NAME

Hatim Thaker

Northwestern University

TITLE

Urinary Bladder Regeneration Utilizing Mesenchymal Stem Cells Seeded onto Elastomeric Thin Films

ABSTRACT

Acquired or developmental disorders affecting urinary bladder function leads to a myriad of pathological conditions, even with advances in surgical intervention. Previous studies have yielded inconclusive results due to inappropriate cell types and primitive scaffold design. An alternative using bone marrow derived mesenchymal stem cells (MSCs) addresses this shortcoming: MSCs may be transdifferentiated into bladder wall components, suitable for bladder regeneration studies, when combined with poly(1,8-octanediol-co-citrate) thin films (POCf). Initial studies have confirmed the candidacy of MSCs for bladder regeneration since they express contractile proteins and even show contraction in an undifferentiated state. POCf is a highly reproducible elastomeric material capable of being used as a synthetic scaffold. Human MSCs/Urotsa (an immortalized urothelial cell line), and bladder smooth muscle cells (bSMCs)/Urotsa were seeded on opposing sides of POCfs at 15K cells/cm^2, cultured for 1 week. Cell viability was determined in vitro up to 21 days post-seeding. A 30% bladder cystectomy was created in a nude rat bladder augmention model and repaired with the aforementioned cell seeded POCfs or unseeded POCfs enveloped with an omentum. Rats were sacrificed 4 weeks post-implantation and augmented bladders were paraffin embedded for Masson's Trichrome and anti-human g-tubulin staining. in vitro MSC viability at day 1 and 21 post-seeding was >98% on POCfs. Rat bladders augmented with an MSC/Urotsa seeded POCf grew to thickness levels greater than a comparably seeded cSMC/Urotsa POCf. Collagen to muscle ratio was also comparable between MSC and SMC groups. g-tubulin staining of the MSC/Urotsa POCfs indicated that cell outgrowth was of human origin as also seen with directly labeled cSMCs. Data gathered from this study demonstrate that MSCs, paired with synthetic POCfs, support the regeneration of bladder tissue in vivo.