ADIPOSE TISSUE ENGINEERING

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The reconstruction of extensive soft tissue defects remains a challenge in plastic and reconstructive surgery. A possible solution for these defects is adipose tissue engineering. Today adipose tissue engineering relies on biomaterials seeded in vitro with adipose tissue-derived stem cells or the in vivo recruitment of endogenous precursor cells into an artificial or native matrix.

Harvesting preadipocytes from adult human adipose tissue can be improved by identifying their specific surface markers, for example CD 31, S100 or vWF. Cell culture conditions also play an essential role in adipose tissue engineering. We found that differentiation can be significantly improved by using autologous serum. Also preadipocytes in cell culture conditions for endothelial cells can differentiate into endothelial cells.

Adipose tissue engineering also depends on the adequate scaffold. Scaffolds allow cell attachment and migration, deliver and retain cells and biochemical factors, enable diffusion of vital cell nutrients and exert mechanical and biological influences to modify the behavior of the cell phase.

Currently using an adipose construct as filler material currently seems feasible only for smaller defects. Another strategy is to use the body's own potential for tissue regeneration and synthesis. The goal is to mimic the mechanisms of producing large amounts of adipose tissue like in obesity.

Several different adipokinins and proinflammatory mediators are secreted by adipocytes and promote adipogenesis. In an animal model we could show that a system consisting of proinflammatory stimuli like MCP-1 and nitric oxide potentially allows better results in adipose tissue engineering This represents an innovative approach for the successful production of adipose tissues in vitro, ex vivo or in vivo.