

A "round block" purse-string suture in facial reconstruction after operations for skin cancer surgery

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SUMMARY. Removal of skin cancers in the head and neck region usually results in a circular or oval defect, which must be reconstructed immediately using one of several techniques. Larger defects can present a difficult aesthetic problem. The purse-string suture is particularly suited to such large defects where the skin is lax. We report 51 cases where this technique was used in the head and neck region. All defects were considerably reduced in size and some required a small skin graft to complete the reconstruction. Initially many redundant skin folds and considerable local distortion were seen but these improved with time. The technique is simple, inexpensive, and the results are satisfactory in appropriately selected cases. Comprehensive discussion to prepare patients for the gross initial distortion and the long period of retention of the suture makes the procedure acceptable to patients.

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Keywords: Purse-string suture; Facial reconstruction; Skin cancer surgery

INTRODUCTION

Removal of cutaneous tumours usually results in a circular or oval defect. There are four options for treating the wound: healing by second intention, primary closure, local skin flap, and skin grafting. Immediate reconstruction is favoured unless it is in an area that heals well by second intention.

The approach that respects aesthetic boundaries, achieves closure under minimal tension, and causes the least alteration in tissue planes yields the most favourable results with the fewest complications to our knowledge. Peled et al.¹ first describe the purse-string suture in plastic surgery. It has been used for the restoration of defects by many surgeons and is particularly suited to circular defects. It allows almost complete or partial closure of the defect by advancing the skin from the entire periphery of the wound. In large defects that are not completely closed, the residual defect can either be left to granulate or be covered with a skin graft. It is the skin's extensibility and laxity that permit many plastic surgical procedures, particularly the complete closure of defects without the need to import tissue from a distance. Gibson and Kenedi² first described these viscoelastic properties in 1967; the main properties being creep and stress relaxation. Mechanical creep occurs when a constant force stretches a piece of skin. Stress relaxation, on the other hand, occurs when a piece of skin is stretched for a given distance and that distance is held constant; the force required to keep it stretched gradually decreases. This process occurs over minutes or hours. The skin also possesses the property of biologic creep, so there is true expansion of the skin as a result of the tension with time.³

It is these properties that allow the use of the pursestring suture technique, which causes considerable initial gathering and distortion of the skin but gradual and sustained aesthetic improvement. We report 75 cases in which this technique has been used in the head and neck region.

PATIENTS AND METHODS

Seventy-five consecutive defects were treated using the purse-string technique. Fifty-one were for defects resulting from resection of skin lesions. The remaining 24 defects were from skin graft donor sites at the neck region. These were 1 cm or less in diameter and were followed up for less than 6 months. They are not considered further.

After removal of the lesion, a round or oval defect was usually left. No or minimal (<0.5 cm) undermining of the wound margins was done to ensure adequate perfusion.⁴

In most cases we used a 1/0 polypropylene suture, although 2/0 or 3/0 can be used where tissues are more lax.



Fig. 1 Diagram illustrating insertion of suture.

The mid-dermal level was the point of entry and exit of the suture. Horizontal intradermal loops were then placed through the dermis at the wound edge. The suture was continued around the periphery, never penetrating the skin

(Fig. 1). When the technique was used to reduce the size of the defect and a skin graft was required, the initial entry site of the suture was through the skin 5 mm from the edge of the defect. Horizontal escape loops were placed 5 mm from the wound edge at the 3, 6, and 9 o'clock positions. Silk ties were placed through these loops and they were used to hold a pack over the skin graft. Once the suture had been passed all the way around the wound, tension was applied to close the defect. This was applied several times before the suture was tied. When the wound was not closed adequately, a template was taken and a skin graft placed in the usual manner. The purse-string was left for a minimum of 4 weeks. When a skin graft was placed, the sutures for the graft were removed after 2 weeks. The gathered ridges usually took 2-3 weeks to flatten out. When the wound was closed without a skin graft, the final scar was linear and often aligned along the relaxed lines of skin tension.

Details of age, site and type of lesion were recorded. The defect was measured with a ruler. We recorded the diameter of circular lesions to the nearest millimetre. When



Fig. 2 (a) Defect at left retromandibular region. (b) Round block suture in place. (c) Defect closed. (d) Six months after suture removal.





Fig. 2 (Continued).

the lesion was not roughly circular, the width and length were recorded. Similarly, the diameter of the residual defect was recorded after the suture had been placed and tightened. Defects were considered to be closed when the residual area was 5 mm or less in diameter. The maximum area of the wound was calculated using the formula for an ellipse:

Area =
$$\frac{\pi}{2}$$
 (length × width).

RESULTS

The ages ranged from 26 to 93 years (mean 75). Basal cell carcinomas accounted for 35 (69%) of the lesions whilst 10(20%) were squamous cell carcinomas. The remaining 6 (11%) were for other lesions.

Of the 51 defects, 38 were on the head or face and 13 on the neck. The largest defect in this series was 8×6 cm²

 (38 cm^2) and was in the neck region. The smallest was $1.5 \times 1.5 \text{ cm}^2$ (1.8 cm^2). The mean area of the defects in this series was 9.56 cm^2 (equivalent to a circular defect of about 3.5 cm in diameter).

The wounds were considered to be closed in 35 cases, the residual defect being 0.5 cm or less in diameter. A full thickness skin graft was needed in 11 cases to close the residual defect. The mean area of defects needing a skin graft was 3.14 cm^2 . There were five cases in which the residual defect was more than 5 mm in diameter and these were allowed to close by second intention. All these healed with satisfactory results. Overall, the mean reduction in the size of the defect was 89%.

In all but four cases the purse-string suture was left in place for at least 4 weeks. Of the four cases in which the suture was removed early, in one case the suture was loose and not required at 2 weeks. Confusion when the technique was first introduced resulted in the early removal of the suture in the other three cases. However, all healed satisfactorily without problems.

The results of the technique were good except in two cases. The first was on the scalp and resulted in an area of alopecia. The second was from an infection, which resulted in the loss of the full thickness skin graft from the preauricular region.

DISCUSSION

The quality of the final scar in almost all cases was surprisingly good despite the considerable initial tension required for the closure (Fig. 2). We followed the experience of Tremolada *et al.*⁵ and the findings of Hirshowitz *et al.*⁴ and limited the undermining to a minimal distance if at all, to avoid compromising the vascularity at the margins. Furnas⁶ has shown the presence of "retaining ligaments", which anchor the skin and prevent the lasting distortion by forces exerted beyond their insertion. By avoiding extensive undermining it was also hoped that these ligaments were retained, therefore maintaining the anatomy and allowing the final scar to mature along the natural lines of relaxed skin tension. Brady *et al.*⁷ and Greenbaum and Radonich⁸ advocated extensive undermining, but we found it unnecessary.

Mulliken *et al.*⁹ showed that circular excision and purse-string closure resulted in a scar that was 45%



Fig. 3 (a) Defect in right temple region with suture in place. (b) Skin graft sutured into residual defect after tying round block suture. (c) Four weeks postoperatively with round block suture removed. (d) Six months after removal of suture.



Fig. 4 (a) Lesion excised and round block suture in place. (b) Defect closed. (c). Six months after operation. Suture.

smaller in the longitudinal axis but 50% more oval than the linear scar which would be produced by a lenticular excision.

The best results were obtained when this technique was used in the neck and retromandibular region. Skin in these areas is relatively lax and with time the folds smooth out virtually back to normal leaving a linear but wider scar. We also noted that, at the temple region, this technique allowed the hair-bearing skin to creep back to its natural position and minimised the aesthetic damage (Fig. 3).

The worst results were when this technique was used on the scalp. The tension required to close the defect was considerable and there was little give in the tissues. The main problem here was hair loss (Fig. 4). Scalp flaps with wide subgaleal undermining can give better results. The purse-string suture can still be useful in reducing the size of the defect in non-hairy scalps and therefore reducing the size of skin graft required.

The main disadvantage is the amount of initial distortion of skin caused by the gathering of the skin. It is essential to prepare the patient for this gross distortion as well as the tightness experienced during the first few weeks. It is also important to warn the patient of the problems of stretching of the scar and poor aesthetics if the suture is removed too soon.

There are many advantages: it is a simple, inexpensive technique and the final results are often good, particularly in areas of lax skin. Even when the suture fails the final result is not compromised because later repair with a local flap can be done. Haematomas do not form because of the open nature of the central area. We have found that although the blood vessels at the periphery of the wound are placed under tension by the closure, those at the base of the wound and more importantly those where the vertical edge meets the horizontal base are to a certain extent relaxed and may bleed postoperatively. Haemostasis in this area is important to avoid the nuisance of further suturing or diathermy. Another advantage is that by avoiding the need for a skin graft we can remove the risk of donor site morbidity.

CONCLUSION

The "round block" purse-string suture can produce reliable and very satisfactory aesthetic results. It is not the first line of treatment for the repair of skin defects but in carefully selected cases it has many advantages over conventional techniques.

REFERENCES

 Peled JI, Zagher U, Wexler MR. Purse-string suture for reduction and closure of skin defects. Ann Plastic Surg 1985; 14: 465–469.

- Gibson T, Kenedi RM. Biomechanical properties of the skin. Surg Clin North Am 1967; 47: 279.
- Gibson T. Physical properties of skin. In: McCarthy J, ed. Reconstructive Plastic Surgery, vol. 1. 2nd ed. Philadelphia: WB Saunders, 1990: 207.
- Hirshowitz B, Lindenbaum E, Hari-Shai Y. A skin-stretching device for harnessing of viscoelastic properties of the skin. Plast Reconst Surg 1993; 92: 260–270.
- Tremolada C, Blandini D, Beretta M, Mascetti M. The "round-block" purse-string suture: a simple method to close skin defects with minimal scarring. Plast Reconstr Surg 1997; 100: 126–131.
- 6. Furnas DW. The retaining ligaments of the cheek. Plast Reconstr Surg 1989; 83: 11–16.
- Brady JG, Grande DJ, Katz AE. The purse-string suture in facial reconstruction. J Dermatol Surg Oncol 1992; 18: 812–816.
- Greenbaum SS, Radonich MA. The purse-string closure. Dermatol Surg 1996; 22: 1054.
- Mulliken JB, Rogers GF, Marlar JJ. Circular excision of haemangioma and purse-string closure: the smallest possible scar. Plast Reconstr Surg 2002; 109: 1544–1554.

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Accepted 16 February 2003