# Different Overdentures Materials Assessment by Mechanical Testing

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## INTRODUCTION

The mandibular edentulous patient could be treated by inserting 4 to 6 implants in the bone covered with different types of overdentures. Different materials and morphologies of the overdentures are influencing their biomechanics.

## OBJECTIVES

The present study compares the performances of different overdentures materials on five implants infrastructure. The overdentures had one extension on the third quadrant and two extensions in the fourth quadrant

## METHODS & MATERIAL

Five different types of materials were been considered for this study: BioHpp-Brecam, Co-Cr-Composite (Ivoclar), Co-Cr-Brecam, Grafenano and Brecam. Five overdentures for each considered group were obtained. The mechanical tests were performed on a Zwick/Roell Z005 universal machine with 5 (kN) force cell in uniaxial load, accuracy class 0,5 on force measurement range 1 ÷ 130% according to ISO 7500-1.

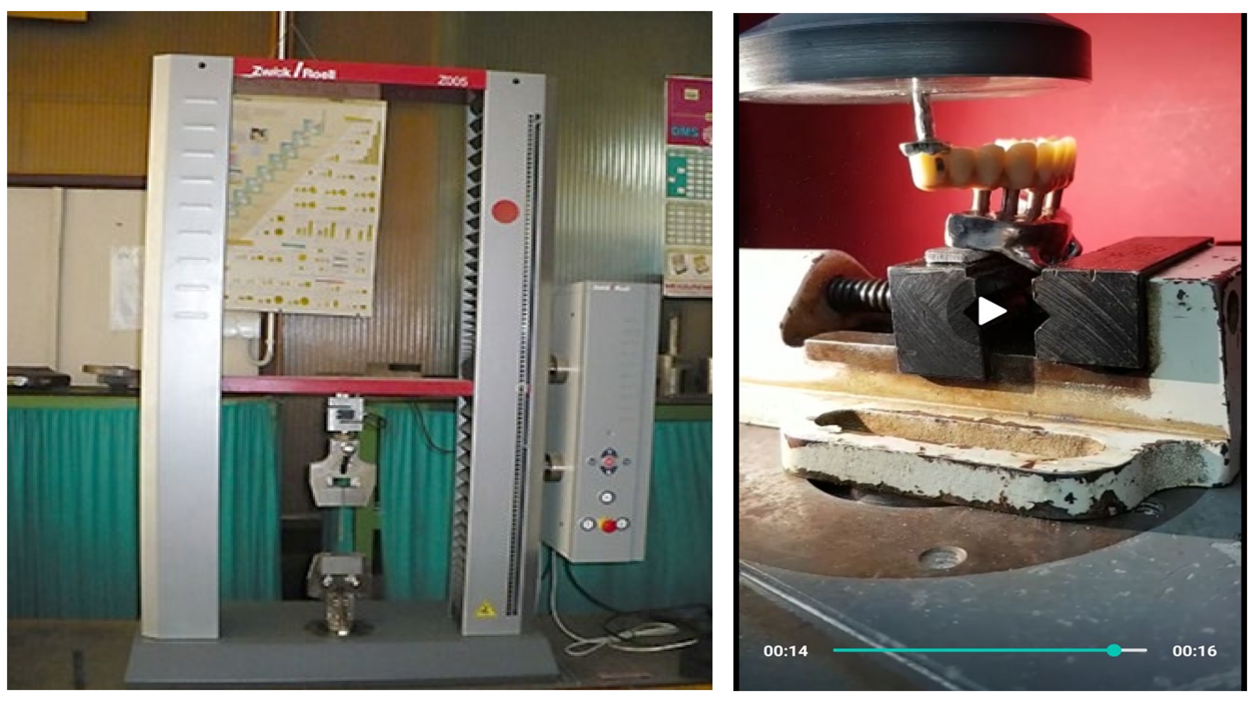

*Figure 1. The architecture of the Zwick/Roell Z005 universal machine used in this study.*

The tests were performed in the displacement control mode, at ambient temperature, as follows: test with the traverse travel speed of 12 mm /min; recording the force F and the displacement of the Δl.

The study was focusing on the fractures of the extensions (figure 2) and then on the fractures of the frontal part (between the implants) – figure 3.

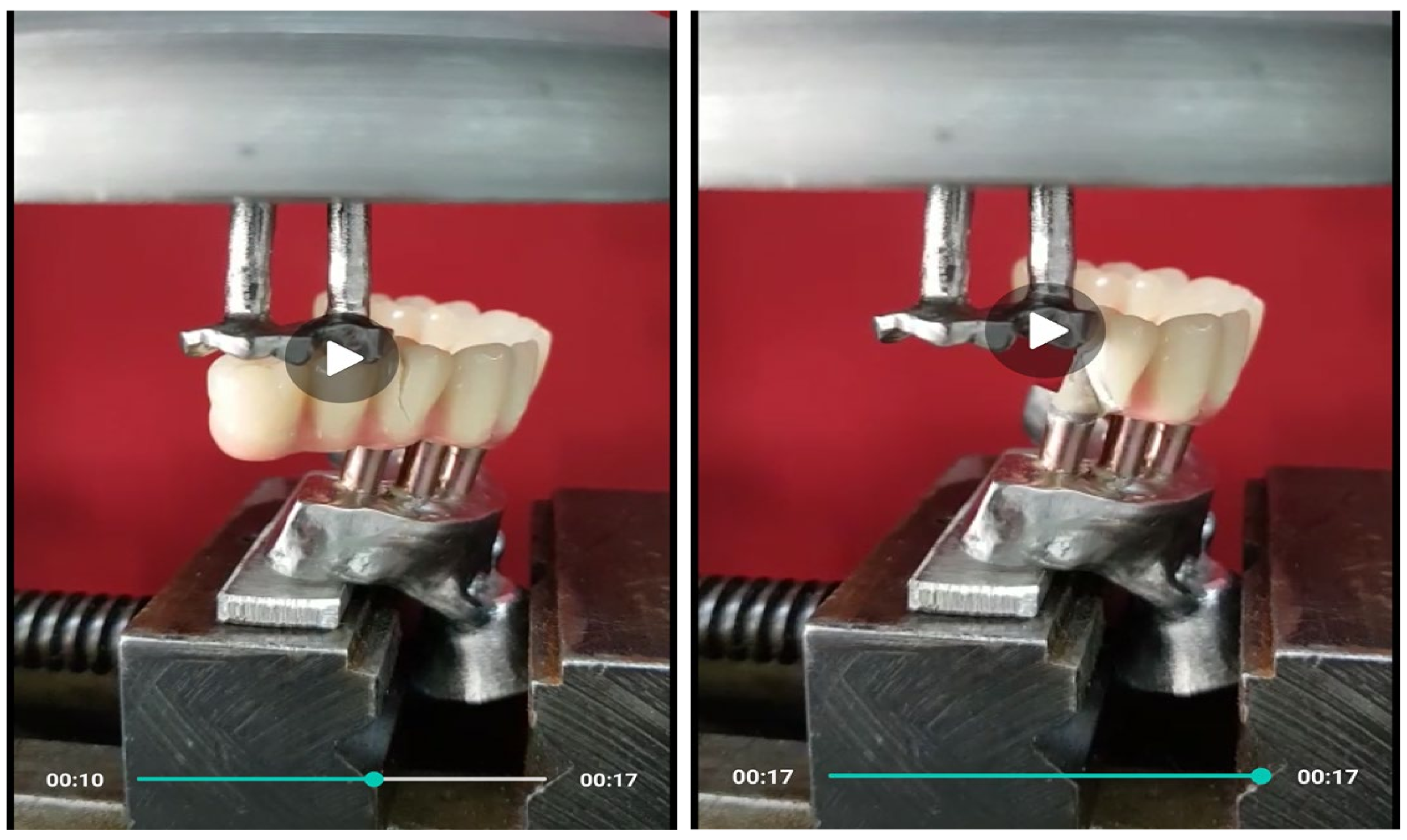

*Figure 2. Evaluation of the extensions fractures.*

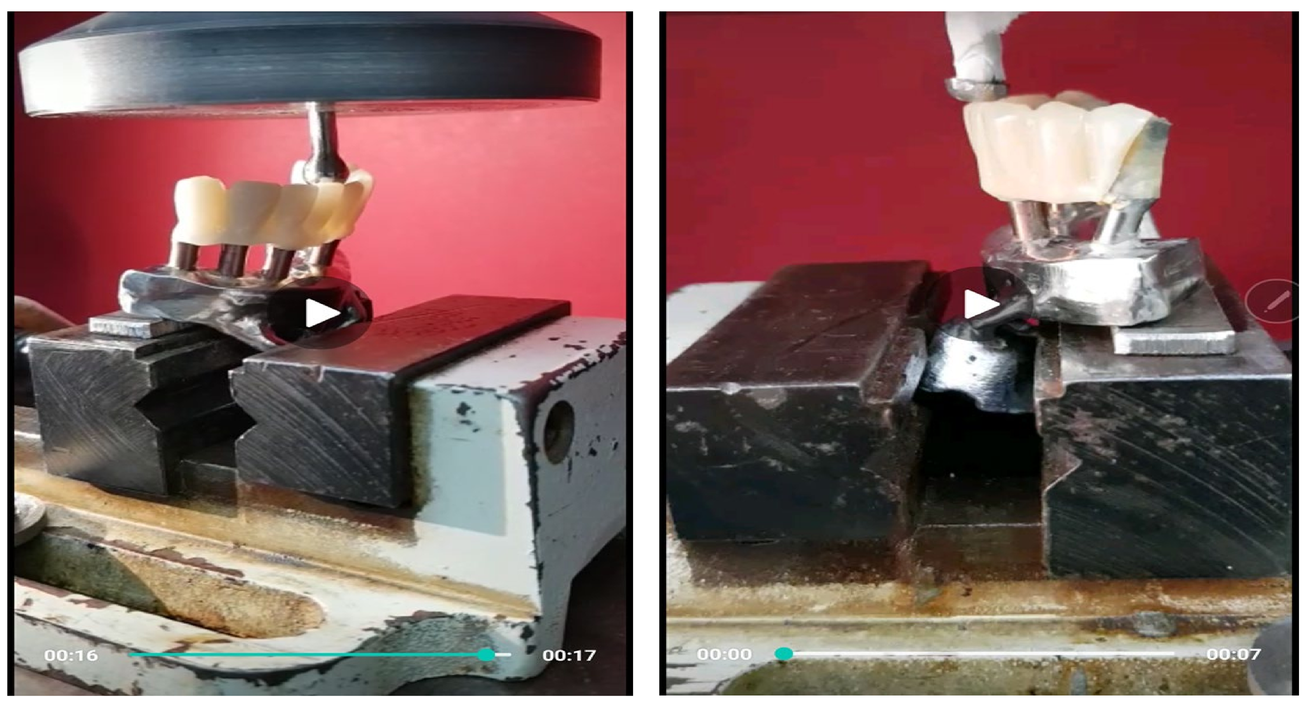

*Figure 3. Evaluation of the frontal part of the overdentures fractures.*

Several fractures graphics were obtained and analyzed (Figure 4).

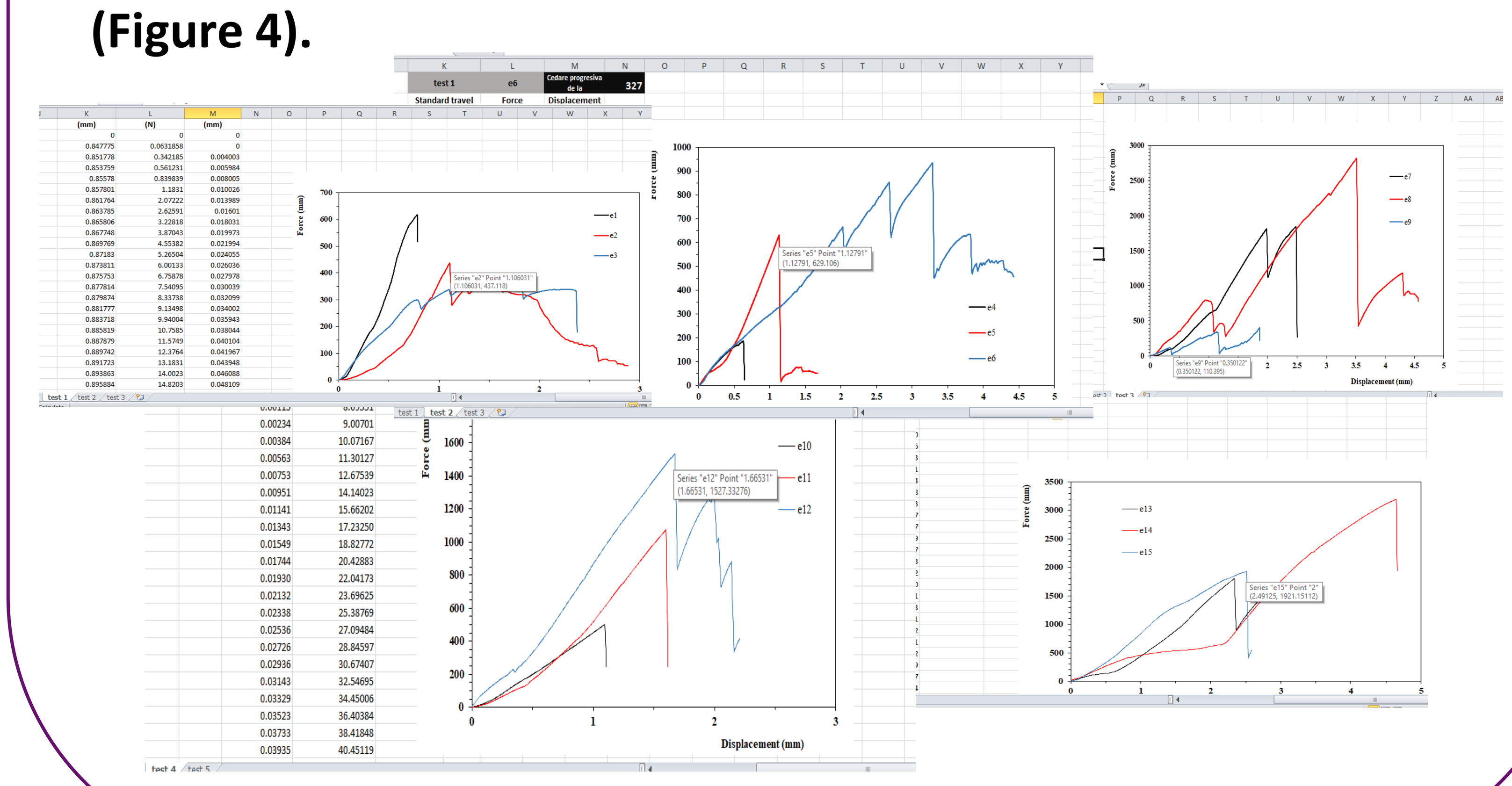

*Figure 4. Fracture graphics obtained after the mechanical evaluation.*

## RESULTS and CONCLUSION

**Comparison of BioHpp + Composite versus Metal + Composite:**
- at the level of the two Extensions, BioHpp + Composite showed a much more elastic behavior (the fracture was later recorded at a value of 185N) compared to Metal + Composite, where the fracture was sudden (faster, about 1/2 from the time interval compared to BioHpp + Composite) at a value of 110 N (59.45% compared to BioHpp)

**Metal + Composite:**
- First a central fragment of the distal extension was fractured, then the second extension was completely framed; the first extension remained to make a common body with the rest of the structure.

**At BioHpp + composite:** - The fracturing mechanism was slower, but affecting the implant area where the fracture occurred.

Regarding **the fracture of a single extension**, in the case of BioHpp this was achieved at 437 N (55.24%) exposing the implant, compared to 791 N in the case of metal composite infrastructure. For the previous area, in both cases, the fracture concerned only the plywood, leaving the infrastructure unaltered. At BioHpp, however, due to the more pronounced elasticity of the entire assembly, fractures occurred at 299 N compared to 118 N (39.46%) in the case of metal infrastructure with composite.

**Related to Integrally Polymeric Structures:**

1. The two extensions yielded faster than the single extension In the case of Graphene Full (200/625 = 32%), BioHpp (185/437 = 42.33%) and Brecam Full (497/1068 = 46%). One extension is recommended instead of two. Fractures in the extension areas do not affect at all the areas between the implants (previous to them)
2. For the frontal area, BreCam full performed best (1506 N total fracture), followed by Grafenano (600 N - 600/1506 = 39.84%) and BioHpp (299 N - 299/1506 = 19.85 %). The ranges of fractures recorded followed the above ranking: Brecam (228; 1506; 1248; 1273; 1007; 867) versus Grafenano (325; 659; 846; 931) versus BioHpp (299; 337; 382; 381; 332). As the first chipping Grafenano performed best (325 N) followed by BioHpp (299 N) and BreCam (228 N).

## ACKNOWLEDGMENTS

The present study was conducted at the Research Center in Dental Medicine Using Conventional and Alternative Technologies, Faculty of Dental Medicine, Victor Babeş University of Medicine and Pharmacy of Timişoara, 9 Revolutiei 1989 Ave.,300070 Timişoara, Romania

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Presented at the 97st Annual Session of the Greater New York Dental Meeting in 2021