

The “Reading Man” Procedure

A New Technique for the Closure of Circular Skin Defects

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Background: As most of the skin lesions tend to grow in a circular pattern, the resultant defects after surgical removal of these lesions are often circular. Although a number of local flap procedures have been described, alternative techniques are still needed for the closure of circular defects.

Purpose: Here, a new surgical technique for the closure of circular skin defects is presented. This technique basically uses the extra skin relaxation gained with an unequal Z-plasty maneuver in favor of the defect closure. The procedure is named as “the reading man” because its surgical design resembles the silhouette of a man who is reading a book held in his hand.

Material and Methods: In this technique, 2 flaps designed in an unequal Z-plasty manner are used. The first flap is transposed to the defect area whereas the second flap is used for closure of the first flap’s donor site. For 3 years, this technique has been used for closure of the circular skin defects in 27 patients (19 men and 8 women) aged from 2 months to 68 years. The defect size was ranging between 1.5 and 14 cm in diameter.

Results: A tension-free defect closure was obtained in all patients. All flaps healed with no complications. There was no patient with dog ear formation. A mean follow-up of 15 months (6 months–3 years) revealed an esthetically acceptable scar formation in all patients.

Conclusion: The reading man procedure was found to be a useful and an easy going technique for the closure of circular skin defects located on various anatomic regions. It enables surgeon to obtain a tension-free closure of considerably large skin defects with minimal scarring and additional healthy skin excision.

Key Words: defect closure, skin defects, circular defects, the reading man procedure, local flaps, unequal Z-plasty, Z-plasty, Limberg’s procedure

(*Ann Plast Surg* 2008;60: 420–425)

Received March 21, 2007 and accepted for publication, after revision, May 31, 2007.

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Presented in the 10th Congress of the European Society of Plastic, Reconstructive and Aesthetic Surgery; August 30 to September 3, 2005; Vienna, Austria.

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ISSN: 0148-7043/08/6004-0420

DOI: 10.1097/SAP.0b013e31812f5aa0

Although several local flap procedures^{1–14} have been described for the closure of circular skin defects, alternative techniques are still needed because the shape, size, and anatomic location of these defects vary in a wide spectrum. An ideal flap procedure for the closure of circular skin defects should provide a tension-free closure with minimal additional healthy skin excision and scarring. Moreover, it should not cause dog ear formation and displacement of the neighboring mobile anatomic landmarks. To achieve these goals, we developed a new technique namely “the reading man procedure” for the closure of circular skin defects. Here, we present our 3 years of clinical experience with the use of this new technique for treatment of the circular skin defects located on various parts of the body.

Surgical Technique

In this technique, 2 skin flaps designed in an unequal Z-plasty manner are used. Before planning the flaps, we need to determine the relaxed skin tension lines (RSTL) at the defect area. To obtain a better resultant scar aligned with the relaxed skin tension lines, the central limb should be placed perpendicular to these lines (Fig. 1B). Once its direction is decided, the central limb of the unequal Z-plasty is drawn as an imaginary tangential line passing through the margin of the circular defect (Fig. 1C). The length of the central limb of the Z-plasty is designed to be 50% longer than the diameter of the circular defect. Beginning from the free end of this line another imaginary line is drawn with an angle of 60 degrees (Fig. 1D). Then beginning from the other end of the central limb our third imaginary line is drawn with an angle of 45 degrees (Fig. 1E). With this design, 2 skin flaps (f_1 and f_2) are obtained (Fig. 1E). The flaps are elevated as either pure cutaneous or fasciocutaneous as required in consideration with the anatomic location of the defect. After flap elevation, the f_1 is moved to the defect area whereas the f_2 is transposed to cover the first flap’s donor site (Fig. 1E). A suction drain is placed beneath the skin flaps as required and the skin closure was done in a 2-layered fashion (Fig. 1F).

Clinical Material

Over 3 years, “the reading man procedure” was successfully used in 27 cases aged from 2 months to 68 years in our clinic. It was used for the closure of skin defects resulted from excision of the skin cancers located at facial area in 15 patients and on the trunk in 3 patients. The technique was used after excision of large benign facial skin lesions in other

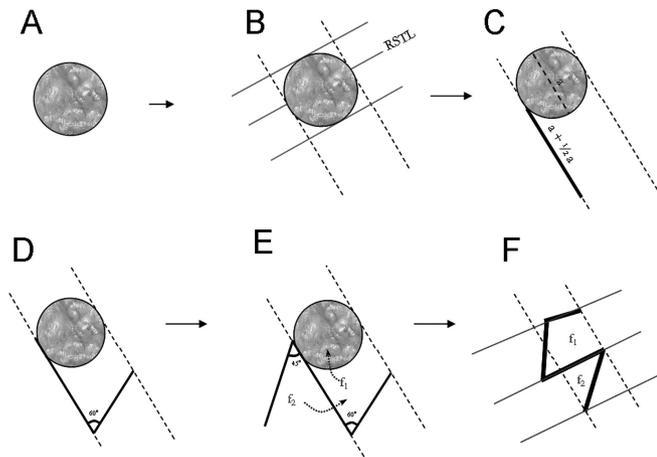


FIGURE 1. Illustration showing surgical technique. A, Circular defect. B, Determining the direction of the central limb of the Z-plasty (dotted lines). To obtain a fine scar, this line should be perpendicular to the relaxed skin tension lines (RSTL). C, The central limb of the Z-plasty is drawn as an imaginary tangential line passing through the margin of the circular defect. D, E, Other limbs of Z-plasty are planned with angles of 45 degrees and 60 degrees according to unequal Z-plasty concept. E, Flap nearby the defect (f_1) is used for the defect closure whereas other flap (f_2) is transposed for closure of donor site of first flap with Z-plasty maneuver. F, The final view after defect closure.

3 patients and a calf defect resulted from excision of a giant nevus in 1 patient. In the remaining 5 patients, it was used for the closure of the flap donor site defects on the extremities. The defect sizes were ranging 1.5 to 14 cm in diameter. Fifteen patients were operated under general anesthesia while the procedure was done with local infiltration anesthesia provided with 1% lidocaine solution in the remaining 12

patients. All patients were operated by M.M. or under his supervision.

RESULTS

In all patients, a successful tension-free closure of the defect was obtained. Except 5 patients who required a minimal amount of additional healthy skin excision from the tips of the flaps, defect closure was achieved without any additional healthy tissue excision in all patients. There was no patient with dog ear formation. This technique was found to be useful for closure of the skin defects up to 14 cm in diameter in this clinical series. All patients healed uneventfully with no flap necrosis or infection. Because the defects were closed with alike neighboring skin, an excellent skin match was obtained. A mean follow-up of 15 months (6 months–3 years) revealed a durable skin coverage with fine scars in all patients. There was no patient requiring secondary surgery.

Illustrative Case Reports

Case 1

A 3-year-old boy referred to our department with multiple giant hairy nevi occupying various regions of his body. He underwent a multistaged excision protocol. A reading man procedure was used for the treatment of a giant hairy nevus located at the left calf region. While planning the reading man procedure, a smaller nevus located near the defect was included within the incision (Fig. 2A). Excision of the hairy nevus located on his left calf was resulted with a defect of 8 cm in diameter (Fig. 2B). The flaps are elevated subfascially and the defect was closed with transposition of the flaps in a Z-plasty manner (Fig. 2C). Despite it was a remarkably large defect involving the whole width of the calf, a tension-free closure was achieved. Defect closure was done with no additional

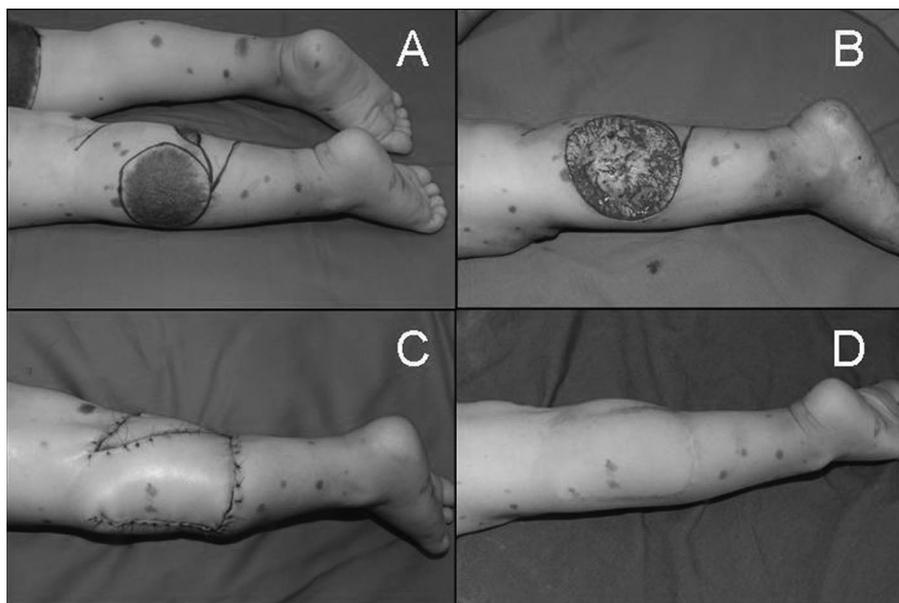


FIGURE 2. Case 1. A 3-year-old boy with multiple giant hairy nevi occupying various regions of his body. A, Surgical plan for the treatment of a giant hairy nevus located at the left calf. B, An excisional defect of 8 cm in diameter. C, Immediate postoperative view. D, Late postoperative views at 2 years after surgery.

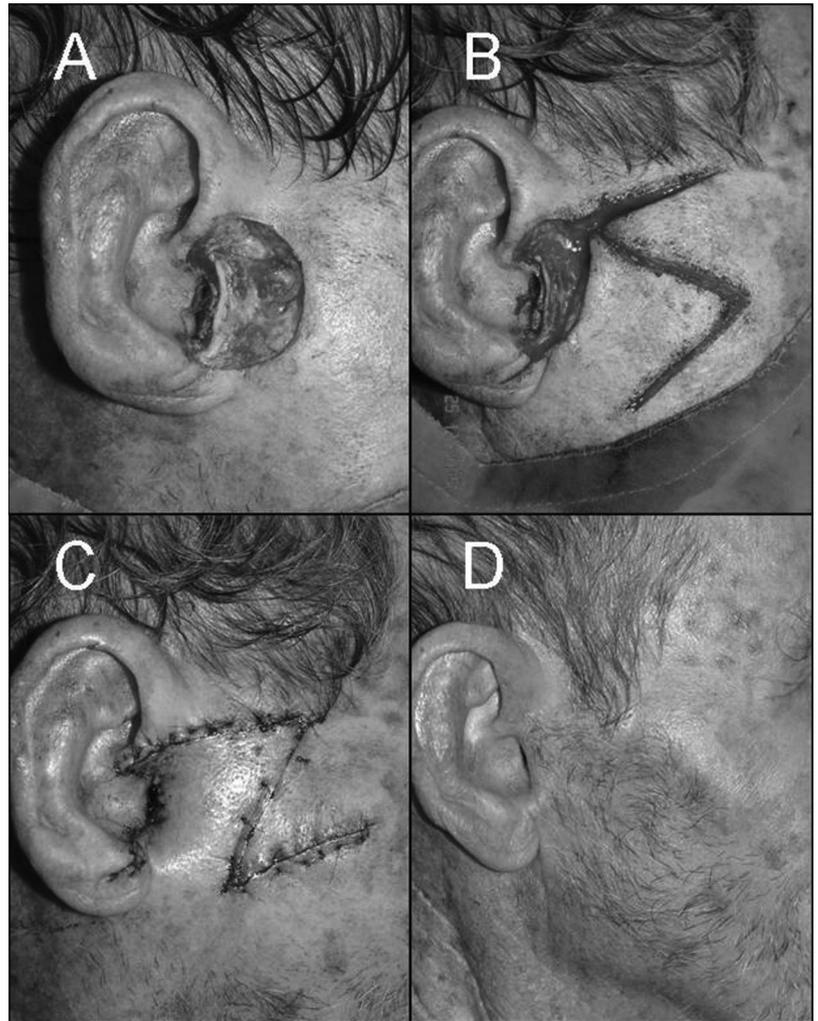


FIGURE 3. Case 2. A 53-year-old man with a basal cell carcinoma on his right preauricular region. A, Excisional defect. B, Elevation of the flaps. C, Immediate postoperative view. D, Postoperative view of the patient at 1 year after surgery.

healthy tissue excision and dog ear formation. The flaps healed uneventfully. At 2 years after surgery, the result was esthetically acceptable (Fig. 2D).

Case 2

A 53-year-old man presented with a basal cell carcinoma located on his right preauricular region. Under local infiltration anesthesia with 1% lidocaine solution, lesion was excised with 5 mm of free margin. The resultant defect was found to be 3 cm in diameter (Fig. 3A). Defect closure was accomplished with the reading man procedure (Fig. 3B, C). At 1 year after surgery, there was no recurrence and the final scar was almost invisible (Fig. 3D).

Case 3

A 57-year-old man admitted to our institution with a large squamous cell carcinoma on his right heel. Under general anesthesia lesion was excised and the defect area was covered with a free sensate sartorius perforatory flap¹⁵ harvested from his left thigh. The donor site of the sartorius flap was 11 cm in diameter (Fig. 4A). The defect was planned to be closed with this newly designed technique (Fig. 4B). The

flaps were elevated fasciocutaneously. By transposition of the flaps, a tension-free closure was achieved without any extra healthy skin excision and dog ear formation (Fig. 4C, D). There were no postoperative complications, such as circulatory compromise and infection (Fig. 4E). The scar was fine at 1 1/2 years postoperatively.

Case 4

A 68-year-old woman with a round-shaped nodular squamous cell carcinoma located at the malar region (Fig. 5A). Under local infiltration anesthesia with 1% lidocaine solution, the tumor was excised with 1 cm of intact margin (Fig. 5B). The closure of the resultant defect was accomplished with the reading man procedure (Fig. 5B, C). The flaps healed uneventfully and an esthetically acceptable scar was achieved (Fig. 5D).

DISCUSSION

In this study, a new technique for the closure of circular skin defects is presented. The technique was named “the reading man procedure” because its design resembles the

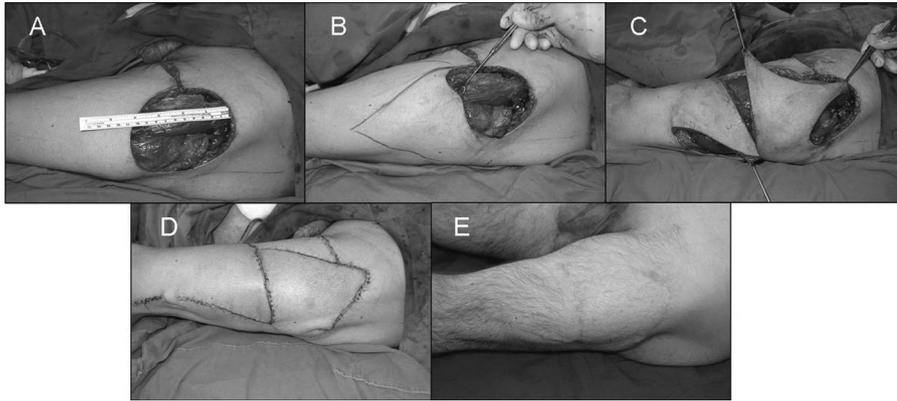


FIGURE 4. Case 3. A 57-year-old man presented with a large squamous cell carcinoma on his right heel. Lesion was excised and the defect area was covered with the free sartorius perforatory flap harvested from his left thigh. The reading man flap was planned for the donor site closure. A, Circular skin defect with a diameter of 11 cm. B, Surgical plan. C, Flap elevation. D, Immediate postoperative view. E, Postoperative view of the patient 1 1/2 year after surgery.



FIGURE 5. A 68-year-old woman with a round-shaped nodular squamous cell carcinoma located on her malar region. A, Surgical plan. B, Excisional defect and flap incisions. C, Immediate postoperative view. D, Postoperative view at 1 month after surgery.

silhouette of a man who is reading a book held in his hand. This technique basically uses extra skin relaxation provided with an unequal Z-plasty maneuver in favor of the defect closure. Use of Z-plasty principle for defect closure is not

new. Up today, many local flap procedures including the note,¹⁰ banner,⁵ Limberg,³ Dufourmentel² and double opposing semicircular flaps,¹³ and the double-z rhomboid technique⁸ used Z-plasty principle for the closure of circular skin

defects. Among them, the Limberg flap³ seems to be the first local flap procedure in which Z-plasty concept is used for defect closure. In this old and still useful technique, the defect is surgically converted into a rhomboid with a considerable amount of additional healthy skin excision and closed by means of an unequal Z-plasty with angles of 60 degrees and 120 degrees. Positioning one of the lateral limbs of the Z-plasty on the defect margin, the Limberg's technique delivers only one skin flap. The defect closure is achieved with transposition of this flap while the flap donor site is closed primarily often under remarkable tension despite undermining and stretching of the wound margins. In the Dufourmentel,² banner,⁵ and note flap¹⁰ techniques, Z-plasty principle is also used in a similar way and the defect is closed by means of a single transposition flap. In our technique, however, Z-plasty principle is used in a quite different way. Planning the Z-plasty separately on the neighboring skin and keeping all limbs of Z-plasty apart from the wound margins, 2 skin flaps are obtained. One of these flaps is used for the defect closure and the other one is used for the closure of the donor site of the primary flap. In our technique, using 2 skin flaps,

the amount of tissue relaxation provided by Z-plasty maneuver is maximized and the defect closure is achieved with a remarkably lesser tension as illustrated with a comparative sponge model study shown in the Figure 6. Moreover, in contrast with the Limberg's procedure in which tissue is borrowed from 1 direction only, our technique borrows tissue from 2 directions. Thus, it distributes tension and causes a lesser tissue distortion and displacement of the neighboring mobile anatomic landmarks.

Another criterion to evaluate the efficiency of the defect closure techniques is the length of the resultant scar. Earlier techniques including double opposing semicircular flap,¹³ double-z rhomboid⁸ and double rotation flaps, and Z-plasty procedures⁹ result in a considerably long scar which extends up to 5 to 11 times the defect diameter. However, in our technique the length of the resultant scar is only 4 times longer than the defect diameter. This length is equal with the scar resulted with the Limberg's procedure.

Golomb and Neuman,¹⁶ comparing various local flap procedures in an experimental model, stated that the efficiency of a technique for the closure of a circular defect was

FIGURE 6. Comparative sponge model study of the reading man and Limberg's procedures. Borrowing tissue from 2 directions, unlike Limberg's technique, the reading man procedure results in minimal distortion and displacement of the neighboring mobile anatomic structures.

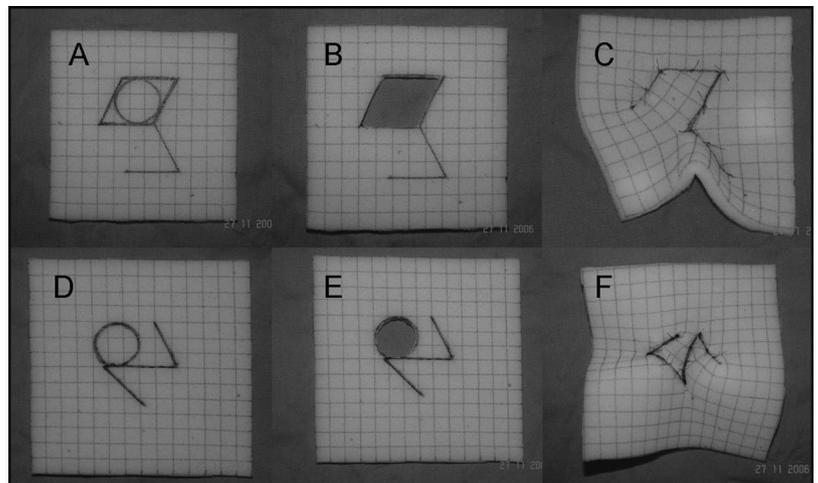
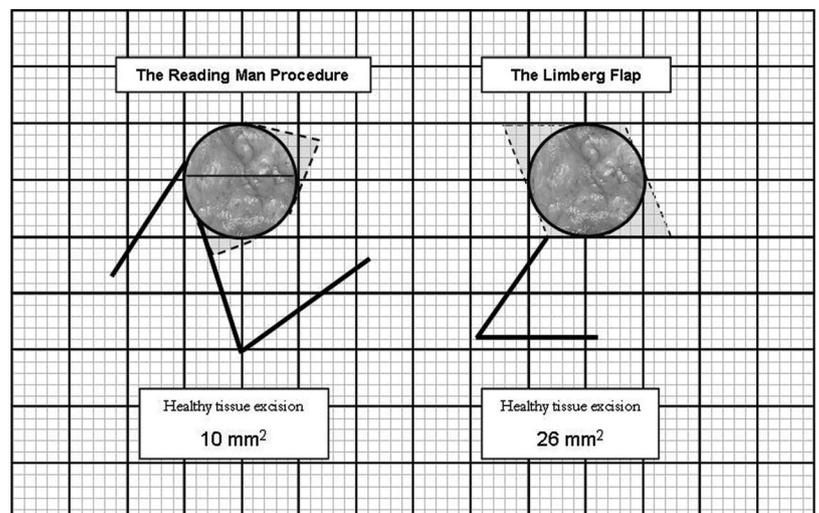


FIGURE 7. Metric analysis of the reading man and Limberg's procedures. The amount of additional healthy skin excision is 10 mm² in our technique whereas it is 26 mm² in the Limberg's procedure.



inversely related with the amount of the healthy tissue excised during the procedure. However, most of the previously reported closure techniques much or less require some additional healthy skin excision either for the alteration of defect's shape^{2,3,6-8} or to convert the flaps into the shape of the defect.^{5,10,13,14} Although it requires some additional healthy tissue excision in the paper and sponge models, the amount of additional healthy tissue excision in our technique is considerably lesser in comparison with those procedures converting the defect in a rhomboid as documented with a metric analysis shown in the Figure 7. As a matter of fact, the results of these model studies cannot reflect the clinical circumstances properly. Despite the defect closure was achieved with no additional healthy tissue excision in most of our patients, there was no patient with dog ear formation in our clinical series presumably due to elastic nature of the human skin.

In conclusion, the reading man procedure seems to be an easy going and useful alternative for the closure of circular skin defects with different sizes and locations.

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