ACCSCIENCE PUBLISHING

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RESEARCH ARTICLE

3D bioprinting of adhesive, anti-bacterial alginate/polyacrylamide-based customized boluses using digital light processing for radiotherapy applications

Supplementary File

(A) Effect of alginate concentration on compressive modulus

Based on Figure S1, the compressive modulus increases with the alginate (ALG) concentration. However, the viscosity of 2% ALG solution significantly increases, which is not conducive to photocuring printing. Therefore, 1% ALG was chosen for this study.

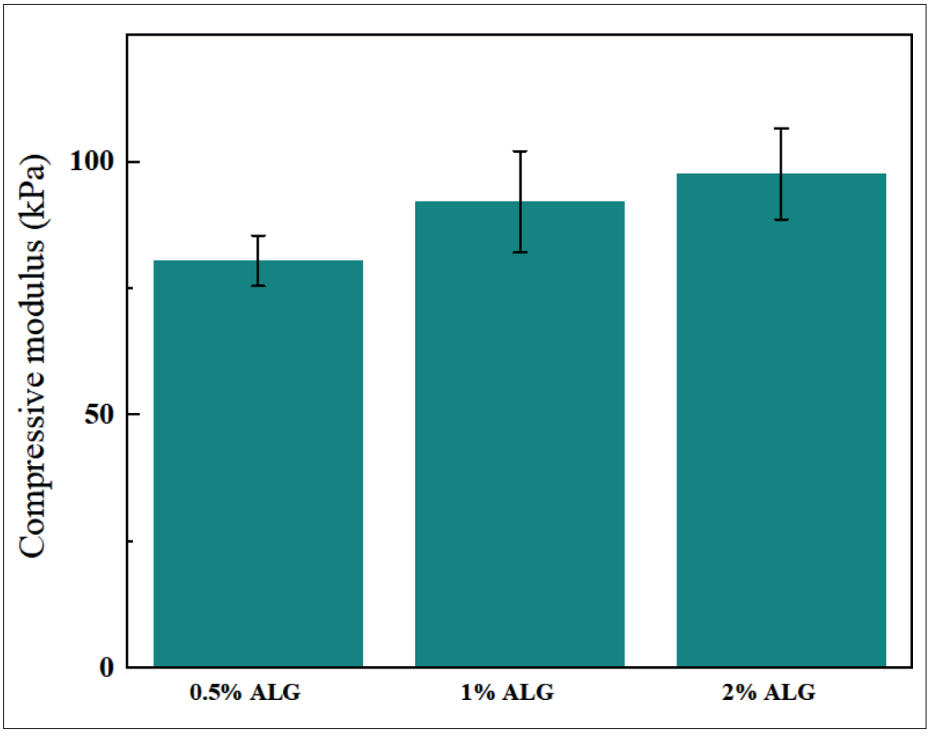

Figure S1. Effect of alginate (ALG) concentration on compressive modulus of the gel under the same acrylamide (AM) and polyethylene glycol dimethacrylate (PEGDA) content.

(B) Effect of protocatechuic acid concentration on adhesive strength

Based on Figure S2, with the increase in protocatechuic acid (PA) concentration, the adhesion strength first increases and then decreases. Therefore, 3% PA was chosen for this study.

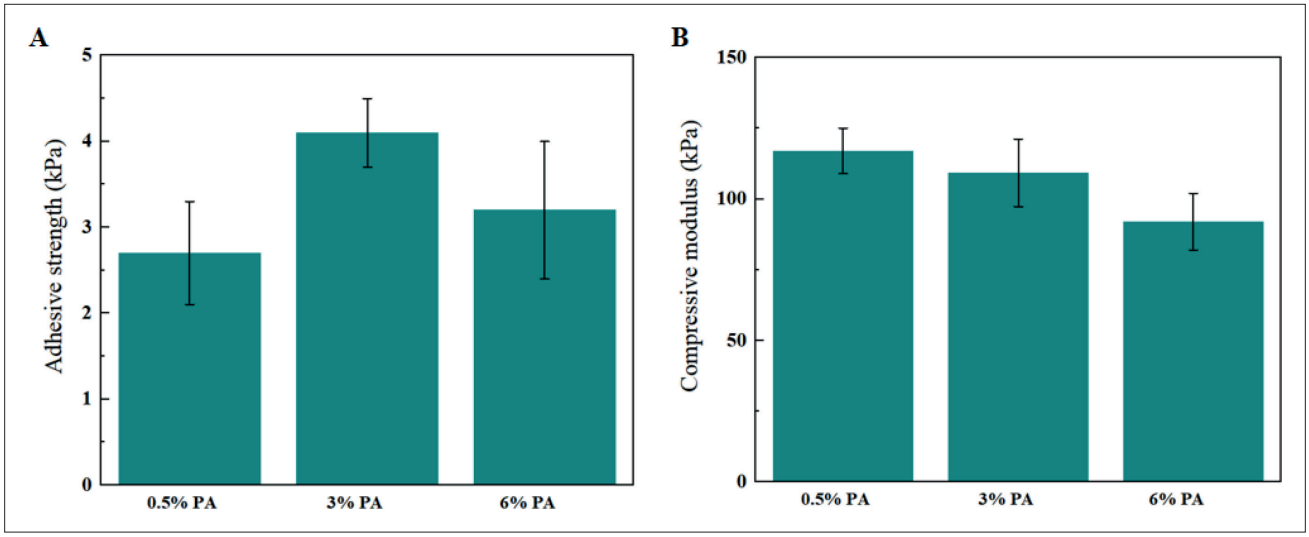

Figure S2. (A) Effect of protocatechuic acid (PA) concentration on adhesive strength of the gel of the same acrylamide (AM), polyethylene glycol dimethacrylate (PEGDA), and alginate (ALG) concentrations. (B) Effect of PA concentration on the compressive modulus of the gel of the same AM, PEGDA, and ALG concentrations.

(C) Effect of glycerol concentration on compressive modulus

Based on **Figure S3**, it can be seen that as the concentration of glycerol (GLY) increases, the compressive modulus decreases. However, compared to 20% GLY, 30% GLY manifested better water retention. Therefore, 30% GLY was chosen for this study.

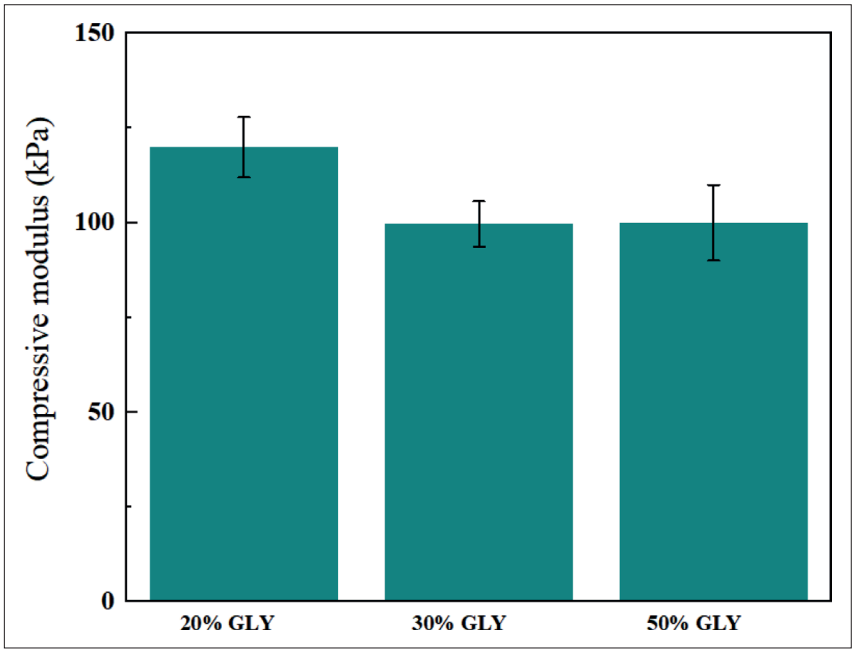

Figure S3. Effect of glycerol (GLY) concentration on compressive modulus of the gel of the same acrylamide (AM), polyethylene glycol dimethacrylate (PEGDA), alginate (ALG), and protocatechuic acid (PA) concentrations.

(D) Changes of mass density with time for different hydrogels

The changes of mass density with time for different hydrogels are shown in **Figure S4**.

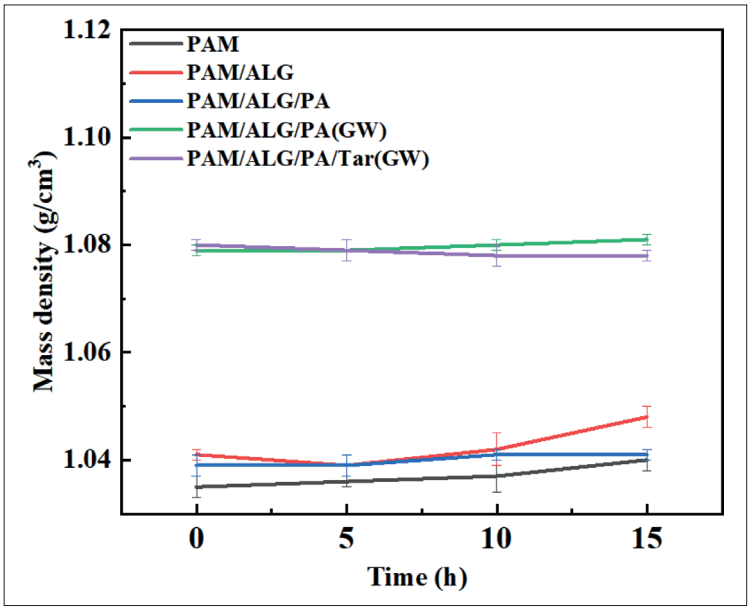

Figure S4. Changes of mass density with time for different hydrogels.

(E) Preparation of bolus using the gel

The gel can be used to prepare bolus for head radiotherapy (**Figure S5**).

Figure S5. Boluses for head radiotherapy were printed using the gel. The top row shows the boluses that can be used for the nose, and the bottom row shows the boluses that can be used for the top of the skull.

(F) Comparison of the printed, commercial and virtual plans with and without bolus

Figure S6. A comparison of the dose volume histogram (DVH) of four different treatment options, including the printed bolus, the commercial bolus, the virtual plan, and the control group (without bolus).

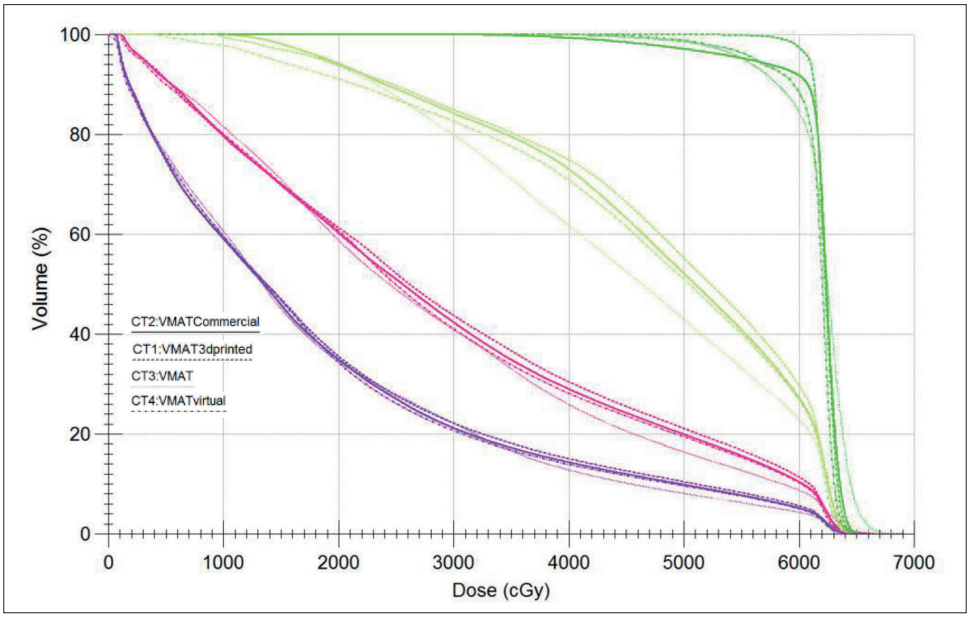

Figure S6. A comparison of the dose volume histogram (DVH) of four different treatment options, including the printed bolus, the commercial bolus, the virtual plan, and the control group (without bolus). The green line denotes the DVH of the planning target volume (PTV). Other lines denote the 1 cm, 2 cm, and 3 cm rings around the PTV.