Artificial vascular and bone prostheses are engineered as bioinert, not allowing cell attachment and growth. Our aim was to prepare materials based on natural and synthetic polymers that could modify the surface or create the bulk material of prostheses, and test their bioactivity in vitro. We prepared fibrin assemblies of various thicknesses and
evaluated the adhesion, growth and differentiation of endothelial cells (EC) on these layers. We observed increased cell spreading on twodimensional fibrin assemblies and improved cell growth and maturation on thick fibrin gels. Fibrin coated with collagen I, or fibronectin, increased the adhesion area and the proliferation activity of vascular smooth muscle cells (VSMC). Synthetic polymers were based on an inert block copolymer of poly(DL-lactide) and polyethylene oxide (PDLLA-b-PEO) in which 5% or 20% of the PEO chains were grafted with Gly-Arg-Gly-Asp-Ser-Gly oligopeptide, a ligand for cell adhesion receptors. Grafting oligopeptide peptide to the cell non-adhesive copolymer restored adhesion and growth of VSMC, even in a serum-free medium. Synthetic polymers could therefore serve as artificial extracellular matrix analogues for vascular tissue repair and regeneration. Our study with human osteoblast-like MG 63 cells cultured in poly(lactic-co-glycolic acid) scaffolds revealed that the pore size, rather than the technique used for preparing the scaffold, improved cell attachment and growth inside the scaffolds. The cells on the scaffolds of large or medium pore size, i.e. 200 and 600 μm, infiltrated the inside part of the material, whereas on the scaffolds of small pore size (40 μm), the cells were retained on the material surface. Mesenchymal stem cells, VSMC, or EC were cultured on micropatterned surfaces, which were prepared by successive plasma polymerization of hydrophilic acrylic acid and hydrophobic 1,7-octadiene.