Biotextiles that are woven by using electrochemically aligned collagen threads show promise for treating rotator cuff injuries as they are biocompatible, biodegradable, and have tenoinductive effect on mesenchymal cells toward formation of replacement tendon tissue. We fabricated electrochemically aligned collagen scaffolds and surgically implanted them into segmental defects introduced in a rabbit infraspinatus tendon, with or without allogeneic mesenchymal stem cells. The results indicated that at 6 months post op segmental defects that are repaired by MSC supplemented woven collagen biotextiles to match the biomechanical properties of positive control direct repair. Importantly, the repair tissue was positive for tendon-specific marker tenomodulin. In addition to segmental tendon defect repair, the presentation will elucidate on the topographical mechanisms by which aligned collagen threads drive MSC to tenocyte differentiation.