A Unique Case of Allogeneic Fat Grafting Between Brothers

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Summary: We present a case of a 65-year-old man with cutaneous T-cell lymphoma treated with radiation therapy and an allogeneic hematopoietic stem cell transplant from his human leukocyte antigen-matched brother. Engraftment was successful, but the patient went on to develop painful, radiation-induced ulcers. The ulcers were fat-allografted using liposuctioned fat from his brother because of the patient’s unique chimeric state. Postprocedure follow-up revealed epithelialization of the ulcer sites and significant improvement in neuropathic pain. Our unique case study supports the use of fat grafting for its restorative purposes and for its ability to alleviate chronic neuropathic pain. Additionally, it appears that our case provides a basis of a general approach to the treatment of radiation-induced ulcers in chimeric patients with lymphoid malignancies. (Plast Reconstr Surg Glob Open 2016;4:e1032; doi: 10.1097/GOX.0000000000001032; Published online 16 September 2016.)

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The patient remained disease free, but he developed painful, radiation-induced ulcers of his bilateral thighs, left flank, and left axilla for which he was referred to us in 2014. The ulcers were exquisitely painful, requiring high doses of oral and transdermal opioid medication (Fig. 1A). Furthermore, they exhibited constant breakdown, were unresponsive to conservative management, and deemed unsuitable for free-flap reconstruction. Autologous fat grafting of the ulcers was not an option because of the lack of subcutaneous tissue and the necessity of preserving potential flap sites. The possibility of fat allografting the ulcers using liposuctioned fat from his human leukocyte antigen-matched brother was discussed because of the patient’s unique chimeric state. Repeat chimerism testing continued to remain stable. After the risks and benefits of the procedure along with its innovative nature were discussed, the patient and his brother consented to the procedure. The Yale University Human Investigation Committee gave their approval as an innovative procedure.

In August of 2015, fat was harvested using liposuction from the brother’s abdomen and purified using Puregraft (Puregraft LLC, Solana Beach, Calif.). A 50 to 60 cm³ of the purified fat was injected into each of the patient’s ulcer sites subcutaneously for a total of 210 cm³. The procedure was completed without complications, and the patient was discharged home.

Clinical assessment on follow-up revealed new epithelialization of the patient’s ulcer sites (Figs. 1B and 2). Additionally, the patient expressed a dramatic improvement in pain symptoms and was eventually able to stop all his opioid medications. Flow cytometry and chimerism studies showed continued cancer remission and a stable chimerism profile (Fig. 3) (Supplemental Digital Content 2, http://links.lww.com/PRSGO/A255).

**DISCUSSION**

Neuropathic pain is caused by damage to the somatosensory nervous system, which can lead to abnormal processing and sensitization of both peripheral and central neurons. Treatment of neuropathic pain consists of a variety of opioids, antidepressants, anticonvulsants, and lidocaine patches. The difficulty in treating neuropathic pain, however, often leads to the chronic use and abuse of multiple agents. Fat grafting has been shown to improve neuropathic pain from various causes such as postmastectomy pain syndrome, extremity end neuritis, and traumatic and burn scars with sustained responses.8–10

Several hypotheses have been proposed for the mechanism of pain relief with fat grafting. Vaienti et al10 proposed that fat grafts act mechanically as cushions around nerve stumps and act biologically by improving local vascularization and reducing inflammation. Sacerdote et al11 showed in a rodent model that systemic administration of adipose-derived mesenchymal stem cells decreased levels of proinflammatory cytokine interleukin (IL)-1β and increased levels of anti-inflammatory cytokine IL-10. They proposed that adipose-derived mesenchymal stem cells improve neuropathic pain through immunomodulation resulting in decreased inflammation. In a recent study by Huang et al, fat grafts were injected into burn-injured hind paws of rats, which significantly reduced pain symptoms. Furthermore, these fat graft injections reduced levels of inflammatory markers such as IL-1β, tumor necrosis tumor–α, COX-2, iNOS, and nNOS in both the spinal cord and burn scars of these rats. The authors concluded that fat grafting had a direct anti-inflammatory effect both peripherally and centrally that reduced neuropathic pain in burn wounds.12

Our concerns during discussions with our patient before allogeneic fat grafting were whether the mesen-

**Fig. 1.** Left thigh ulcer before and after fat allografting. A, The skin ulcer shows poor epithelialization causing the patient significant pain. B, The skin ulcer shows new epithelialization after the fat allografting procedure. Moreover, the patient’s pain symptoms were significantly decreased after the procedure.
chymal stem cells from the fat transfer would have any adverse effects such as reactivating our patient’s CTCL or altering his chimeric profile. From our experience, it appears that allogeneic fat grafting does not cause these adverse effects.

Our unique case study supports the use of fat grafting not only for its restorative purposes but also for its ability to alleviate chronic neuropathic pain. Additionally, it appears that our case provides a basis of a general approach to the treatment of radiation-induced ulcers in chimeric patients with lymphoid malignancies.

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