

# Intraoperative Tissue Expansion to Allow Primary Linear Closure of 2 Large Adjacent Surgical Defects

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It is becoming increasingly more common for dermatology patients to present for treatment of multiple skin cancers during the same appointment. When 2 lesions are close together, the final repair will need to take into consideration the final size of the adjacent defects, any normal tissue remaining between the defects, and the inherent tension of the tissue in those locations. The SUTUREGARD ISR device (Sutureguard Medical Inc) can allow intraoperative tissue expansion to decrease tension on the tissue and may provide the opportunity to allow primary linear closure for both defects as opposed to a much larger flap or graft repair.

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## Practice Gap

Nonmelanoma skin cancers most commonly are found on the head and neck. In these locations, many of these malignancies will meet criteria to undergo treatment with Mohs micrographic surgery. It is becoming increasingly common for patients to have multiple lesions treated at the same time, and sometimes these lesions can be in close proximity to one another. The final size of the adjacent defects, along with the amount of normal tissue remaining between them, will determine how to best repair both defects.<sup>1</sup> Many times, repair options are limited to the use of a larger and more extensive repair such as a flap or graft. We present a novel option to increase the options for surgical repair.

## The Technique

We present a case of 2 large adjacent postsurgical defects where intraoperative tissue relaxation allowed for successful primary linear closure of both defects under notably decreased tension from baseline. A 70-year-old man presented for treatment of 2 adjacent invasive squamous cell carcinomas on the left temple and left frontal scalp.

The initial lesion sizes were 2.0×1.0 and 2.0×2.0 cm, respectively. Mohs micrographic surgery was performed on both lesions, and the final defect sizes measured 2.0×1.4 and 3.0×1.6 cm, respectively. The island of normal tissue between the defects measured 2.3-cm wide. Different repair options were discussed with the patient, including allowing 1 or both lesions to heal via secondary intention, creating 1 large wound to repair with a full-thickness skin graft, using a large skin flap to cover both wounds, or utilizing a 2-to-Z flap.<sup>2</sup> We also discussed using an intraoperative skin relaxation device to stretch the skin around 1 or both defects and close both defects in a linear fashion; the patient opted for the latter treatment option.

The left temple had adequate mobility to perform a primary closure oriented horizontally along the long axis of the defect. Although it would have been a simple repair for this lesion, the superior defect on the frontal scalp would have been subjected to increased downward tension. The scalp defect was already under considerable tension with limited tissue mobility, so closing the temple defect horizontally would have required repair of the scalp defect using a skin graft or leaving it open to heal on its own. Similarly, the force necessary to close the frontal scalp wound first would have prevented primary closure of the temple defect.

A SUTUREGARD ISR device (Sutureguard Medical Inc) was secured centrally over both defects at a 90° angle to one another to provide intraoperative tissue relaxation without undermining. The devices were held in place by a US Pharmacopeia 2-0 nylon suture and allowed to sit for 60 minutes (Figure 1).<sup>3</sup>

After 60 minutes, the temple defect had adequate relaxation to allow a standard layered intermediate

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Dr. Ferrell reports no conflict of interest. Dr. Lear is a cofounder and shareholder and holds a patent for the SUTUREGARD ISR device (Sutureguard Medical Inc).

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closure in a vertical orientation along the hairline using 3-0 polyglactin 910 and 3-0 nylon. Although the scalp defect was not completely approximated, it was more than 60% smaller and able to be closed at both wound edges using the same layered approach. There was a central defect area approximately 4-mm wide that was left to heal by secondary intention (Figure 2). Undermining was not used to close either defect.

The patient tolerated the procedure well with minimal pain or discomfort. He followed standard postoperative care instructions and returned for suture removal after 14 days of healing. At the time of suture removal there were no complications. At 1-month follow-up the patient presented with excellent cosmetic results (Figure 3).

**Practice Implications**

The methods of repairing 2 adjacent postsurgical defects are numerous and vary depending on the size of the individual defects, the location of the defects, and the amount of normal skin remaining between them. Various methods of closure for the adjacent defects include healing by secondary intention, primary linear closure, skin grafts, skin flaps, creating 1 larger wound to be repaired, or a combination of these approaches.<sup>1,2,4,5</sup>

In our patient, closing the high-tension wound of the scalp would have prevented both wounds from being closed in a linear fashion without first stretching the tissue. Although Zitelli<sup>5</sup> has cited that many wounds will heal well on their own despite a large size, many patients prefer the cosmetic appearance and shorter healing time

of wounds that have been closed with sutures, particularly if those defects are greater than 8-mm wide. In contrast, patients preferred the cosmetic appearance of 4-mm wounds that healed via secondary intention.<sup>6</sup> In our case, we closed the majority of the wound and left a small 4-mm-wide portion to heal on its own. The overall outcome was excellent and healed much quicker than leaving the entire scalp defect to heal by secondary intention.

The other methods of closure, such as a 2-to-Z flap, would have been difficult given the orientation of the lesions and the island between them.<sup>2</sup> To create this flap, an extensive amount of undermining would have been necessary, leading to serious disruption of the blood and nerve supply and an increased risk for flap necrosis. Creating 1 large wound and repairing with a flap would have similar requirements and complications.



**FIGURE 1.** Adjacent postsurgical defects after removal of 2 separate squamous cell carcinomas. The SUTUREGARD ISR devices are oriented perpendicularly to one another prior to tightening.



**FIGURE 2.** Primary linear closure of both defects was possible after 60 minutes of intraoperative tissue expansion, with the exception of a small central area within the superior defect that was left to heal by secondary intention.



**FIGURE 3.** Excellent healing of both surgical defects 1 month after surgery.

Intraoperative tissue relaxation can be used to allow primary closure of adjacent wounds without the need for undermining. Prior research has shown that 30 minutes of stress relaxation with 20 Newtons of applied tension yields a 65% reduction in wound-closure tension.<sup>7</sup> Orienting the devices between 45° to 90° angles to one another creates opposing tension vectors so that the closure of one defect does not prevent the closure of the other defect. Even in cases in which the defects cannot be completely approximated, closing the wound edges to create a smaller central defect can decrease healing time and lead to an excellent cosmetic outcome without the need for a flap or graft.

The SUTUREGARD ISR suture retention bridge also is cost-effective for the surgeon and the patient. The device and suture-guide washer are included in a set that retails for \$35 each or \$300 for a box of 12.<sup>8</sup> The suture most commonly used to secure the device in our practice is 2-0 nylon and retails for approximately \$34 for a box of 12,<sup>9</sup> which brings the total cost with the device to around \$38 per use. The updated *Current Procedural Terminology* guidelines from the Centers for Medicare & Medicaid Services define that an intermediate repair requires a layered closure and may include, but does not require, limited undermining. A complex linear closure must meet criteria for an intermediate closure plus at least 1 additional criterion, such as exposure of cartilage, bone, or tendons within the defect; extensive undermining; wound-edge debridement; involvement of free margins; or use of a retention suture.<sup>10</sup> Use of a suture

retention bridge such as the SUTUREGARD ISR device and therefore a retention suture qualifies the repair as a complex linear closure. Overall, use of the device expands the surgeon's choices for surgical closures and helps to limit the need for larger, more invasive repair procedures.

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