PRP laden 3D bio-printed scaffold for cranio-maxillofacial bone tissue regeneration

Nikita Pahurkar [1] Kaushik Chatterjee [2]

Department of Materials Engineering, Indian Institute of Science, Bengaluru, INDIA[1]
Department of Bioengineering, Indian Institute of Science, Bengaluru, INDIA[2]

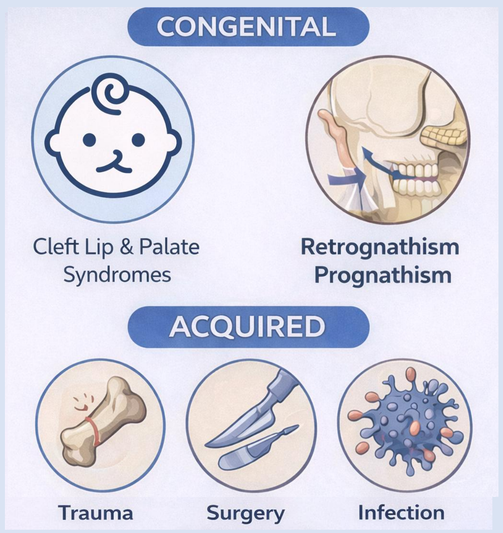
Introduction

Bone defects in maxillofacial region pose major reconstructive challenges due to complex anatomy and demanding functional requirements.

Current Treatment Approaches

- **Autografts**
- **Allografts**
- **Xenografts**
- **Metal implants and fixation plates**
- **Distraction osteogenesis**
- **Tissue-engineered scaffolds (emerging)**

Etiology



Objectives

Develop a bioprintable PRP-incorporated hydrogel scaffold

Assessment *In vitro*

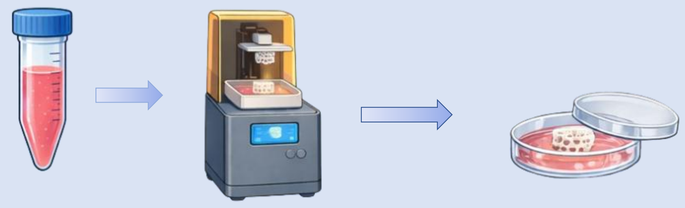
Assessment *In vivo*

Explore the potential application in cranio-maxillofacial bone regeneration

Methodology

PRP Extraction → Bioink Preparation → DLP Printing

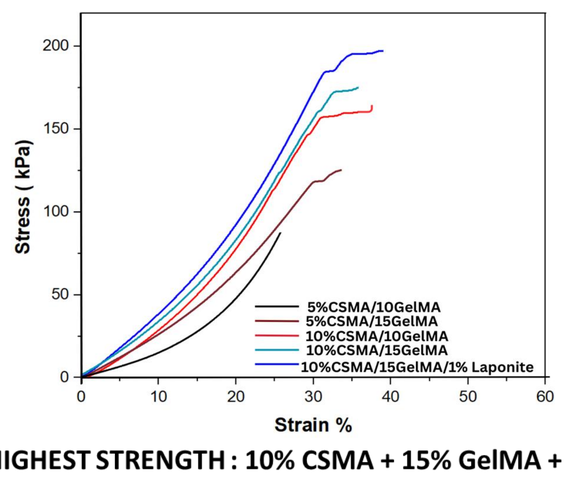




Bioink preparation **DLP Printing**

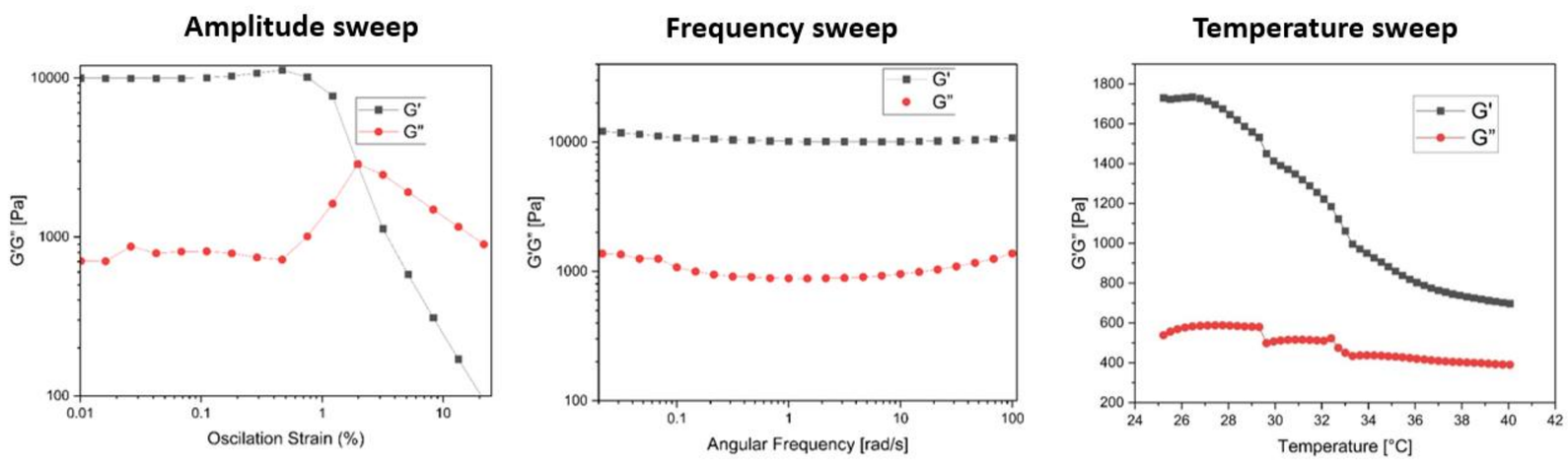
RESULTS - *In vitro*

Compression Testing



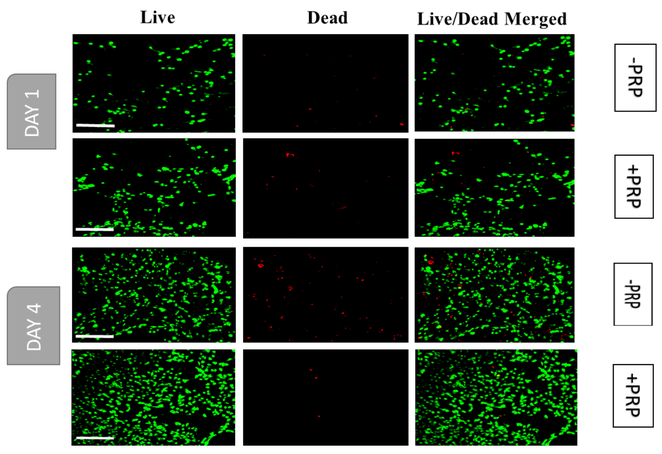
HIGHEST STRENGTH : 10% CSMA + 15% GelMA + 1% LAPONITE

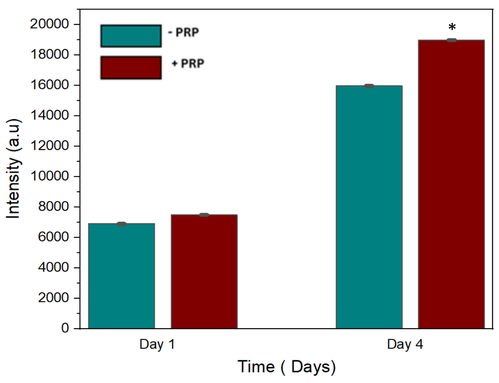
Rheology



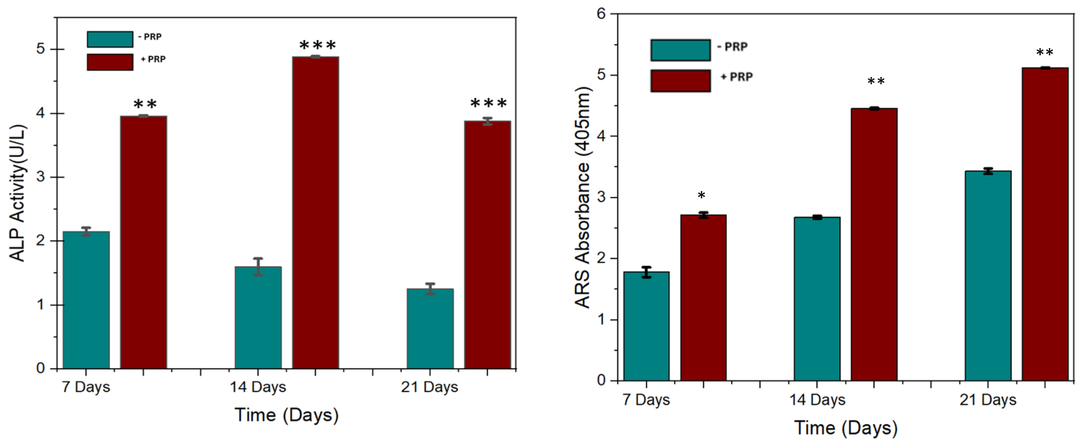
G′ > G″

In vitro cytocompatibility and osteogenic potential





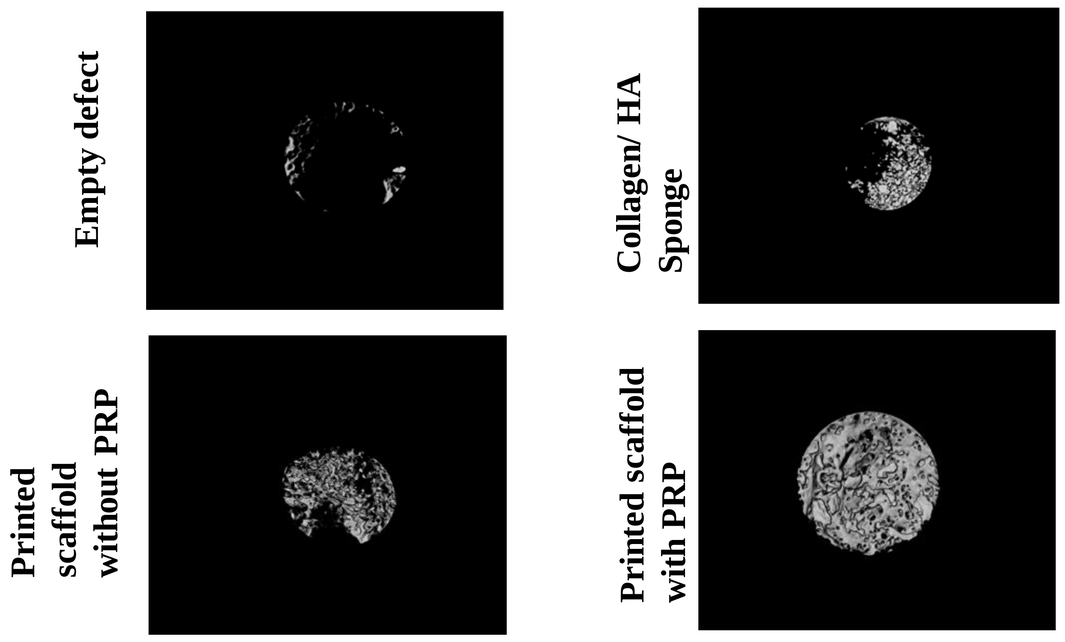
Cell Proliferation :
PRP Scaffold > Non PRP Scaffold



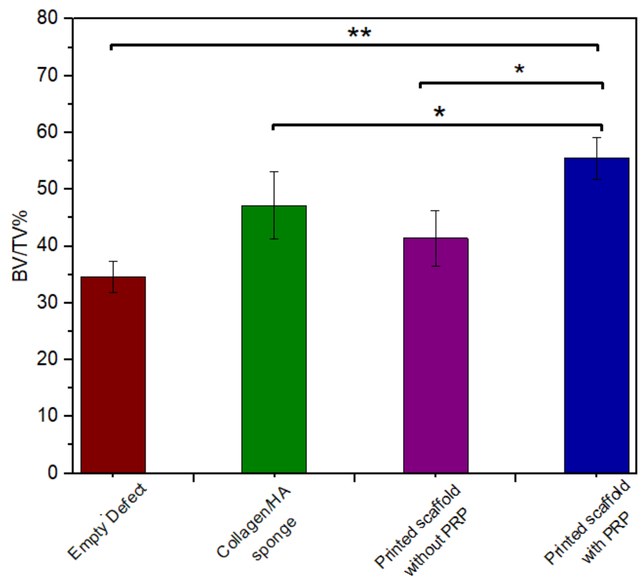
Osteogenic potential : PRP Scaffold > Non PRP Scaffold

RESULTS - *In vivo*

Micro CT – Coronal view



Bone volume/Total volume %



Summary

Incorporation of platelet-rich plasma (PRP) augmented osteogenic differentiation as evidenced by elevated alkaline phosphatase activity, Alizarin Red Stain mineral deposition, and Micro – CT assessment..

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