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0207

USABILITY PROPERTIES OF RESIN MODIFIED GLASS IONOMER CEMENTS (RMGIC).

OBJECTIVES

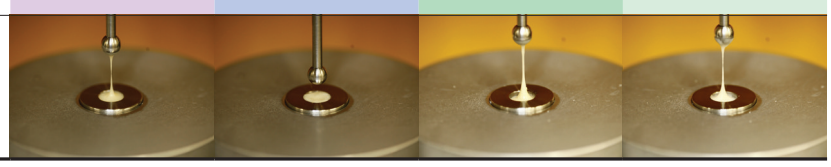
This study aims to evaluate and rank the usability of market leading Resin Modified Glass Ionomer Cement (RMGIC) capsules. The usability factors covered in this study are as follows: Activation Force (AF), Extrusion Force (EF), Paste Viscosity (PV), Paste Stickiness (PS) and Nozzle Length.

Usability Factor	Definition / Method	Desired performance
Activation Force	Force to depress the capsule plunger allowing powder/liquid mix	As low as possible without causing activation prior to removing foil wrap.
Extrusion Force	Maximum force to fully extrude the mixed capsule	As low as possible without paste spurting
Paste Viscosity	Viscosity of paste	Depends on user preference and restoration type
Paste Stickiness	Length of string when probe is withdrawn from paste	Does not stick to instruments
Nozzle length	Length from centre of base to centre of tip of nozzle	Long length enables placement of restorations in difficult to reach cavities

CONCLUSION

The overall usability of RH and RL compared very favourably to P2 and PF.

RESULTS AND DISCUSSION

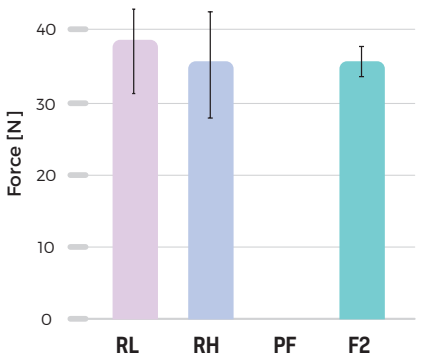
	Riva LC (RL)	Riva LC HV (RV)	Photac™ Fil Quick Aplicap™ (PF)	Fuji® II LC(F2)
Activation Force (N) n=20	38[A] (6)	36[A] (9)	N/A	36[A] (2)
Extrusion Force (N) n=20	170[B] (20)	126[C] (7)	123[C] (12)	470[D] (30)
Paste Viscosity (gF) n=5	10[E] (1)	33[F] (3)	19[G] (3)	15[G] (2)
Nozzle Length (mm) n=3	18.6[H] (0.1)	16.7[I] (0.1)	10.4[J] (0.3)	18.6[H] (0.2)
Paste Stickiness				

Numbers in brackets are standard deviations. Means sharing a letter are not statistically different (post-hoc Tukey HSD p<0.05).
Photac™ Fil Quick Aplicap™ is activated using an additional tool and cannot be evaluated using the method above.

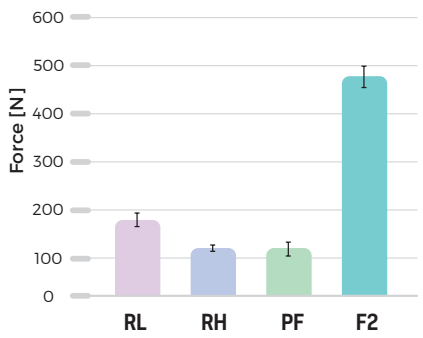
RANKING OF USABILITY TESTS (best = 1, worst = 4)

Usability Factor	Riva LC (RL)	Riva LC HV (RV)	Photac™ Fil Quick Aplicap™ (PF)	Fuji® II LC(F2)
Activation Force	1	1	4	1
Extrusion Force	3	1	1	4
Paste Viscosity	Depends on user preference and restoration type			
Nozzle Length	1	3	4	1
Paste Stickiness	2	1	2	2
Total	7	6	11	8

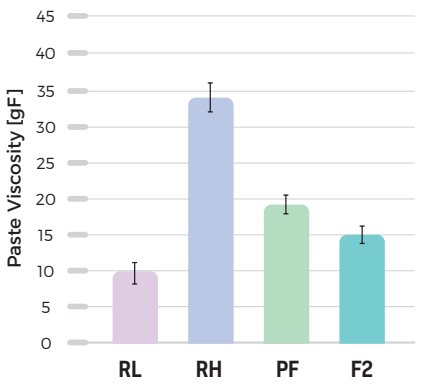
ACTIVATION FORCE



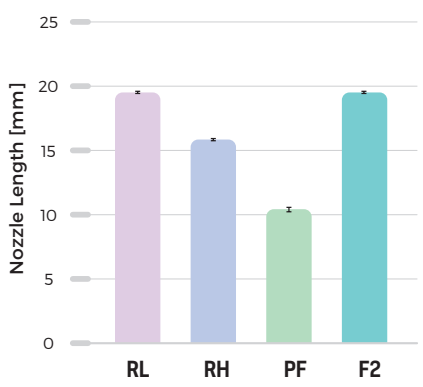
EXTRUSION FORCE



PASTE VISCOSITY



NOZZLE LENGTH



EVALUATION OF RESULTS

The results are reported in Table 2. Statistically significant differences were found in the extrusion forces, paste viscosity and nozzle length. There were no significant differences in activation forces between RL, RH and F2, but PF required an additional tool, reducing convenience. The extrusion force of RH was lowest (best on the criteria above), RL and PF were not significantly different, while F2 was highest. RL and F2 had the longest nozzle length, allowing access to awkward cavities, followed by RH and PF. Stickiness of RH was far lower than the other RMGICs. Each of the RMGICs were ranked across 4 the four handling attributes, and a total for each RMGIC calculated. RH and RL had the highest rank, followed by F2 and PF.

EXPERIMENTAL METHODS

Riva Light Cure*[RL], Riva Light Cure HV*[RH], Photac™ Fil Quick Aplicap™† [PF] and Fuji™ II LC‡ [F2] were evaluated in their respective capsules. Activation and extrusion forces were maximum values measured using Instron compression tests (Instron #5942 and #5566 respectively). In both cases, the tests started on detection of the plunger, data was collected from 0-4.5mm each 1.25N at a speed of 150m/min (activation) and 10-13.5mm each 10N at a speed of 45mm/min (extrusion). Paste Viscosity was the maximum value measured by a compression test with a Brookfield CT3 Texture Analyser (TA), measured each 0.1mm from 0 to 4.0mm penetration with a probe (LA39) travelling at 2.00mm/s in an internal diameter 5mm annulus. Paste Stickiness was evaluated from photos taken during a TA compression test using the TA8 Probe at 2.00mm/s. Nozzle length was measured using a vernier calliper.

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