilometer Five tracings of each of 3 specimens were measured Means and standard deviations of Ra are listed for the composite Analysis of variance showed no significant differences ($p<0.05$) in Ra among DP, FP or water nor before application versus after brushing No significant changes in surface roughness of the composite were observed after removal of 2 fluoride varnishes by brushing Materials provided by companies. Funded by Houston Biomaterials Research Center

	DP	FP	Water
Before application	0 08 (0 05)	0 06 (0 02)	0 09 (0 05)
After brushing	0 09 (0 03)	0 08 (0 02)	0 07 (0 04)

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Surface Roughness of Microhybrid Resin Composites L B ROEDER*, W H TATE, J M POWERS (Houston Biomaterials Research Center, UT-Houston Dental Branch, Houston, TX, USA)

Microhybrid composites have been introduced to provide increased polishability Surface roughness was evaluated after use of 2 different polishing systems (Enhance/Prisma Gloss, E/PG, Sof lex, SL) on 4 composites (Z250, KO 4, R30, Palfique Estelite) Five specimens per condition were cured in acrylic wells 6 mm in diameter and 3 mm in depth against a mylar strip Specimens were finished with a 12-fluted carbide finishing bur and then polished with E/PG or SL Average surface roughness (Ra,µm) was measured using a surface profilometer with a tracing length of 2 mm and a cutoff value of 0 25 mm Five tracings were recorded for each specimen Means of Ra (n=25) with standard deviations in parentheses are listed Tukey Kramer intervals ($p<0.05$) for comparisons among composites and between polishing agents were 0 03 and 0 02 µm Significant differences between composite materials existed when finished with the resin finishing system. Aluminum oxide discs finished the surface to a significantly smoother surface. Materials provided by companies Funded in part by 3M, Kerr, Caulk Tokuyama

Finish	Z250	K0.4	R30	EST
Mylar	0 04 (0 02)	0 03 (0 02)	0 07 (0 04)	0 11 (0 06)
Carbide bur	0 33 (0 12)	0 42 (0 16)	0 41 (0 21)	0 34 (0 13)
E/PG	0 37 (0 13)	0 20 (0 06)	0 31 (0 07)	0 43 (0 23)
Mylar	0 03 (0 02)	0 04 (0 02)	0 04 (0 03)	0 08 (0 03)
Carbide bur	0 51 (0 19)	0 44 (0 15)	0 52 (0 16)	0 41 (0 12)
SL	0 15 (0 03)	0 09 (0 03)	0 09 (0 02)	0 12 (0 05)

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Surface Roughness of Packable Resin Composites W H TATE*, L B ROEDER, J M POWERS (Houston Biomaterials Research Center, University of Texas Houston Dental Branch, Houston, TX, USA)

The effect of finishing and polishing on surface roughness of packable composites is an important consideration in the restorative process Surface roughness was evaluated after use of 2 polishing systems (One Gloss/SuperBuff, OG/SB, Sof-lex Discs, SL) on 4 composites (Z250, P60, Prodigy Condensable, PC, Pyramid Enamel, PE) Five specimens per condition were cured against a mylar strip Specimens were finished with a 12-fluted carbide finishing bur and then polished with OG/SB or SL Average surface roughness (Ra,µm) was measured using a surface profilometer with a tracing length of 2 mm and a cutoff value of 0 25 mm Five tracings were recorded for each specimen Means of Ra (n=25) with standard deviations in parentheses are listed Tukey-Kramer intervals ($p<0.05$) for comparisons among composites and between polishing agents were 0 04 and 0 02 µm There were no significant differences among the packable composites when finished with OG/SB and SL. Aluminum oxide discs produced significantly smoother surfaces for the packable composites. Materials provided by companies Funded by 3M and Bisco

Finish	Z250	P60	PC	PE
Mylar	0 04 (0 02)	0 13 (0 03)	0 17 (0 02)	0 19 (0 08)
Carbide bur	0 29 (0 09)	0 74 (0 24)	0 51 (0 15)	0 81 (0 28)
OG/SB	0 31 (0 08)	0 37 (0 11)	0 37 (0 13)	0 34 (0 12)
Mylar	0 04 (0 02)	0 15 (0 03)	0.14 (0 05)	0 16 (0 04)
Carbide bur	0 46 (0 16)	0 54 (0 09)	0 53 (0 18)	0 48 (0 20)
SL	0 15 (0 05)	0 15 (0 04)	0 14 (0 05)	0 12 (0 03)