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Case Report

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Implantation of a heterologous dermo-epidermal skin substitute in a patient with deep dermal burn that enhances biomechanical and functional recovery: Case report

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In Mexico, burns are considered a public health problem; approximately 93% of all burned patients are treated at public hospitals. For patients undergoing extensive burns, prompt skin coverage avoids potential complications, is life-saving, and is the key for acceptable functional and esthetic results. Many efforts have been undertaken to find new strategies for the treatment of burns. The aim of this study was to create a permanent human Dermo-Epidermal Skin Substitute (hDE-SS) by combining heterologous keratinocytes and fibroblasts cultured onto Radio-sterilized Human Amnion (RHA), suitable for the treatment of patients with deep dermal burns. The manufacture of hDE-SS was carried out under sterile conditions in a Class 100 Cleanroom located inside the Laboratory of Biotechnology at the National Center of Research and Attention for Burn Patients (CENIAQ, its acronym in Spanish). The heterologous cells were obtained from skin remnants collected from elective esthetic surgeries. RHA used as a scaffold was obtained from placental tissue irradiated with 25 kGy of gamma radiation. Viable constructs were obtained, revealing a positive immunophenotype for fibroblast surface antigen (1B10) and negative for human alpha smooth muscle actin protein (α -sma). Keratinocytes were positive for CK5 and CK10 to a lesser extent. hDE-SS was implanted in one patient with a deep dermal burn who fulfilled the inclusion criteria for this study. The implanted patient was followed up through days 7, 14, 21, 35, and 92 post-implantation using photographic monitoring and measurement of the following: viscoelasticity (R6); net elasticity (R5); maximal extension (R0), and hydration, melanin, and erythema with a Cutometer[®]. The employment of hDE-SS in a deep dermal burn showed clinical re-epithelization within a 7-day period favored by cellular migration, due to the presence of fibroblasts and keratinocytes. Also, the functional and mechanical quality of the skin was measured with the Cutometer[®], demonstrating that it is optimal and similar to controls of healthy skin and an autograft, justifying the usage of hDE-SS.

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