

## Scar-Saving Flap during Serial Excision by Borrowing from the Opposite Side

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**Background:** Congenital melanocytic nevi may have various shapes according to the anatomic location. Therefore, it is desirable to apply proper surgical designs to the diverse forms considering the characteristics of the sites as well as the shape and size.

**Objective:** The purpose of this article is to introduce a new scar-saving flap design for semicircular defects after removing congenital melanocytic nevi without excising additional normal skin.

**Methods:** In most cases to excise semicircular nevi, normal skin should be excised to prevent dog ear, resulting in the long length of the scar. So we use a new scar-saving flap design by borrowing a partial length from the opposite side.

**Results:** We used this new technique for 4 cases of large semicircular skin defects. In all cases, this method had some advantages from this perspective: (1) it does not require excision of normal adjacent skin to convert a semicircular defect into a crescent shape or to remove dog-ears (2) the final suture line is not much longer than the diameter of the original defect and (3) it makes the removal of a much larger volume possible in one procedure rather than using the classic serial excision technique, which consists of a central elliptical excision within the confines of the nevus. In this way the frequency of procedures and discomfort to the patient can be reduced.

**Conclusion:** We think that a scar-saving flap design by borrowing a partial length from the opposite side can be a good strategy for a semicircular skin defect.

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*Key Words:* Congenital melanocytic nevi, Scar, Serial excision, Treatment

### INTRODUCTION

Congenital melanocytic nevi (CMN) are tissue malformations of the neuroectoderm that are mainly comprised of melanocytes<sup>1</sup>, that are present at birth or appear within the first few months of life<sup>2</sup>. There are a variety of treatment options for managing CMN according to the size, thickness, location,

patient age and risk of developing melanoma<sup>1</sup>. These reconstructive options include serial excision, serial expansion with a tissue expander, full-thickness or split-thickness skin grafting, dermabrasion, curettage, and Er:YAG laser ablation with a cultured epithelial autograft<sup>2,3</sup>.

Serial excision is a surgical technique which is the preferred treatment modality for medium-sized nevi that can be excised in two or three procedures without distorting adjacent structures<sup>4</sup>. Small to medium-sized CMN are usually round or oval, but may have various shapes, such as a fan or semicircular shape according to the anatomic location. However, to excise such semicircular CMN, normal skin should be excised for appropriate edging. Skin grafts can often result in a dissatisfactory cosmetic outcome,

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and traditional skin flaps have a limited role.  
Therefore, to prevent excising additional normal skin, we developed a new flap design by borrowing

a partial length from the opposite side to close a skin defect so as to decrease the length of the scar. In this article, our new flap design, which we named "scar saving flap", is introduced and its effectiveness is evaluated in 4 clinical cases.

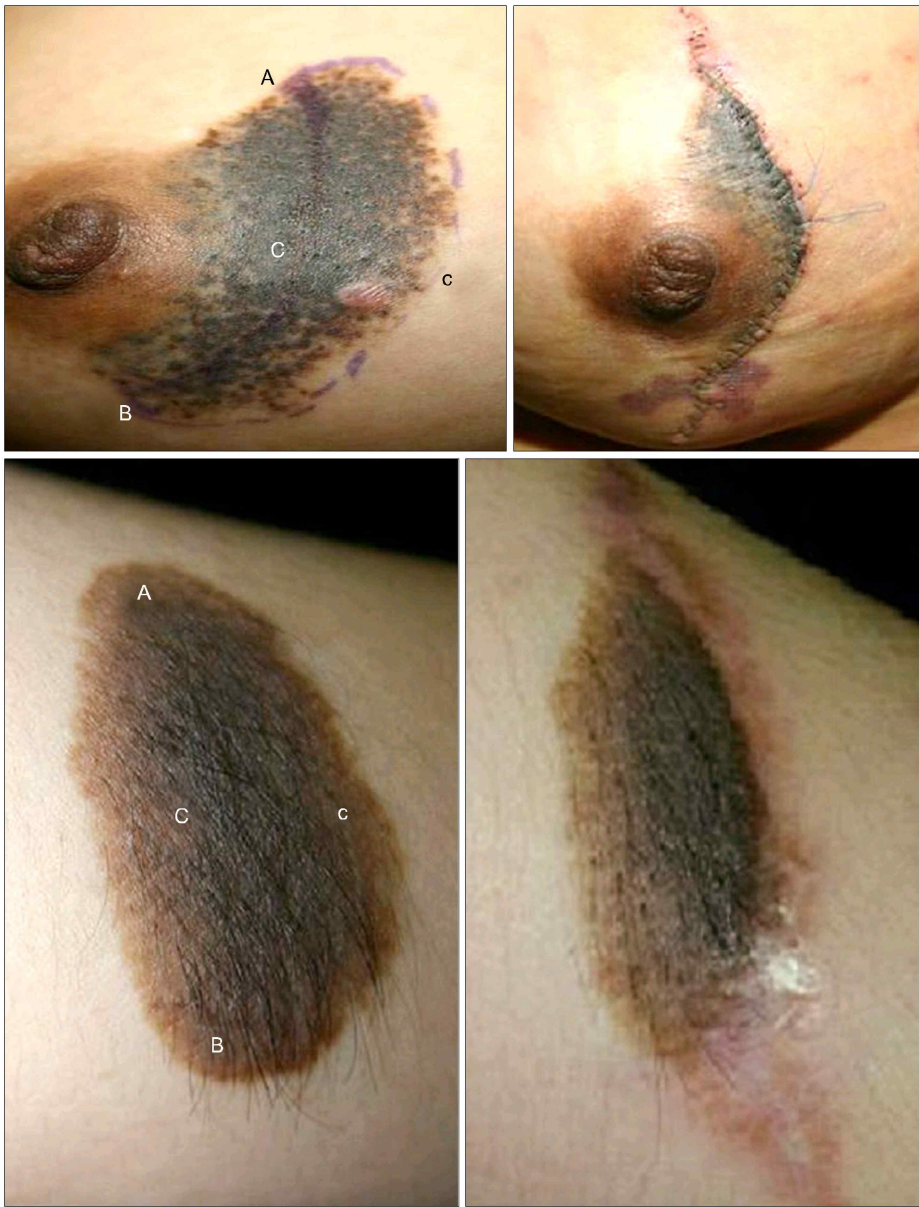
**Table 1.** Details of the 4 patients

	Sex/Age	Sites	Size
Patient 1	F/35	Breast	9.0×4.5 cm
Patient 2	M/14	Arm	2.7×4.9 cm
Patient 3	F/44	Buttock	10.0×4.0 cm
Patient 4	M/18	Arm	6.0×4.0 cm

**MATERIALS AND METHODS**

**Patients**

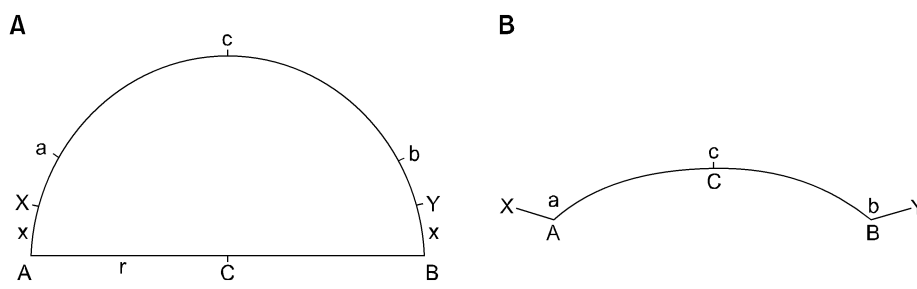
Four patients who had presented with semi-circular CMN were assembled. The patients con-



**Fig. 1.** Fan-shaped or oval-shaped congenital melanocytic nevi were present in 4 patients. Details including the sites of CMN were shown on Table 1. (a,b=patient 1, c,d=patient 2, e,f=patient 3, g,h=patient 4) The designed excision is semicircular. Using this new method, we can reduce the large volume of CMN after the excision and gain short broken line scars rather than long linear scars.



Fig. 1. Continued.



**Fig. 2.** Schematic explanation of the scar-saving method, which involves borrowing from the opposite side to close a semicircular skin defect ( $ac = cb = AC = CB$ ,  $AX = Xa = BY = Yb$ ).

sisted of 2 males and 2 females, with an age range of between 14 and 44 years (Table 1). The size of the nevus was estimated by actual measurement and photograph (Fig. 1).

### Methods

The principle of a scar-saving flap for a semicir-

cular skin defect is shown schematically in Fig. 2A. The diameter ( $d$ ) of the semicircle is the straight line from point A through the center C to point B, and the radius ( $r$ ) is half the diameter. The circumference of a semicircle is  $(\pi \times d)/2$  or  $\pi r$ . Simple interrupted suturing of a semicircular skin defect can make a longer scar because the length

of one side is  $\pi r$  and that of the other is  $2r$ . Therefore, we need to find the two points on a curved line that result in two sides of equal length. Assume that points X and Y are on the curved line and are located equal distances from points A and B, respectively. If the arc length from point A to point X is  $\chi$ , we get the following linear equation:

$$\pi r - 2 = 2r + 2\chi \text{ or } \chi = (\pi r - 2r)/4.$$

Moreover, two additional points, a and b, are distance  $\chi$  from points X and Y.

After these points are identified, the skin is undermined in all directions. When two single-pronged skin hooks holding the tissues at points X and Y are pulled in opposite directions, the skin defect is transformed into a hat shape. At this time, curves XA and YB, which previously formed the semicircle, are folded inward. As the length of arc XY now equals the total length of XABY, there is no problem suturing the hat-shaped wound. After making key stitches at aA and bB, the hat-shaped wound can be sutured using buried, interrupted, dermal-subdermal sutures and a running continuous suture. The final suture line is shown in Fig. 2B.

We checked the results of the four patients by photographs and compared the results with previous photographs.

## RESULTS

In all patients using our new technique for closing a large semicircular skin defect, we can save the normal adjacent skin because this method does not need to convert a semicircular defect into a crescent shape or to remove dog-ears. In addition, the final suture line is not much longer than the diameter of the original defect, so we can reduce the entire scar length, resulting in a short broken line scar instead of a long linear scar. Also, it can make the removal of a much larger volume possible in one procedure rather than using the classic serial excision technique, so that the frequency of procedures and discomfort to the patient can be reduced (Fig. 1).

Through this new method, we can gain good cosmetic results as well as the treatment effect due to reducing the large volumes. The total patients were also satisfied the results after the operation.

## DISCUSSION

CMN is defined as a melanocytic nevus present at birth or one that appears within the first few months of life<sup>2</sup>. Usually CMNs are classified according to their size, or the size they are predicted to attain at adulthood. Roughly, one can estimate that a CMN on the head will increase in size by a factor of 1.5 and on the rest of the body by a factor of 3. In adulthood, CMNs that are less than 1.5 cm in greatest diameter are classified as small; those measuring between 1.5 and 19.9 cm are classified as medium; and those that measure at least 20 cm in greatest diameter are classified as large. Very large CMNs measuring at least 50 cm in diameter are sometimes referred to as "giant nevi"<sup>1</sup>. The optimal management depends on the size of the CMN, the anatomic area, and the histopathologic type. Many treatment options have been postulated for CMN, including dermabrasion<sup>6</sup>, CO<sub>2</sub> laser ablation<sup>7</sup>, phenol chemical peels<sup>8</sup>, curettage<sup>9</sup>, excision and skin grafting<sup>10</sup>, use of expanded full-thickness skin grafts<sup>11</sup>, serial excision<sup>12</sup>, tissue expansion<sup>13</sup>, and free tissue transfer<sup>14</sup>, especially depending on the size<sup>15</sup>.

For the management decisions for patients with CMN, two main problems need to be considered. First, these lesions have the potential for malignant transformation. Second, we should make an effort to optimize the cosmetic and functional outcomes, particularly for giant lesions and those located on the head and neck. Therefore, it is important to find a balance point between decreasing the risk of developing melanoma through prophylactic removal, and achieving acceptable cosmetic results. This balance point will be different for each patient<sup>1</sup>.

Serial excision is a surgical technique in which successive advancement flaps composed of adjacent normal skin are gradually stretched over a defect created by incremental excision of a lesion. It is not a difficult process to perform and has far fewer potential complications than those of tissue expansion<sup>15</sup>. Usually it is the preferred treatment modality for medium-sized nevi that can be excised in two or three procedures without distorting adjacent structures. Small to medium-sized CMN are usually round or oval, but may have various shapes, such as a fan or semicircular shape according to the anatomic location (Fig. 1). Crescent-shaped skin defects can be sutured using the "rule of halves" to

ensure that the tension on closure is evenly distributed and that dog-ears do not form at the ends. In a semicircular defect, however, one side is too much longer than the other to apply the "rule of halves", especially for lesions located on the back, which have minimal redundancy, and arms and shoulder, which have three-dimensional cylindrical shape. In such cases, to excise semicircular CMN, normal skin should be excised for appropriate edging. Skin grafts can often result in a dissatisfactory cosmetic outcome, and traditional skin flaps have a limited role. A few flaps for closing semicircular skin defects have been described in the literature. A small defect is often changed into a crescent form by excising additional normal skin, but this method is impracticable for larger defects.

Therefore, we performed a new scar-saving flap design by borrowing a partial length from the opposite side to close a skin defect without excising additional normal skin. Our new technique for closing a large semicircular skin defect has some advantages from this perspective: (1) it does not require excision of normal adjacent skin to convert a semicircular defect into a crescent shape or to remove dog-ears; (2) the final suture line is not much longer than the diameter of the original defect; and (3) it makes the removal of a much larger volume possible in one procedure rather than using the classic serial excision technique, which consists of a central elliptical excision within the confines of the nevus, so that the frequency of procedures and discomfort to the patient can be reduced. Additionally this method results in short broken line scars instead of long straight scars. When mechanical forces work on scars, the long straight scar is easily strained and fibroblasts are stimulated to result in hypertrophic changes. However, our new flap technique can modify the scar to be an irregular shape, making it less conspicuous compared with long linear scars and it can disrupt wound contracture with its irregular pattern like W-plasty<sup>16-18</sup>.

We have applied this idea to skin defects in which the two sides are of different lengths. Although we occasionally needed to remove dog-ears, the final outcome was satisfactory. Understanding the concept of borrowing a flap from the opposite side may help reduce the length of the scar, allowing beginners to modify the stereotypic elliptical excision.

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