Cerclage Technique for Repairing Large Circular Defects of the Trunk: Two-Staged Excision of a Plexiform Neurofibroma

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NF-1 (von Recklinghausen's disease) is an autosomal dominantly inherited disorder. The classic clinical findings include neurofibromas, café au lait spots, lisch nodules, axillary freckling, and macroglossia. The predominant lesions in NF-1 are cutaneous neurofibromas, which represent benign proliferations of neuronal support structures. Plexiform neurofibromas (PNFs) are composed of numerous encapsulated neurofibromas that develop as deep nodules often involving the dermis and subcutaneous fat. The classic "bag of worms" description gives these lesions a distinct, unmistakable appearance (Figure 1). They occur in approximately 10% of cases and are virtually pathognomonic of NF-1.[1] Although uncommon (1%–5%), malignant peripheral nerve sheath tumors may arise from PNFs and are often heralded by rapid growth or an acute onset of pain.[1]

The majority of patients with PNFs need only observation. Patients may require treatment to avoid significant functional and psychologic morbidity or to rule out rare cases of malignant transformation. Treatment options depend on location, size, patient comorbidities, and other considerations.

Surgical excision remains the treatment of choice and is curative with low rates of recurrence if the lesion is completely resected.[2] A commonly employed technique for large PNFs is sequential excisions.[3] Radiation therapy has been used successfully in cases where surgery is contraindicated.[4,5] The use of ablative lasers has also been reported on select

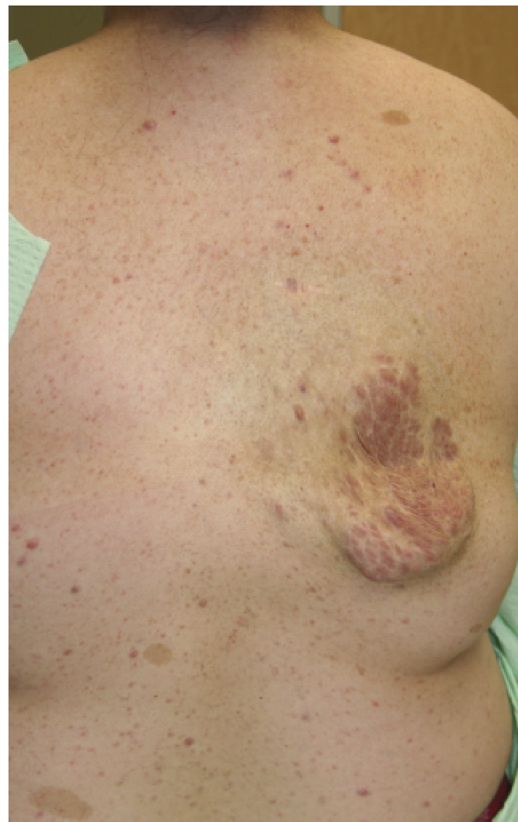

Figure 1. Patient presenting with a large, 22 × 15-cm, subscapular PNF, consistent with her diagnosis of NF-1.

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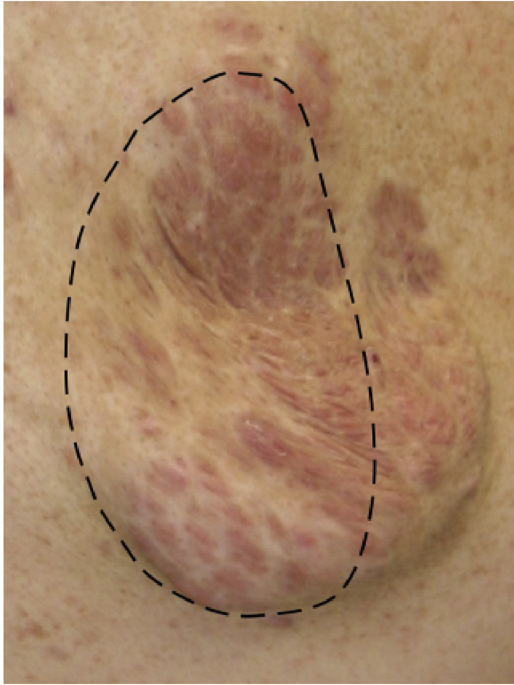

Figure 2. Lesion is initially divided into two portions. The larger portion is approximately two-thirds of the entire lesion and is excised during Stage 1.

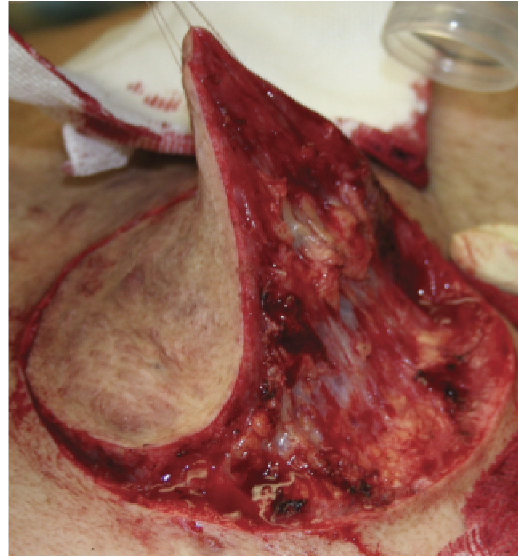

Figure 3. Excision of PNF along the deep subcutaneous plane.

mucosal and ophthalmic lesions.[6–8] Pharmacologic therapy has not produced promising results, and the use of chemotherapeutic agents is still investigational.[9]

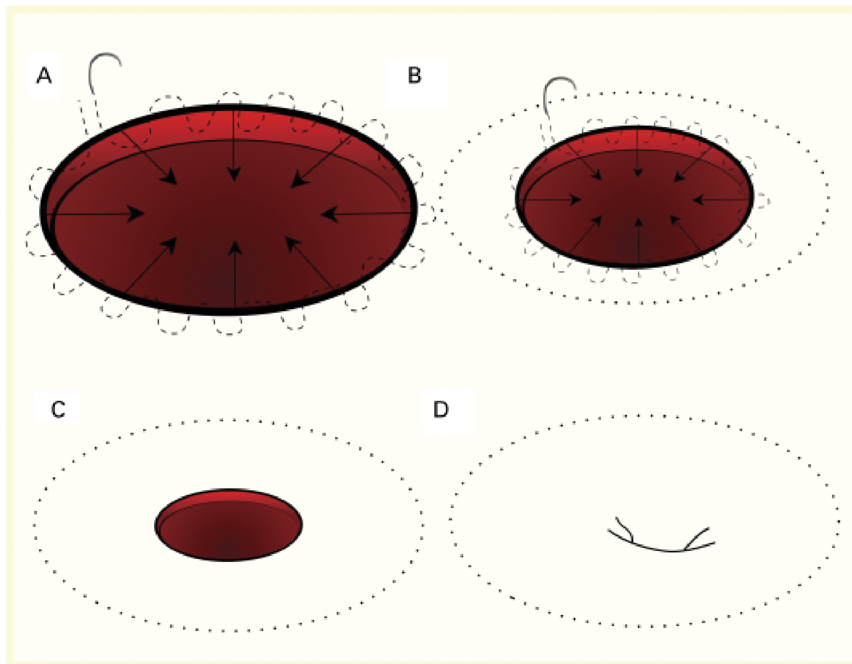

Figure 4. Purse string suture. (A) The first purse string suture is placed. (B) Result after tightening of initial purse string suture and placement of second purse string suture. The dotted line represents the original lesion size. (C) Result after tightening of second purse string suture. At this point place horizontal mattress and simple interrupted sutures. (D) Remaining scar.

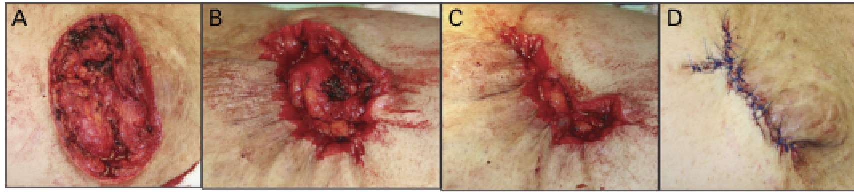

Figure 5. Stage 1. (A) Circular defect after excision to the premuscular tissue layer. (B) Purse string suture placed and tightened to decrease the size of the defect. (C) A second purse string suture is placed and tightened leaving a smaller defect. (D) Approximation and closure of remaining defect with horizontal mattress and simple interrupted sutures using 3-0 nylon while excising dog-ears. The result is a geometric approximation.

Methods

Anesthesia of the lesion is achieved by infiltration with approximately 200 cm^3 of tumescent, anesthetic solution (0.1% lidocaine with 1:1,000,000 epinephrine). The solution is allowed approximately 15 minutes to achieve adequate vasoconstriction and anesthesia. The lesion is then divided into two unequal portions measuring approximately two-thirds and one-third of the original lesion size (Figure 2). The greater two-thirds portion of the tumor is excised during the first stage of the procedure to ensure minimal wound tension during the second stage, thereby minimizing the final scar. Using a No. 10 blade, the margin of the larger portion of the lesion is traced into the subcutis. Owing to its tremendous vascular supply, excision along the deep subcutaneous plane is performed using a bovie electrosurgical cutting unit (Figure 3). After adequate hemostasis and closure of dead space, a running, subcuticular stitch is placed around the circumference of the wound using a 2.0 polydiaxonone (PDS II) suture on an FS-1 needle in a purse string–type fashion (Figure 4).[10] This suture reduces the wound diameter to approximately one-third of its original size (Figure 5B). A second cerclage suture placed in the same manner yields a smaller defect (Figure 5C). This defect is then repaired with 3-0 nylon horizontal mattress and simple interrupted sutures with excision of resultant dog-ears as needed until the margins are closely approximated (Figure 5D).

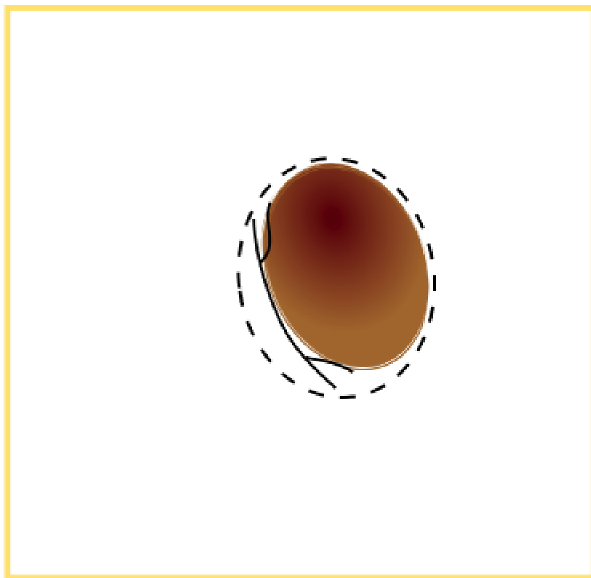

Figure 6. One month after stage 1. The resultant scar abutting the remaining one-third of the lesion. The dashed line represents the margins of excision for stage 2.

One month later, the second stage of the excision is performed. The remaining smaller portion of the lesion along with the resultant scar from the initial stage is excised (Figure 6). We use the purse string method in the same fashion until the defect is small enough to close primarily (Figures 7A–7C). After excision of resultant dog-ears, the second and final stage yields a geometrically shaped closure (Figure 7D).

When excising a lesion of this magnitude, the potential for postoperative complications is greatly increased. The risks of seroma and hematoma as well as the potential for toxicity due to the large volume of anesthesia required are minimized by intraoperative hemostasis, appropriate closure of dead space, and the use of tumescent anesthesia, respectively.

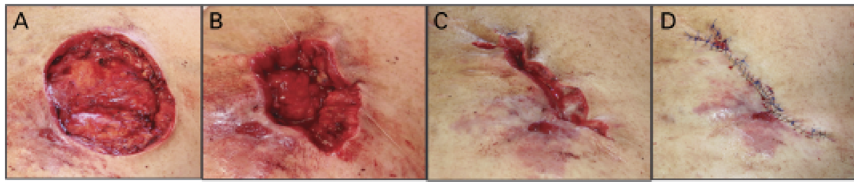

Figure 7. Stage 2. (A) Circular defect after excision to the premuscular tissue layer of the remainder of the PNF and previous scar. (B) Purse-string suture is placed to decrease the size of the defect. (C) A second purse-string suture is placed and tightened leaving a smaller defect. (D) Approximation and closure of remaining defect with simple interrupted and running sutures using 3-0 nylon while excising dog ears. The result is a geometric approximation.

Discussion

Surgical alternatives to this method are less favorable. An elliptical excision (either entirely in one procedure or in staged excisions) results in a scar three times the length of the lesion or two or more separate lengthy scars. Another alternative, a split-thickness skin graft, requires a donor site and, thus, two separate areas of wound healing. It also produces a poor cosmetic result, especially if the donor tissue is obtained from a dissimilar cosmetic unit. There is also the possibility of necrosis due to graft failure. A large transposition flap would also increase scar length and bears the potential for flap necrosis.

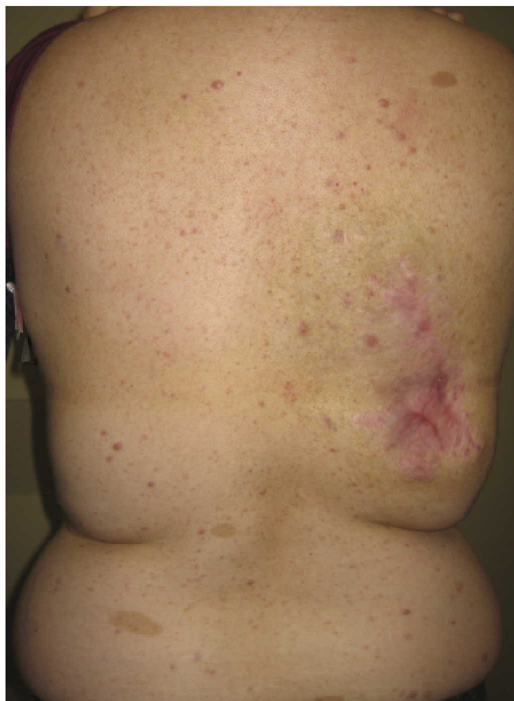

Figure 8. The patient 3 months post-excision of PNF with a minimal scar.

Using the cerclage method, scar length is minimized and the greatest amount of normal tissue is spared (Figure 8). This method also inevitably produces an irregular, geometric scar thereby improving overall cosmesis as compared to linear wound closure.[11] Furthermore, the dermatologic surgeon obviates the use of general anesthesia, skin grafting, or large flap repair, thereby reducing morbidity. This case demonstrates an effective method for removing large PNFs in staged excisions using local tumescent anesthesia. It also illustrates a valuable, seldom-used technique in the armamentarium of dermatologic surgery, the cerclage technique, for repairing large circular defects.

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