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Original Article

Intraoperative local flap transforming (iLoFT) method; from hachet to reading-man flap☆

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ABSTRACT

Local flaps are widely used in soft tissue reconstruction because they result in good colour and texture match. They can be quickly placed without donor site morbidity. However, it is not always easy to preoperatively design a feasible procedure, predict the final scar line or image the tension that may occur on and around the flap, especially for inexperienced surgeons. Because the elasticity of the skin varies with anatomical location and among individuals, unpredictable intraoperative design changes are sometimes required. Therefore, a preoperative back-up plan would be helpful. We evaluated the possibilities and advantages of an intraoperative switch from a hatchet flap (HF) to a reading man flap (RMF) procedure. Using a previously reported computer simulation with the finite element method (FEM) analysis, we developed an intraoperative local flap transformation (iLoFT) model.

Introduction

Local flaps are widely used in soft tissue reconstruction because they result in good colour and texture match, can be quickly placed and donor site morbidity can be avoided.[1] However, it is not always easy to preoperatively design a feasible procedure, predict the final scar line or image the

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tension everywhere on the flap, especially for inexperienced surgeons. Because the elasticity of the skin varies with anatomical location and among individuals, unpredictable intraoperative design changes are sometimes required. Therefore, a preoperative back-up plan to anticipate switching would be helpful. We evaluated the possibilities and advantages of an intraoperative switch from a hatchet flap (HF) to a reading man flap (RMF) procedure. Using a previously reported computer simulation with the finite element method (FEM) analysis,[2–4] we developed an intraoperative local flap transformation (iLoFT) model.

Material and methods

We reviewed FEM computer simulation models of flap stress in different flap designs. Briefly, the skin model was simulated using the Mooney–Rivlin elastic model with ADINA 8.8 software on an EPSON Pro 7500 Intel Core 3.20 GHz personal computer running on Windows 7. In each model, RMF and HF procedures were compared as previously reported.[2,3]

The iLoFT model was applied in clinical cases involving patients who needed skin and soft tissue reconstruction, and both HF and RMF were preoperatively designed. Initially, HF was elevated to cover the defect, and the donor site and flap were temporarily sutured after the HF elevation. In case the skin colour whitened and the vascularity was considered unreliable, an additional incision was intraoperatively performed to transform the design to RMF.

Clinical cases

Case 1 was an 82-year-old woman who had a 3 × 4-cm bed sore and a subcutaneous pocket on her right hip. The scar could not be treated using conservative therapy because of lateral paralysis, malnutrition and continuous pressure on the decubitus. The floor of the ulcer reached the bone (Figure 1). To improve vascularity and decrease the risk of ulcer recurrence, the iLoFT method from HF to RMF was used (Figure 2). There were no surgical complications or recurrence in 3 years of follow-up.

Case 2 was a 45-year-old man with a small skin lesion on his right cheek that was diagnosed as dermatofibrosarcoma protuberance; he underwent a resection with a 4-cm horizontal margin. An initial attempt to cover the large skin defect by a lateral HF with the neck as the donor site failed because the tension would not allow closing the primary site (Figure 3). A successful switch to RMF was made using iLoFT (Figure 4). There were no surgical complications or recurrence in 1 year of follow-up. The scar on the neck will be retouched (Figure 5).

Case 3 was an 11-month-old boy with rhabdomyosarcoma on the lower back; he underwent a wide excision leaving a 5 × 3-cm soft tissue defect that reached the periosteum (Figure 6). HF was elevated

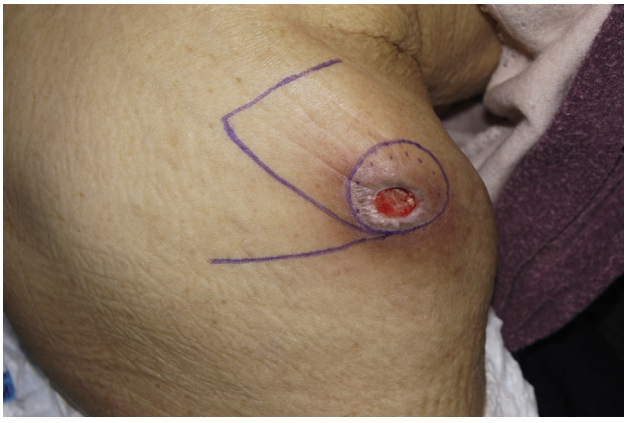

Figure 1. Preoperative design of a reading man flap on the hip.