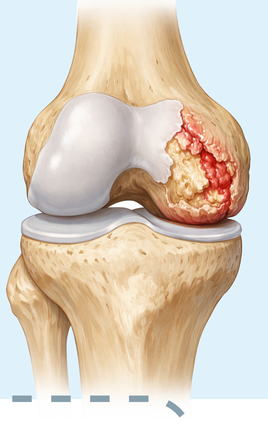
Hybrid 3D-Printed PLA and Ionic Exchange Calcium Alginate Scaffold for Articular Cartilage Repair

Liliana Andrea Lizarazo Fonseca[1], Adriana Lorena Lara Bertrand[1], Leonardo Prieto Abello[1], Gustavo Andrés Salguero[1], Ingrid Zulay Silva Cote[1]
[1]Unidad de Ingeniería Tisular, Instituto Distrital de Ciencia Biotecnología e Innovación en Salud - IDCBIS, Bogotá, Colombia

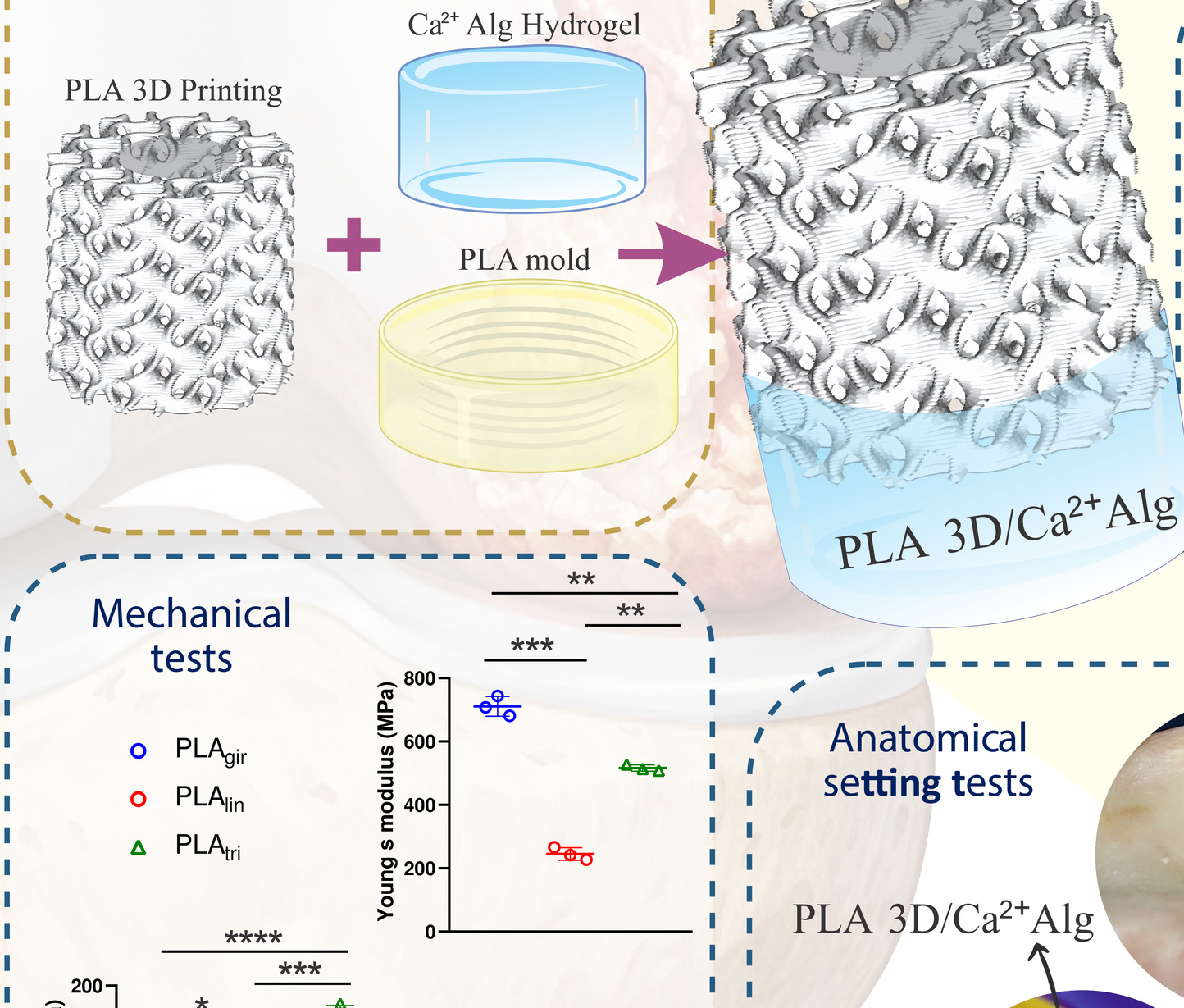


INTRODUCTION

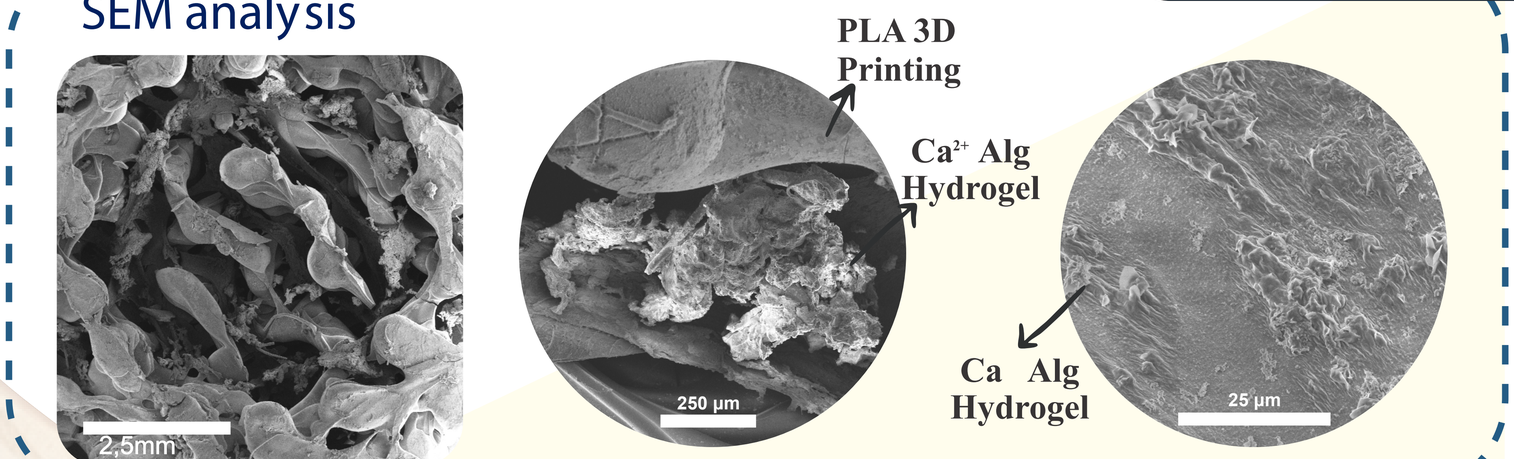
Articular cartilage repair remains challenging due to its avascular nature and limited regenerative capacity. After injury, cartilage is often replaced by fibrocartilage with inferior mechanical properties, leading to joint degeneration and osteoarthritis (OA) (1,2). Tissue engineering approaches using biomimetic hybrid scaffolds composed of synthetic polymers and hydrogels have shown promising mechanical and biological properties (3,4). Additionally, mesenchymal stromal cells (MSCs), particularly those derived from Wharton's jelly, provide immunomodulatory and pro-regenerative signals that may enhance tissue repair (5,6). This study evaluates biomimetic hybrid scaffolds combined with Wharton's jelly–derived MSCs to promote osteochondral regeneration.

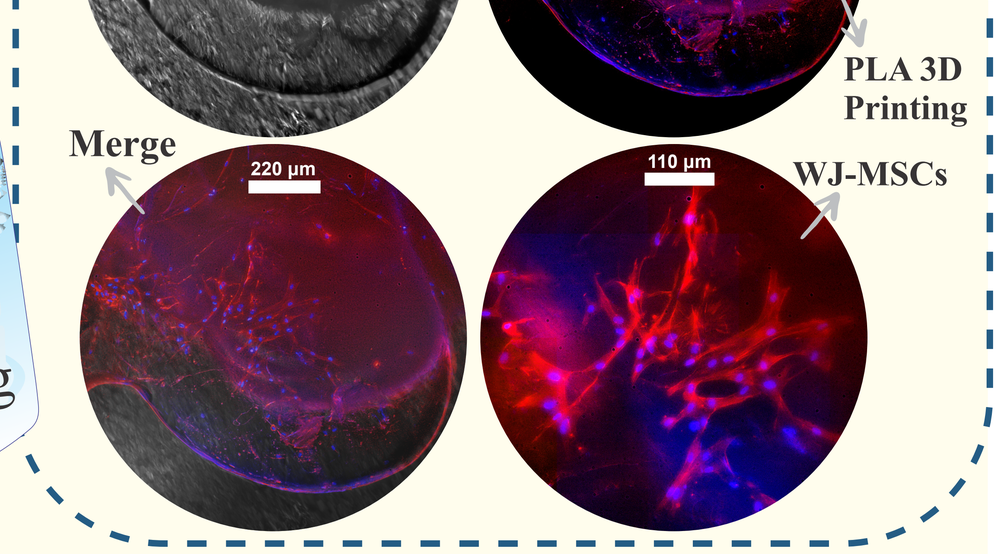
METHODS

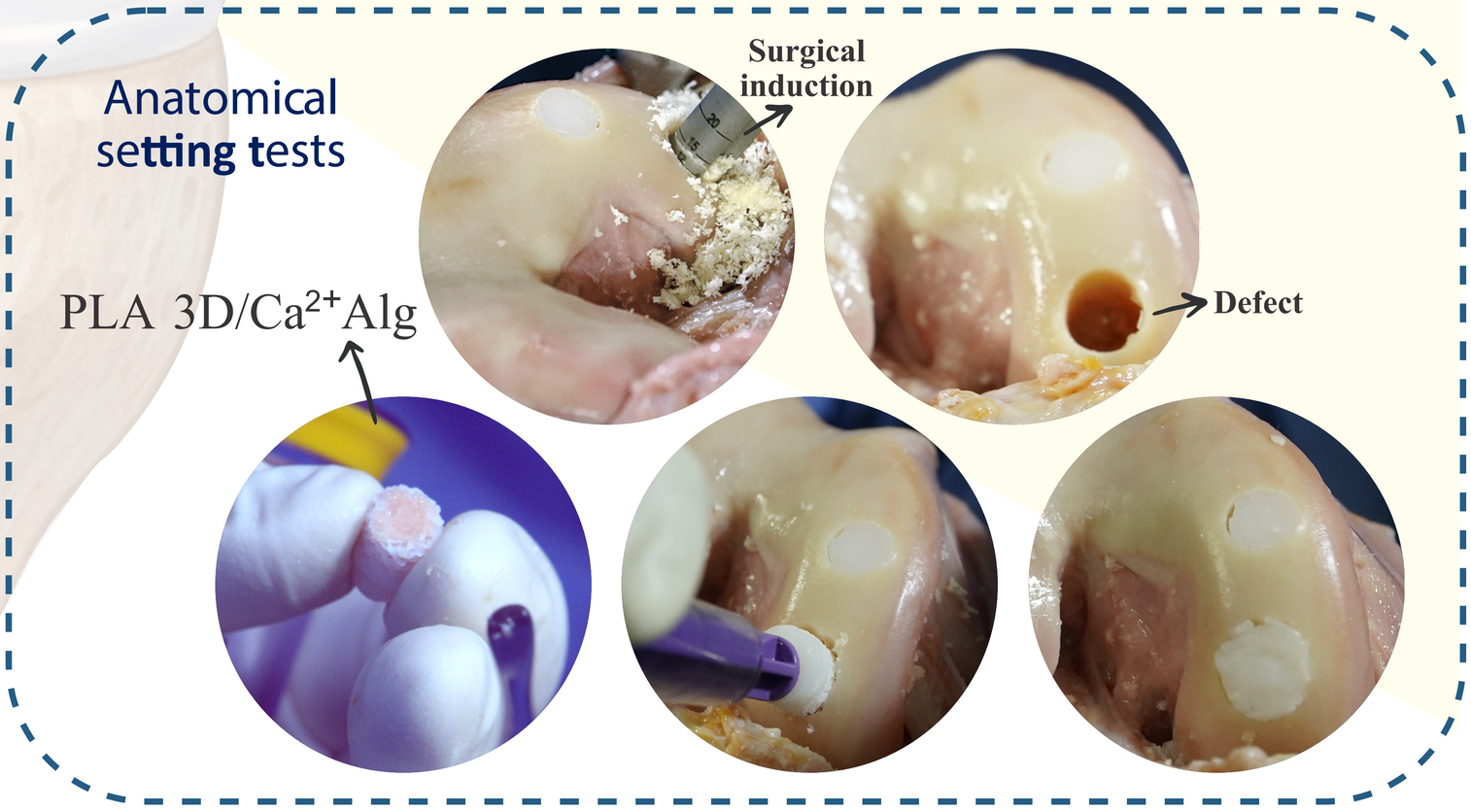




RESULTS







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CONCLUSIONS

The developed scaffold exhibited appropriate mechanical properties to preserve structural integrity while supporting cellular activity and tissue integration. Overall, these results highlight its potential as a promising biomaterial platform for articular cartilage regeneration and future translational applications.

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IDCBIS Instituto Distrital de Ciencia, Biotecnología e Innovación en Salud
BOGOTÁ
Carrera 32 No. 12-81 Edificio IDCBIS
Secretaría Distrital de Salud
PBX (+57) 1 3649620
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