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Multistage Layered Complex Cell Sheet to Regenerate Periodontal Tissue in a Mice Model

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Periodontal disease can affect up to 90% of worldwide population and is the most common cause of tooth loss in adults. Periodontal tissue regeneration requires simultaneous regeneration of 3 different tissues: cementum, periodontal ligament (PDL) and alveolar bone. Tissue-engineering strategies based on mesenchymal stem cells and cell sheets have been widely used for periodontal tissue regeneration. However, the use of a single type of cell cannot reliably regenerate periodontal tissue, a complex structure containing both soft and hard tissues. Monolayer cell sheet applied to larger defects can result in incomplete regeneration of the affected area. Here, we developed a new periodontal tissue regeneration technique using cell sheet engineering. We used osteoblast like and PDL cells to fabricate two single cell sheets consists of either of these cells and a complex cell sheet contains both types of cells in the same cell sheet by layering PDL cells over osteoblast like cells. Following 4 weeks of ectopic and 8 weeks of orthotopic transplantation in immunocompromised mice, we analyzed the transplants using histology, micro-CT and immunohistochemistry. Here we found that complex cell sheet has higher capacity to regenerate the periodontal tissue composed of PDL and bone like tissues in its natural form compared to control and single cell sheets. Layering two different cells in a single temperature responsive culture well can maintain the position of cells, thereby it can maintain the shape of tissues to be regenerated and it might have contributed to the regeneration of periodontal tissue similar to its natural anatomy.

Biography

Resmi Raju has completed his BDS and MDS from SRM University, India and currently in the final year of PhD from Tokushima University, Japan. She was a Gold medallist in MDS from SRM University in 2013, She had won various awards such as Dr Udaya Raghav Reddy Memorial award for the Best outgoing student in MDS 2013, Oral science award 2019, Young researcher award and Hosoi Kazuo award 2019 from Tokushima University. She is an Otsuka Toshimi Scholarship Scholar from 2018 April to 2020 March. Resmi Raju has published around 5 articles in reputed journal during PhD studies.

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