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Impact strength of composite materials on different thicknesses

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INTRODUCTION & AIM

- Composite materials are among the most widely applied in the clinical practice of restorative dentistry
- Knowledge of the resistance of these materials in their different consistencies is crucial for decision-making in the restorative process
- Knowledge of the resistance of these materials under more abrupt forces, in an impact situation, is not widely explored in the literature

AIM: *To investigate the effect of different consistencies of resin composite materials (conventional and flowable) commonly used for dental restorations on their impact strength*

MATERIALS & METHODS

Study Design (N=60)

MATERIALS:

- Clearfil Majesty ES Flow (Kuraray Noritake)
- Clearfil AP-X PLT (Kuraray Noritake)

THICKNESSES:

- 1,0 mm and 1,5 mm

Fig. 1 – Selected Materials for this study

1,0 or 1,5 mm x 4 mm x 15 mm

Fig. 2 – Representative sample

Impact Strength Testing

Fig. 3 – Dynstat Aparatus

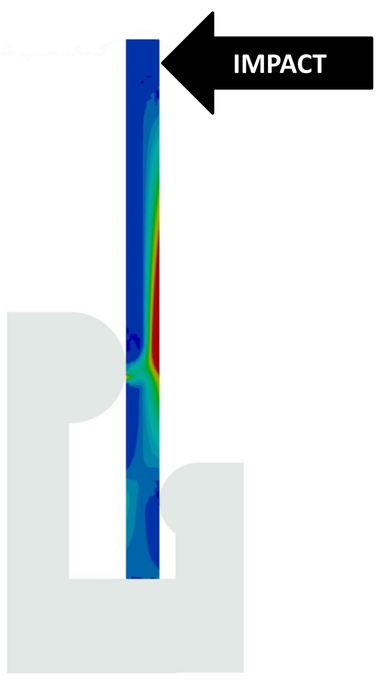

Fig. 4 – Central cross-section of the maximum tensile stress in the test set-up

RESULTS & DISCUSSION

Results

Table 1 – Impact Strength test results according the study design (n=15) (Mean ± SD)

Material	Impact Strength (kJ/m²)	
	1.0 mm	1.5 mm
Flow	11.61 ± 2.66 ^{A}	6.53 ± 1.04 ^{A}
Conventional	5.06 ± 0.98 ^{B}	6.75 ± 1.01 ^{A}

One-way ANOVA was used to evaluate the differences between the materials for the different thicknesses ($p<0,05$, CI 95%). Different letters indicate significant statistical differences in each column.

- Flowable composites tends to behave similar to conventional composites on thicker pieces
- Conventional composites tends to have lowest impact strength than the flowable ones on thinner pieces
- Considering thicknesses in the same materials, higher impact strength values were found for the Flow composite with 1.0 mm thickness

Discussion

- Thicker pieces can have more intrinsic deffects, which can lead to lowest impact strength results
- de Jager et al., 2021 - Values for APX = 2.54 ± 1.04 , with a 2mm thickness, can corroborate with our findings, that thicker pieces has lowest impact strength
- Flowable composites can have lower defect population due to its application method
- Shrinkage stresses can play a role on the strength of larger pieces

CONCLUSION

Given the results, it can be concluded that the evaluated flowable resin composite behaved similarly to a regular composite in thicker constructions and that inner defects and residual polymerization shrinkage stresses can make larger pieces more fragile.

REFERENCES

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