INTRODUCTION

The term “cicatricial” contains the Latin root “cicatrix,” which means “scar resulting from the formation and contraction of fibrous tissue.” (1) Historically, dermatologists have used the term cicatricial alopecia to refer to scarring alopecia caused by inflammatory disease processes such as discoid lupus erythematosus, lichen planopilaris, pseudopalade, etc. In the field of hair transplantation, the term is often used more broadly to include scarring alopecias caused by various forms of trauma (burns, accidental injury, cosmetic surgery, radiation, etc). Chapter 4 categorizes and discusses the various causes of scarring alopecia, and it is not the purpose of this chapter to repeat this information. However, at times, the hair transplant surgeon may be called upon to consider grafting into scar tissue. The purpose of this chapter is to discuss the various factors and techniques that need to be considered when contemplating hair transplantation into an area of scarring.

Factors to consider before transplanting

Although there is often initial concern about viability, our experience has shown that hair can often be implanted successfully in scar tissue. (2, 3, 4, 5, 6, 7) The physician should, however, carefully evaluate a number of factors before deciding to perform such a procedure, or alter the technique to accommodate those factors.

1. Optimal Procedure; Surgical Revision vs. Hair Transplantation

If the area of scarring is relatively small, or if the surgeon is confident that the scar can be removed by an excision and subsequent repair, such an alternative should be presented to the patient. In some situations, when larger areas of alopecia exist, a portion of the area can be excised, leaving a small area that requires fewer grafts or the use of expanders and flaps should be considered. (2) On these occasions, if the physician is not skilled in these more aggressive types of procedures, he should consider an appropriate referral. It may be that after partially removing a larger area of scarring, a smaller scar may remain that can be more easily aesthetically enhanced by transplantation.

Although many types of grafts currently exist in the field of hair restoration surgery, these authors believe that smaller grafts, and in particular FU grafts, are better than larger ones when transplanting into scar tissue. It is our opinion that FU’s have the greatest chance of survival and the least chance of causing ischemic injury when transplanted into what may be less vascular areas of scar tissue. It should be noted, however, that in the past, other types of small graft procedures have been successfully performed in areas of scarring. (3, 4, 5, 6)

2. Etiology of Scarring

- Scarring caused by an inflammatory disease process

The caveat in transplanting patients whose scarring is the result of inflammatory disease processes (lichen planopilaris, discoid lupus erythematosus, etc), is to be certain that the disease process has “burned out” before undertaking the procedure. It may be appropriate to consult with a dermatologist and/or obtain a biopsy from the area to be transplanted to ascertain if the inflammatory or infectious process has subsided. A general rule of thumb has been to wait until there are no signs of active disease for approximately one year. (2) Unfortunately, due to the variable clinical course of these processes, we cannot be certain that the disease will not reactivate at a later time.

There are apparently no scientific studies that discuss survival rates of grafts in patients with various types of scarring alopecias. There is concern that the survival rate may be somewhat diminished in some cases as compared to grafts placed in normal tissue. In spite of these concerns, as noted earlier, experience has shown that grafts can often be successfully transplanted, and patients are grateful for the cosmetic
improvement. It may be that these patients sometimes accept less than full growth because we are
improving on an unnatural deformity, rather than trying to reverse the natural balding process. However, it
is important to educate these patients before the procedure and warn them about the possibility of disease
recurrence and a decreased hair survival rate.

In examining the patient, it is also important to be certain that the apparent scar is indeed a scar. For
example, in rare instances, a basal cell carcinoma of the sclerosing type can mimic a scar. Patients may
even relate a history of trauma. If there is any question about the diagnosis, the area should be biopsied.

- **Scarring caused by physical trauma**
  With scars caused by physical trauma or cosmetic procedures, the surgeon should inquire as to the nature of
  the injury or procedure. It may be important to know how the surgery was performed. Although rare, a
  patient may have a history of neurosurgery or maxillofacial surgery, and there is a possibility that there may
  be a contraindication to performing the hair replacement procedure. For instance, there may be a fixation
device lying underneath the area of surgery that could be compromised or subject to infection. In this
situation it may be prudent to speak with the surgeon who performed the operation to determine whether the
patient is cleared for hair transplant surgery or other scalp surgery and whether peri-operative antibiotics are
recommended.

We are increasingly called upon to provide hair transplants due to scarring resulting from aesthetic surgery.
Most commonly, these scars are from rhytidectomy and “brow lifts”. In both instances, there may be
significant hair loss surrounding the scar in addition to the scar itself. To provide a natural appearance, the
area surrounding the scar may also need to be transplanted. Though rarely performed today, there are some
patients who have undergone direct brow lifts. These lifts can leave scars that extend into the eyebrow.
When this occurs, the techniques described in Chapter 15A, for transplanting eyebrows, can be used.

Some patients who have previously undergone hair transplantation may have scars in the donor area. In
many cases, a simple scar revision can take care of the problem. There are, however, situations where the
donor area has been heavily harvested and the remaining hair-bearing area adjacent to the scars is quite
sparse. In such cases it may be reasonable to obtain grafts from other less heavily harvested areas of the
donor area from the parietal areas to place in the donor area.

3. **Blood Supply**
The issue of adequacy of the blood supply to the scar tissue often arises. In addition to leading to poor graft
survival, this limited blood supply can potentially leave the recipient area more vulnerable to infection,
further ischemia and necrosis, as more vascular injury from the grafting occurs. Although these are
legitimate concerns, experience has shown that the blood supply in scar tissue is often sufficient to
accommodate the appropriate placement of FU grafts and even longer grafts. However, certain precautions
and modifications should be taken. Some physicians have recommended assessing the blood supply by
sticking the tissue with an 18-gauge needle and waiting for the appearance of blood. If none appears after a
few minutes, one should be extremely cautious and consider test grafts in the area before committing to a
larger procedure. In general, one should always perform the first transplant in areas of scar tissue with
smaller numbers of grafts placed at lower densities than you typically use in normal skin. It is also prudent
to wait longer in between sessions, for example, eight months to one year. In these circumstances, it is
better to plan on doing multiple, smaller sessions that succeed one another, rather than one large session that
fails. As stated earlier, it is our opinion that FU grafts, with their associated small recipient sites, have the
greatest chance of survival and the least chance of causing further injury in tissue with decreased blood
supply. Although not proven, some physicians suggest that the use of a 2% to 5% solution of Rogaine for
one week pre-operatively and five weeks postoperatively may improve the blood supply, and the odds of a
successful transplant. Theoretically, the use of pentoxifylline (Trental®) 400 mg, three times daily with
meals, for at least two weeks prior to surgery, may also provide greater oxygenation to the tissue.
4. Scalp Thickness
The thickness of the scalp in areas of scarring can vary significantly depending whether the scar is hypertrophic or atrophic. Some scar tissue is thick and tough, while other scar tissue is thin and friable. With hypertrophic scars, there is concern that the incisions will not gain access to the blood supply. Minimum depth incisions should probably not be used in these situations; rather, one should err on the side of making the incisions slightly deeper. One must also differentiate simple hypertrophic scars from true keloid scar (see Chapter 14A) as transplanting into true keloid scar tissue as this may stimulate further keloid formation.

Transplanting into atrophic scar tissue, such as that created by post-radiation injury, creates a different, and in our opinion, a more difficult problem. The recipient area in this thin, poorly vascularized tissue is more prone to ischemia. In addition, the shallow skin makes it difficult to create incisions deep enough to house even tiny FUs. Placing grafts into shallow incisions is also more difficult and may lead to greater graft trauma and poor survival. Making the incisions at a more acute angle can increase the length of the incisions, and create a posterior “pocket” to house the graft. Carefully using a small amount of tumescent solution (without epinephrine) can temporarily distend the skin, making it easier to create these more acutely angled incisions. Others have recommended turning the blade 90 degrees, (so the cutting surface is parallel to the skin) in order to facilitate making an incision at a more acute angle. (2,4,5)

On several occasions, we have noticed that after the first conservative transplant into an area of atrophic scarring, the tissue characteristics improve and become more favorable for a second transplant procedure. The tissue becomes thicker and more supple. It may be that the FU grafts act like multiple tiny skin grafts, and also may stimulate angiogenesis. Figs. 15F-1a through 15F-1f show the progression of a patient through two procedures of FU grafting into a large area of scar tissue secondary to burns. The scar tissue in this patient was more vascular, thicker, and easier to transplant at the time of the second procedure.

Summary of Technical Tips
1. In cicatricial alopecia, caused by an inflammatory process, make sure the disease is dormant before proceeding. Consider a biopsy.
2. Evaluate the tissue for scalp thickness and blood supply and adjust the procedure appropriately.
3. Consider a smaller than usual “test graft” session to see how the grafts survive before committing to a larger session(s).
4. Use longer than normal intervals between sessions. Wait eight months to one year.
5. Do smaller sessions, and space the recipient sites farther apart then you would normally. Avoid “dense” packing.
6. Utilize small incisions. We employ 15 and 22.5-degree Sharpoint blades. Others successfully use 18-gauge or 19-gauge needles.
7. Use the smallest amount of epinephrine as is possible.
8. Consider the use of topical 2% to 5% minoxidil pre-operatively and postoperatively to improve the intrinsic blood flow to the area.
9. In scar tissue that is very thin, the surgeon can run into a problem with incisions that
are too shallow. Making the incisions at a more acute angle can increase the length of the incisions and create a posterior “pocket” to house the graft. Careful use of a small amount of tumescent solution can also be helpful when dealing with this problem.

10. Learn what you don’t know. If you are uncomfortable transplanting or excising the area, consult with one of your colleagues.

**Conclusions**
Although there may be some apprehension in transplanting areas of scarring, our experience has been that this type of transplantation can be very successful. By following some general rules, the hair transplant surgeon can approach these situations with confidence.