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FRC in fixed prosthesis : evaluation of the efficacy of an experimental model

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Abstract

Composite materials are a combination of two or more components to obtain a material with new, enhanced properties. For this reason we can consider FRC (Fiber Reinforced Composites) an evolution to adjust more reliable applications.

The evidence of this study is to find an experimental model to evaluate the importance of glass fibers position in FRC fixed prosthesis .

Previous studies had never seen homogeneous specimen : this finding makes difficult to understand chances and future clinical applications of FRC materials.

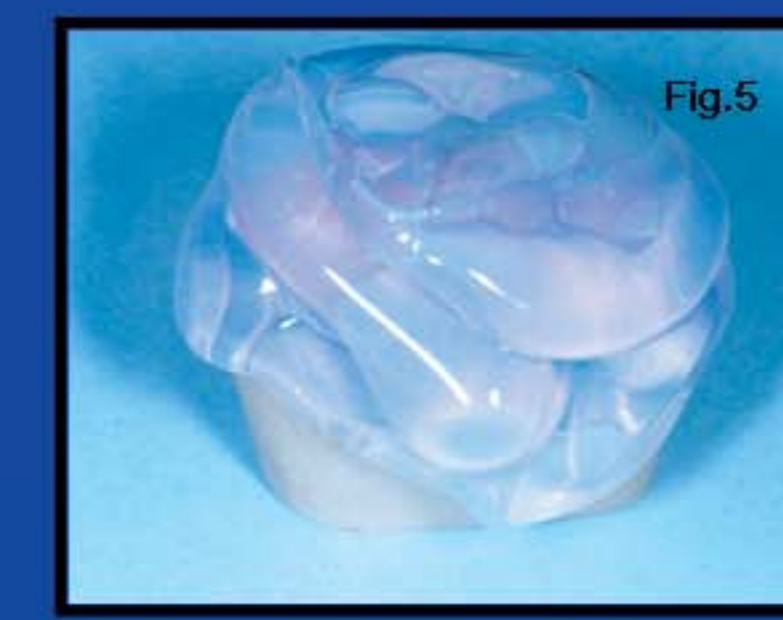
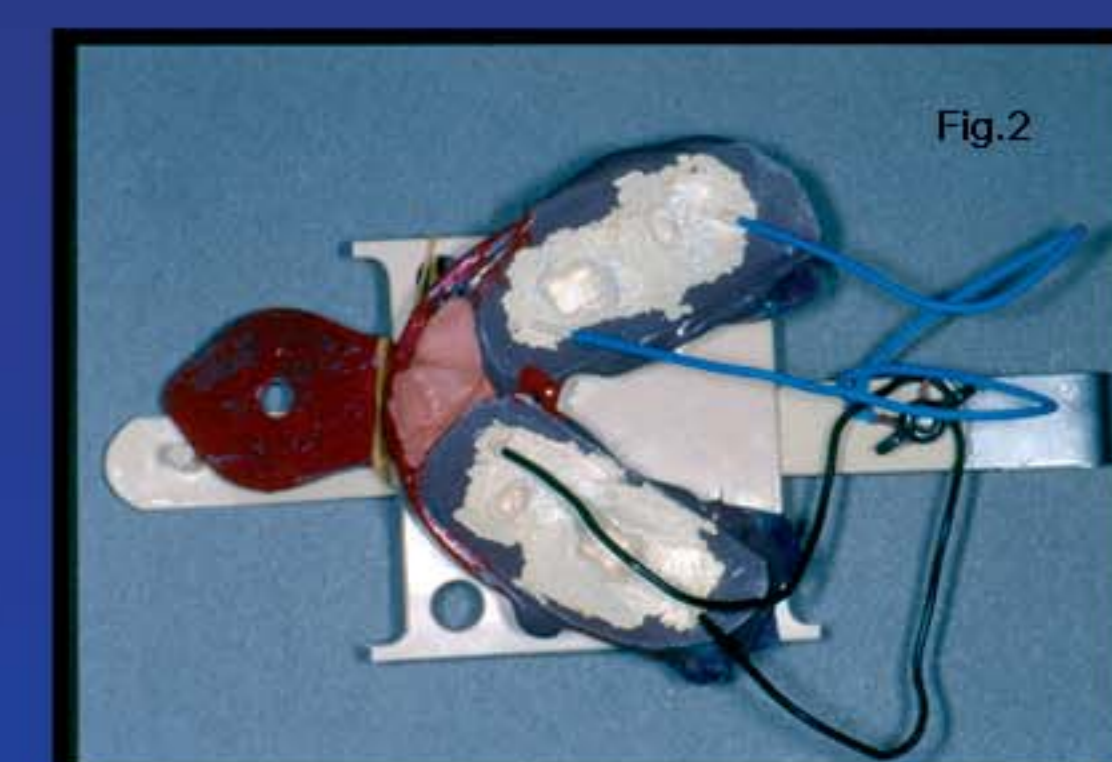
Fixed prosthetic specimen has been built to obtain four exact copies : we have prepared two teeth to simulate a three-elements bridge (fig n°1) with interproximal boxes, under Burstone et al. prescription . They were repeated with a poliether impression (fig n°2) to obtain poliurethan samples (fig.3).

A wax bridge was made on the natural teeth (fig.4) and duplicated with precision silicon material (fig.5) and used to build 4 exact copies of composite bridges (fig n°6) . To avoid the presence of oxygen inclusions we have used a vacuum system for composite polymerization and chosen pre-impregnated glass fibers with a silane coupling agent and Bis-GMA (to obtain a chemical union with composite matrix).

Therefore the only variable was the glass-fiber position and four modality were been identified :

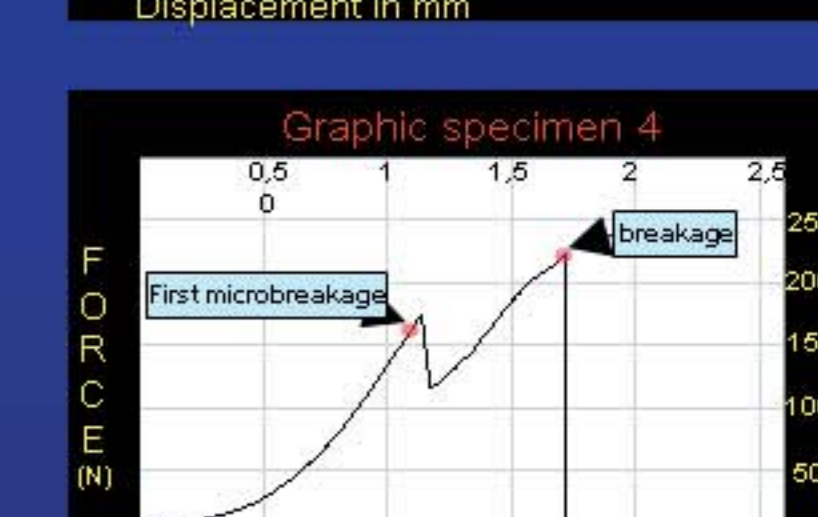
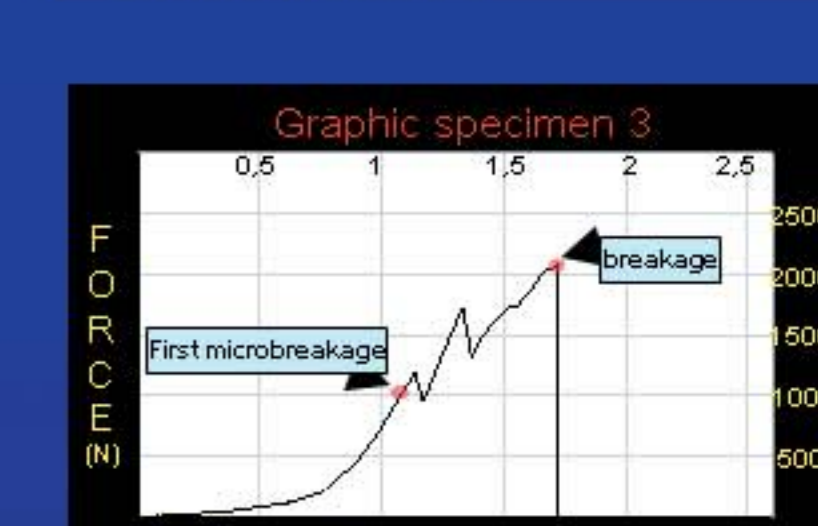
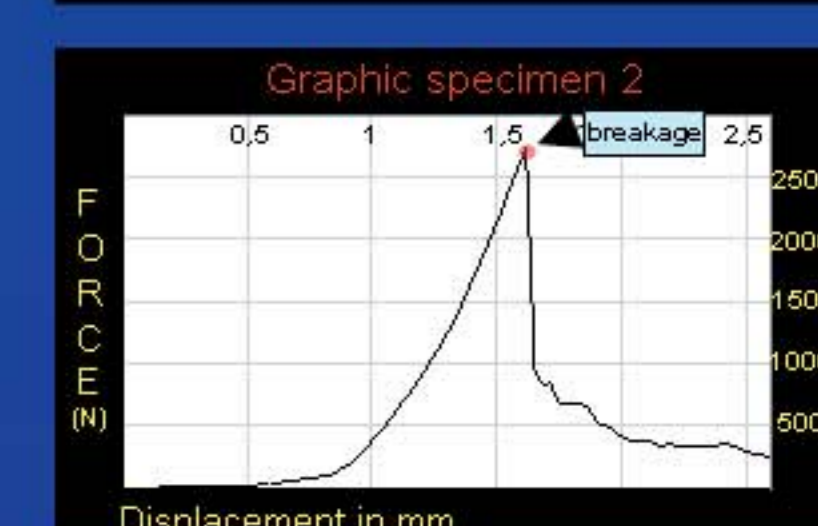
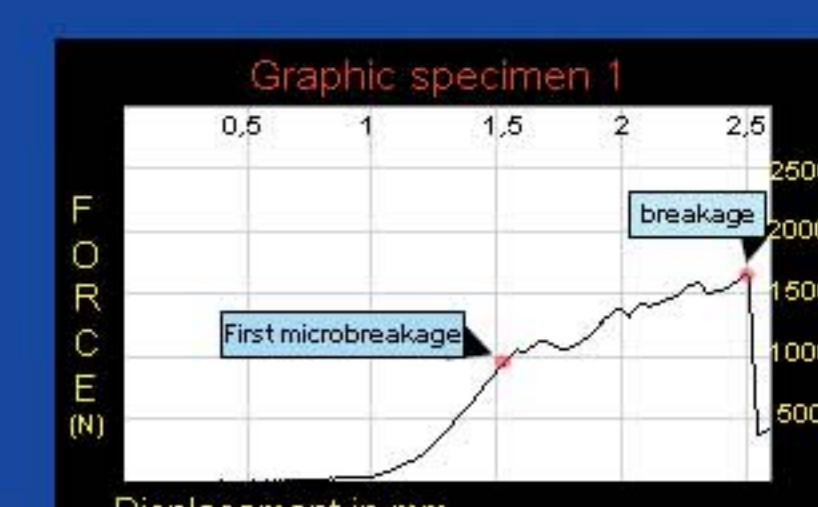
- 1st specimen : unidirectional bundle of 4.000 fibers (from box to box)(fig.7)
- 2nd specimen : like the first sample and ,in addition, two bundles (lingual and buccal)(fig.8)
- 3rd specimen : like the first one , but using a strip of net-fibers (fig.9)
- 4th specimen : like the second one , using net-fibers (fig.10).

➤The bridges were cemented on the duplicated teeth with an adhesive cement and then fixed on a support to realize the mechanic compression test with MTS 810 testing machine (fig.11) : a knife-edge steel point (fig.12,13) has transmitted a compression force (speed 1mm x 60 sec) until to obtain breakage of the specimens. The behaviour of the bridges was analyzed with a mathematical model and represented on cartesian axes: the resulting movement on the abscisses (in mm) and the impressed force on the ordinate (in N) .



T E S T

D A T A P R O C E S S I N G



Results and conclusions

The mathematical evaluation has found different mechanical behaviours of the specimens. Three bridges have demonstrated a breakage interval , while only one had a breakage peak. This study, in progress, intends only to underline the importance of the variable "fiber" in FRC technique : the same material (glass) has different behaviours changing position and volume of the bundles . Therefore , in prospect to continue this analysis with a number of specimens statistically more significant , we can consider this aspect (glass-fiber position) noteworthy .

Probably , in future applications , clinicians have to consider the necessity of A dedicated prescription to obtain the best results of FRC in fixed prosthesis.