Energy metabolism of keloids and scars

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We previously reported that keloid tissues exhibit high ATP levels, even 10 years after onset. We speculated that this may be due to hypoxia-related blood vessel flattening and crushing that promotes anaerobic glycolysis. Notably, keloid fibroblasts share the same bioenergetics characteristics as cancer cells: they mainly generate ATP via glycolysis and exhibit increased lactate production in hypoxic environments. To further examine the relationship between blood vessels, fibroblasts, hypoxia, and glycolysis in keloids, keloid specimens resected at Osaka Medical College Hospital were subjected to immunohistochemical analysis by double-labeling with antibodies specific for CD31, LC3, and LDH, which are markers of endothelial cells, hypoxia, and glycolysis, respectively. Staining intensity was quantitated with image J software. Compared to the marginal zone of the lesions, the central zone exhibited much lower CD31 expression, significantly more LC3 expression by fibroblasts, and larger LDH+ areas. Thus, the highly collagenous central zone of keloids associates with paucity of blood vessels and greater fibroblast hypoxia and glycolysis, while the reverse is observed for the central zone. This tissue structure and biochemical gradient may play an important role in keloid growth.