ABSTRACT

Management of a large variety of musculoskeletal conditions and especially for patients with wrist pathologies requires the prescription and the use of a cast or a splint to aid in their treatment. Splints are noncircumferential immobilizers that not only protect joints, accommodate swelling, reduce pain, help along healing of severe injuries but also prevent injuries and chronic pain reduction. Research has shown that Additive Manufacturing processes can be used to create wrist splints with similar or greater performance than the traditional ones. This study focused on the evaluation, by finite element analysis, of two 3D printed wrist splints fabricated by Polypropylene, designed parametrically by PROGEKTA EUROPE P.C. The two wrist splints, named as "Splint_Cast_Tino_Exo" (Exo) and "Splint_Cast_Tino_Eso" (Eso), were modelled in computer-aided design software Ansys Workbench 2020 R2. The finite element analysis simulations were performed in wrist torsion and flexion-extension wrist movements to compare the displacements and the stresses. From a technical point of view the present research argues that, both Exo and Eso splint, respectively, stand at a great level of performance in displacements and stress values and are, therefore, feasible design approach for future splint design and manufacture.

Keywords: splints, additive manufacturing, finite element analysis, stress, displacement