GIOTTO Project achieves remarkable results in Osteoporotic fracture treatment

August 04 - The GIOTTO project, a collaborative effort led by 14 esteemed scientists and companies across Europe, proudly announces its successful achievements in developing new solutions for the treatment of osteoporotic fractures. With the global population aging and the prevalence of osteoporosis on the rise, the need for effective treatments has never been more critical.

Osteoporotic fractures, which result from the deterioration and fragility of bones, can occur with minimal trauma or during daily activities, posing significant risks to individuals' quality of life. In response to this pressing medical need, the GIOTTO project embarked on a mission to develop ad hoc solutions to address this growing concern.

The GIOTTO project focused on creating three cutting-edge solutions to tackle osteoporotic fractures:

1. **Device 1**: A graded scaffold to fix periprosthetic fractures.
2. **Device 2**: A fibrous scaffold to treat small, non-confined pelvic fractures.
3. **Device 3**: A radiopaque, bioresorbable cement to stabilize vertebral fractures.

Significant progress has been made in gathering comprehensive results for **Device 1**, designed to treat periprosthetic fractures. The findings have been documented to facilitate the device's exploitation and clinical application.

Fractures around the hip prosthesis, particularly involving the femur, have become significant complications with serious consequences, necessitating a second surgery, often accompanied by complications and poor functional outcomes. The prevalence of these clinical cases has risen by 2.5-fold in the past two decades due to various factors, including increased joint replacement surgeries, metabolic bone diseases like osteoporosis, and a rise in life expectancy.

GIOTTO Device 1 is a graded biomedical drug-device product fabricated through 3D printing using a composite polymeric blend. This patient-specific device is implanted directly in contact with the fractured area of the bone. It incorporates the ICOS-Fc biomolecule, which plays a crucial role in promoting the healing of periprosthetic fractures by rebalancing the osteoporotic microenvironment.

The bioprinting platform developed at the University of Pisa allows for high precision resolution and scalability in realizing Device 1 at an industrial scale. The composite material is prepared by combining base polymer materials with nanohydroxyapatite powders from Fluidinova.

Moreover, the ICOS-Fc, a patented bioengineered natural molecule, effectively slows down bone resorption and stimulates new bone formation without causing toxic effects on bone cells. GIOTTO incorporated ICOS-Fc in three devices using various strategies, including surface functionalization processes and encapsulation within resorbable polymeric nanoparticles.

Multiscale modeling by Dublin City University was employed to optimize device design and surgical approaches, taking into account anatomical site locations, bone architecture, functional loading requirements, and surgical constraints.

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Preclinical investigations are currently underway to evaluate the efficacy of GIOTTO Device 1. Preliminary results indicate that this device can be seamlessly integrated into the workflow of periprosthetic fracture stabilization. Surgeons can shape the device according to the patient's specific needs, significantly contributing to the restoration of independent and active lives for osteoporotic patients.

GIOTTO has also been recognized for its excellence, winning the **Best Project award** at the Euronanoforum 2019, bestowed by the head of DG Research and Innovation.

The technologies developed within GIOTTO will revolutionize the treatment of patients and bolster the innovation and competitiveness of European industries. The collaboration among partners has also paved the way for further opportunities in the new Horizon Europe calls.

The GIOTTO project stands as a testament to the power of collaboration, innovation, and the pursuit of improving lives worldwide. Through the dedication of our talented researchers and partners, we remain committed to shaping the future of healthcare and making a lasting impact on the lives of patients affected by osteoporotic fractures.

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