A clinical implementation of in house produced acellular dermal matrix (ADM) inhabited by *in vitro* cultured cells – case series.

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Background: An acellular dermal matrix (ADM) can be repopulated *de novo* by autologous or allogeneic skin cells. The goal was to evaluate a new burn treatment methods based on usage of self produced human living skin substitute.

Material and methods:

The proposed research programme has been approved by the Bioethics Committee of the Silesian Chamber of Physicians in Katowice.

For the production of acellular dermal matrices (ADM), allogeneic and biostatic human skin grafts deposited at the Tissue Bank of the Dr Stanisław Sakiel Centre for Burn Treatment (Polish: Centrum Leczenia Oparzeń, (CLO) were used. Allogeneic skin was harvested from deceased donors during multiorgan harvests, and then developed in accordance with applicable regulations.

Based on an analysis of the results obtained in the research work at the CLO, the optimal method for the production of stable, viable skin substitutes based on independently produced acellular dermal matrices (ADM) and *in vitro* cultured skin cells.

The research protocol proposed an enzymatic method for cell removal (0.05% trypsin solution in EDTA and 0.025% trypsin solution in EDTA).

Four patients were selected:

Case 1. A 63 year old patient with thermal burns of 34% TBSA including 24% III/IV. ADMs and allogeneic skin grafts (control) were meshed 1:2, grafted and then *in vitro* cultured autologous fibroblasts and keratinocytes suspended in PLRG were transplanted.

Case 2. A 36 year old patient with thermal burns of 24% TBSA including 24% III/IV. ADMs and allogeneic skin grafts (control) were meshed 1:1,5, grafted and then *in vitro* cultured autologous fibroblasts and keratinocytes suspended in PLRG were transplanted on the donor sites wounds.

Case 3. A 63 year old patient with thermal burns of burns of 20% TBSA (IIa/IIb). ADMs were meshed 1:1,5, grafted and then *in vitro* cultured allogeneic fibroblasts and keratinocytes suspended in 0,9% NaCl were transplanted.

Case 4. A 59 year old patient with thermal burns of 31% TBSA (IIa/IIb). ADMs were meshed 1: 1.5 and then transplanted with *in vitro* cultured autologous fibroblasts and keratinocytes suspended in the PLRG.

Results:

Case 1: The patient received 2800 cm² allogeneic skin grafts of which 1063 cm² were ADMs. The number of grafted keratinocytes was 3.96 million with 90% vitality and 25.3 million fibroblasts with 96% vitality. In the day 0, 3 and 5 the histochemical samples were prepared. In the day 6 patient died.

Case 2: The patient received 657 cm² allogeneic skin grafts, meshed 1:1,5, of which 462 cm² were ADMs. Keratinocytes and fibroblasts were suspended in PLRG. In the day 0, 3, 5, 14 and 21 the histochemical samples were done. Histochemical images depict the appropriate wound closure.

Case 3. The patient received 92 cm² ADMs meshed 1:1,5. The allogeneic keratinocytes and fibroblasts were grafted in 0.9% NaCl. In the day 0 the histochemical sample was done. The patient did not consent to continue participation in the study.

Case 3

Case 4. The patient received 2,627 cm² allogeneic skin grafts meshed 1:1.5 of which 2,525 cm² were ADMs. ADM scaffolds were seeded with autologous keratinocytes and fibroblasts in PLRG. The patient had written off to the hospital.

Conclusions:

The presented method for burn treatment may be the optimal method for burn wound therapy. However, it requires increased number of samples to perform statistical analysis of the results.