BACKGROUND:

To maximize aesthetic and functional outcomes for complex craniofacial defects, application of composite tissue allografts opens unique one-stage reconstructive option. We have assessed role of different components of the hemiface/mandible/tongue allograft on induction and maintenance of donor-specific chimerism, in correlation with allograft survival.

METHODS:

Twenty-two composite hemiface/mandible/tongue transplantations were performed in three groups: group 1 (n=8)-isotransplantations between Lewis (LEW) rats (RT1)-served as controls. Group 2 (n=8)-allograft rejection controls-hemiface/mandible/tongue transplants performed across major histocompatibility complex (MHC) barrier between semiallogeneic LEW-Brown-Norway (RT1) donors and LEW (RT1) recipients without immunosuppression. Allografts in group 3 (n=6) received tapered cyclosporine A monotherapy. Assessments included monitoring of rejection, flow cytometry for donor-specific chimerism of major histocompatibility complex class I (RT1) antigen, immunohistochemistry for engraftment of donor-origin cells into lymphoid organs and bone marrow (BM) compartment, and histology for hemiface/mandible/tongue architecture.

RESULTS:

Isograft controls survived indefinitely; in allografts without treatment, rejection started within 5 to 7 days. Treated hemiface/mandible/tongue allotransplants survived up to 385 days, without signs of rejection or graft loss. Flap angiography confirmed intact vascularity, and computer tomography scan and histology confirmed bone viability. Donor-specific chimerism at day 125 was present for T cells (3.3% CD4/RT1, 1.1% CD8/RT1) and B cells (6.7% CD45RA/RT1). Engraftment of donor-origin cells was confirmed into BM compartment and lymphoid organs of recipients.

CONCLUSIONS:

We introduced a new multitissue model of composite hemiface/mandible/tongue allograft containing lymphoid and vascularized BM components. Long-term allograft survival correlated with development and maintenance of donor-specific chimerism in lymphoid organs and BM compartment.