Maxillofacial burn scar management using a polymer-based gel wound dressing

Mohamed El Masry[1,2], MD,PhD, Sashwati Roy, PhD[1], Nandini Ghosh, PhD[1],Chandan K. Sen, PhD[1]

[1]Indiana Center for Regenerative Medicine & Engineering, Indiana University School of Medicine, Indianapolis, IN
[2]Plastic Surgery Department, Zagazig University, Egypt.

Background. Face thermal injury is a challenge for plastic surgeons particularly managing its complications such as skin contracture, ectorpion and macro or microstomia with excessive scar formation. The consequential facial deformity burdens the subject socially, emotionally, and psychologically. The primary objective of this work was to study the scarring outcomes in a preclinical porcine model of maxillofacial burn trauma using different dressings compared to split-thickness skin grafting (STSG).

Methods. Burn wounds were made using a standardized electrical burner that created full thickness burn affected up to 50% of the facial surface. Wounds were treated with either placebo dressing (Acticoat™) or a polymer-based gel wound dressing once weekly or skin grafted at d7 post burn. Progression of burn wound healing were followed using non-invasive imaging until d84. Histopathological examination of the burn was performed using standard histopathology/immunohistochemistry.

Results . Thermal injury resulted in a fourth degree burn and excessive contracture and scarring ($n=7$, $p<0.05$) that were evident at d84 post burn. STSG significantly improved face burn deformity with diminished ($n=5$, $p<0.05$) inflammatory response concomitant with improved angiogenesis. Polymer-based gel wound dressing application significantly ($p<0.05$; $n = 3$) enhanced the wound closure during the acute phase and less scarring ($p<0.05$; $n = 3$) with near normal ratio of collagen Ⅰ:Ⅲ ($p<0.05$; $n=3$) as compared to Acticoat™ treatment.

Conclusion . In summary, this pre-clinical model recapitulates features characteristic of human facial burns with severe contracture involving the muco-cutaneous junctions. STGS significantly improved the scar outcomes. Application of a polymer-based gel wound dressing improved early phase responses including improved wound closure and healing outcome.