Abstract

In head and neck reconstruction, there is sometimes the need for a skin flap lined with mucosa. The object of this study was to determine whether small pieces of mucosa grafted onto the undersurface of a skin flap can be expanded in a reasonable time to provide the material required to reconstruct a full-thickness cheek defect as a free flap. The study consisted of two phases: prelamination and expansion of the flap, and vascularized free-tissue transfer of the flap. Six adult mongrel dogs were used. First, a 5 x 10-cm flap based on the saphenous vessels was elevated on the lower leg, and then four 1 x 2-cm pieces of mucosa harvested from the tongue were grafted onto the undersurface of the flap. A tissue expander (5 x 10 cm) was then placed under the flap, and the incision was closed primarily. The expanders were initially filled with just enough normal saline to obliterate dead space immediately after surgery. The expansion was continued twice weekly for 3 weeks until sufficient expansion was obtained. Two of six flaps were followed for an additional 6 weeks after the 3-week expansion period to observe whether additional mucosa could be obtained. After measurement of the mucosal area, each flap was transferred as free flap to reconstruct an iatrogenic cheek defect. The increase of mucosal surface area was compared with the original graft, and differences were analyzed using the paired t test. All flaps were successfully expanded without any complications. Histologic evaluation revealed that grafted mucosa took well without evidence of graft necrosis, and the intergraft area was covered with histiocytes. Angiography revealed well-defined vascular structures covering the entire area of the flap. The new mucosal area (23.5 +/- 2.4 cm2) was significantly larger than the original mucosal graft (8.7 +/- 0.9 cm2) ($p < 0.001$). The net increase of the mucosal area was 172.9 +/- 32.4 percent. The increase of mucosal area in two flaps, following a 6-week consolidation period after 3 weeks of expansion, was only slightly greater (25.9 +/- 1.3 cm2) than those without the consolidation period (22.3 +/- 1.8 cm2). This increase of the mucosal area appears to be related to the amount of expansion, and not to the length of the consolidation period. The flaps were successfully transferred as free flaps to reconstruct the full-thickness cheek defects without major complications. Although a staged operation to allow flaps to mature is needed, the present procedure has the advantages of providing a mucosa-lined flap and allowing primary closure of the donor site. The authors conclude that expansion of this flap has great potential in reconstructive surgery.