Fat Grafting for Treatment of Burns, Burn Scars, and Other Difficult Wounds

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KEYWORDS

• Fat grafting • Burns • Wounds • Burn scars • Burn sequelae • Wound healing • Scar remodeling

KEY POINTS

- The use of fat grafting has changed our practice dramatically, mainly in relation to our previous routines of using immediate excision and grafting in burns of the hands and in relation to our early (practically the immediate day after admission) use of muscle flaps for exposed bone fractures in patients who were traditionally referred (6–8 weeks after the original injury) from a local state hospital with subacute wounds and open fractures of the middle or lower third of the leg.
- Fat grafting has also greatly influenced the way we treat hypertrophic scars as a consequence of burn wounds.
- One of the most pleasant surprises in using fat grafts is the minimal incidence (or none) of hypertrophic scarring on the healing of wounds treated with one or more sessions of fat grafting.

The Authors present three videos of procedures: Video 1 presents chronic wound debridement and fat injections for skin grafting. Video 2 presents fat injection under finger burn wounds. Video 3 presents fat injections under a facial scar. These videos can be viewed at www.plasticsurgery.theclinics.com/

OVERVIEW

Fat grafting has been used worldwide taking advantage of the benefits of adipose-derived stem cells (ADSC's) for regenerative purposes and their ability to differentiate in fat, bone, cartilage, muscle, and possibly other tissues. They also have a great variety of regenerative and metabolic properties, and growth factors (eg, epidermal growth factor, transforming growth factor-β, hepatocyte growth factor, platelet-derived growth factor, basic fibroblast growth factor). Fat on the lipoaspirate can be isolated and/or treated by physical or chemical methods, in the operating room, or in a laboratory setup.[1–8]

Burns and Wound Healing

The most typical burn that occurs in a child in our area of the world is a burn caused by hot liquids during preparation or consumption of a meal, followed by sudden flame of ethanol, used by the child or in the vicinity of an adult using ethanol.

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In the adult population, most commonly burns are caused by ethanol, a work-related injury (electrical, hot surfaces, plastic extrusion/packaging machine, and so forth), or a motorcycle accident (contact burns with the exhaust system, or friction burn/fracture in a fall).

Because our burn service was founded in 1968, and it is open to all patients regardless of payment or insurance, in the past 46 years we have seen more than 320,000 burn cases. Thus, we have slowly evolved to become a burn and wound care center, receiving a substantial number of patients with subacute or chronic wounds, either in consequence of a motorcycle or motor vehicle accident, or related to vascular insufficiency or diabetes.

Patients who are candidates for fat grafting procedure at our service are those with (1) hypertrophic scars that are not improving or not being controlled by pressure garments at 6 or more weeks after healing, (2) burn wounds at 3 weeks or more with no apparent progression to healing, (3) subacute burn wounds or other wounds transferred to us within more than 6 weeks after the accident or wound, and (4) venous or diabetic ulcers.

Surgical Approach

In wounds, we use the Coleman technique, repeating injections (and reharvesting) every 2 to 4 weeks until healing or until a definite procedure (eg, wound closure, skin grafting, flap, or other) is performed. After healing, injections under the scar are performed at 3-month intervals, also via the Coleman technique.[9–12] This approach is also taken with patients with scars who seek our service for consultation after being treated elsewhere.

TREATMENT GOALS AND PLANNED OUTCOMES

The use of fat grafting as an adjuvant treatment in acute and subacute burn wounds and in chronic vascular wounds (venous insufficiency or diabetic arterial disease) takes advantage of fat's benefits: a variety of metabolic and regenerative properties, increasing vascularization, and enhancing the tissue regeneration process. When these wounds are treated with repeated fat grafting (15–21 days apart), healing is the planned outcome.[13–15]

When treating burn scars, the objective is to decrease the amount of hypertrophy (fibrosis), diminishing the scar thickness and increasing scar malleability. We also use this technique to decrease fibrosis around bone joints and at releasing tendon adhesions.[16–19]

PREOPERATIVE PLANNING AND PREPARATION

Patients with subacute burn wounds (more than 3 weeks in our Service without apparent progression to healing), open fractures of the tibia, associated to nonhealing or poorly healing wounds, chronic venous insufficiency, or diabetic arterial disease wounds are selected for adjuvant treatment with fat injection. In open wounds, injections are performed under general anesthesia, in 15- to 21-day intervals.

Patients with hypertrophic scarring after healing of a burn or keloids of any origin are also selected for treatment with fat injection. Repeat injections (up to four injections total) are performed at 8- to 12-week intervals.

Donor areas are "rotated" as needed and fat most frequently is obtained from the abdomen, thighs, or lateral upper buttocks. When necessary, shaving of the pubic area or proximal thigh is performed in the operating room, immediately before the procedure. Puncture incisions for introduction of the liposuction cannula are placed on the midline, at the suprapubic crease; medial to the femoral pulse, at the inguinal crease; or in the middle axillary line, at the upper border of the iliac bone.

The actual volume of harvested lipoaspirate should be at least twice the anticipated volume planned to be injected, and at least four times this volume if one is also planning to have fat deposited over the wound.

PATIENT POSITIONING

Patients are supine when using the abdomen or thighs as donor areas or on lateral decubitus when obtaining fat from the lateral upper thighs. Fat is usually injected while the patient is supine.

PROCEDURAL APPROACH

Fat harvesting and fat injection are sterile surgical procedures and should be performed only in accredited operation rooms under rigorous, completely sterile technique. In patients with scars (healed wounds), the donor area and recipient area are individually prepared and draped in the usual manner. In patients with open, nonhealed wounds, the recipient area is prepared only after the planned amount of fat is obtained, while it is being centrifuged and distributed in various syringes.

Fat is harvested from the patient himself or herself, using a 10-mL Luer Lok syringe, attached to a 3-mm cannula, with two 3-mm side openings distally, with 10-, 15-, or 20-cm length, according to the harvesting site. In children weighing less than 25 kg, we prefer 20-mL syringes and multi