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EFFECTS OF SOLCOSERYL ON FLAP SURVIVAL

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ABSTRACT

An experiment was performed on the effect of solcoseryl on the skin flap survival. When the flap threared with solcoseryl showed slight improvement.

Key Word: Experimental Study, Skih Flap, Solcoseryl, Microangiography

INTRODUCTION

Skin flap necrosis is a serious problem in reconstructive head and neck surgery. The only clinically effective means of preventing flap necrosis that is in current use is to actually delay the grafting of the pedicle flap.

Many medications have been used to enhance the survival of skin flaps (Biller,[1] 1972; Johnson,[2] 1975 and Sasaki,[3] 1980), but, with the exceptions of β-adrenergic blocker (Finseth,[4] 1979) and pentoxifylline (Takayanagi,[5] 1980), were mostly unsuccessful.

The drug solcoseryl, which is known to be a tissue respiration activator, was tested for its effectiveness in flap survival. Luzak[6] (1964) demonstrated that solcoseryl improved the "take" of skin grafts, and also accelerated the generation of granulation tissue.

Other investigators (Malaker,[7] 1970) have also reported the beneficial effects that solcoseryl has on the healing of wounds. We concerned ourselves exclusively to the efficacy of solcoseryl on skin grafts and wound healing in this report. We conducted our own systematic experiments on the backs of rats to determine for ourselves the effectiveness of solcoseryl in skin flap survival.

MATERIALS AND METHODS

Male wistar strain rats (n = 42), weighing about 250g each, were used. They were fed natural diets throughout the experiment.

The rat's backs were prepped by using clippers and/or depilatories. All surgery was performed under intraperitoneal pentobarbital anesthesia.

Caudally plotted 1.5×6cm sized flaps were drawn on the rat's backs (Fig. 1), elevated in the manner described in Sasaki's Method (Sasaki,[8] 1979), and sutured back into place.

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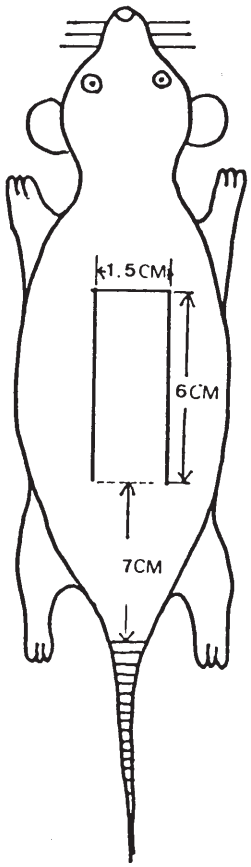


Fig. 1 The design of the flap. A 1.5 × 6 cm caudally based flap.

Our next step was to intravenously inject 0.2 ml of 5% patent blue solution into the rats, and then measure the length of the flap that was stained by the dye in 30 minutes time (dye distance).

The survival length, the distance from the pedicle base to the line of demarcation in the longitudinal midline, was measured 7 days post surgically.

The rats were then divided into 4 groups, each group varying as to the amount of intraperitoneal solcoseryl it recieved.

Experimental group 1 recieved 0.4 ml/kg/day, group 2 recieved 4 ml/kg/day, and group 3 recieved 8 ml/kg/day. The control group, (group 4) recieved one intraperitoneal dose of 8 ml/kg/day of saline solution. All the groups were treated for 7 days.

Microangiographic studies of the flaps vascular patterns were carried out. 1, 3, 5, and 7 days after surgery. This method afforded clear visualization of newly formed vascular channels in the wound margin there-by greatly facilitating the study of their formation.

RESULTS

1. Final Determination of Flap Length Survival

   The results in Fig. 2 show the average elongated survival lengths (survival length minus the dye distance) and elongated survival rates (survival length divided by the distance).

   The control group's average elongated length was -0.26 ± 0.58 cm, and elongated rate was 0.93 ± 0.15. This means that the control group's surviving length was directly proportional to the dye distance.

   Group 1's elongated length was 0.06 ± 0.59 cm, its elongated rate was 1.04 ± 0.18. Group 2's elongated length and rate was -0.05 ± 0.74 cm and 1.04 ± 0.24. Groups 1 and 2 showed no significant improvement or measurable difference.

   The mean elongated length and rate of group 3 was 0.71 ± 0.63 cm and 1.23 ± 0.23. The elongated rate level in group 3 showed a significant increase compared with that of the control group.

2. Microangiographic Findings

   In the control groups 3rd postoperative day there was a slight increase of capillaries in the wound margin. Vascular sprouting from the distal ends of the severed vessels was noted, but no vascular communication was found between the flap and the recipient bed (Fig. 3). Yet, revascularization in group 3 was observed to begin at the distal margin of the flap. These vascular channels rapidly increased in number and extended toward the proximal margin (Fig. 4).

   The control group's 5 day postoperative flap margin was extremely crowded with new capillaries and venules. Revascularization between pre-existing vessels in the flap and recipient vessels was constructed at the level of the capillaries (Fig. 5).

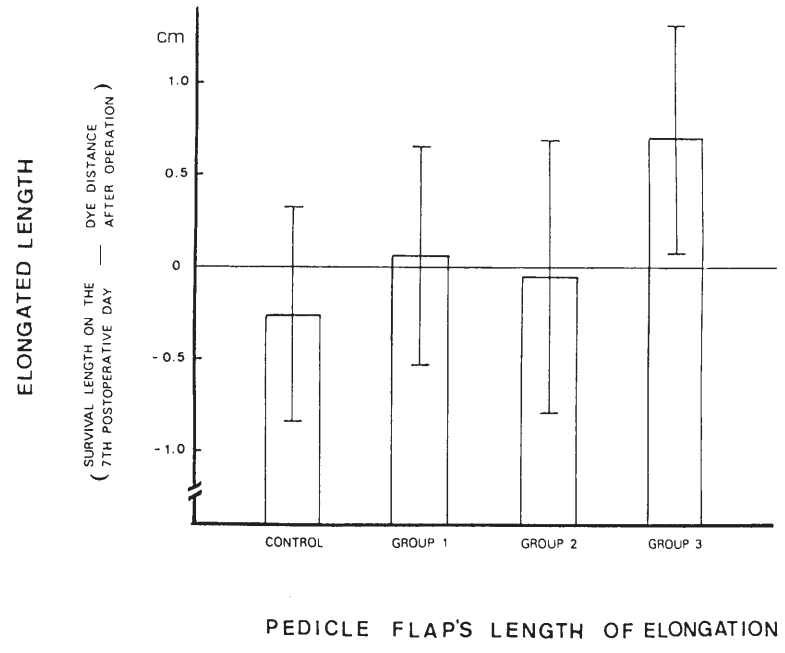
   Group 3's revascularization was almost established, and vascular formation in the center and margin of the flap was complete (Fig. 6). Vascular communication increased in number, and cross section inspection showed them to be mostly located in the sub-dermal layer (Fig. 7). Large dilated vessels were filled with contrast medium along the long axis of the flap.

   These pictures show the slight advantage of revascularization in the treated group as compared to the control group.

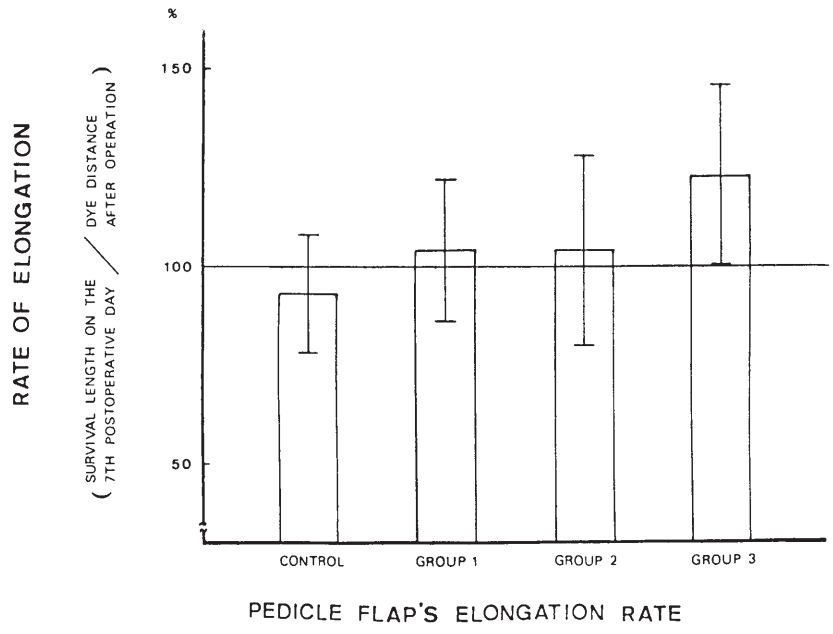
DISCUSSION

The results suggest that the solcoseryl administrated to Group 3 may have had some beneficial effect on it's flap survival, and that the injected dose of solcoseryl in Group 3 exceeded the clinical dose, there-by making it clinically doubtful that solcoseryl prolonged the survival length of the flap.

Malaker *et al*, however, reported that when rats were treated with solcoseryl increases in the rates of wound healing were significant.



(a)



(b)

Fig. 2 Solcoseryl treatment increased the survival of skin flap in group 3.
(a) Pedicle flap's length of elongation.
(b) Pedicle flap's elongation rate.

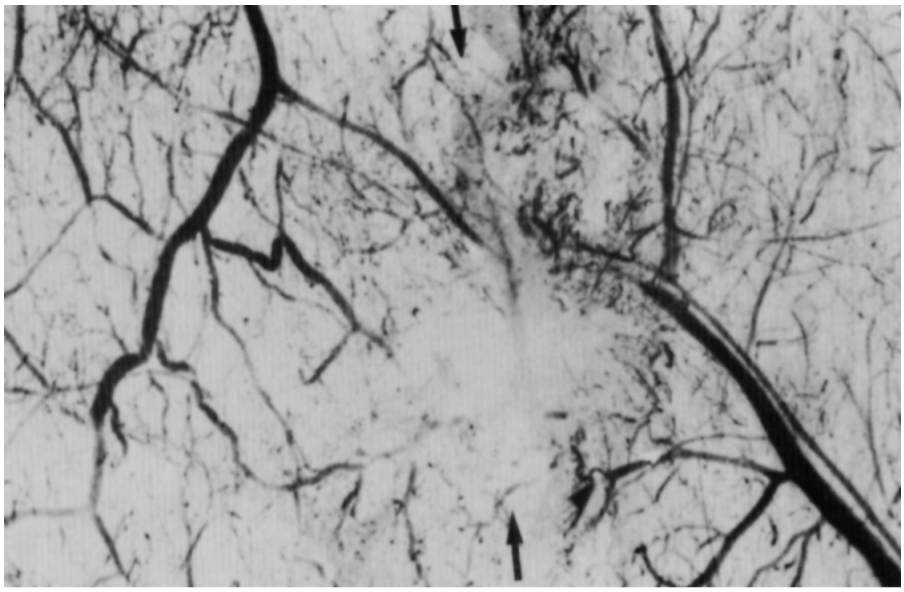


Fig. 3 No vascular communications between flap and recipient bed. Arrows show wound margin. (control group, 3 days postoperatively ×10)

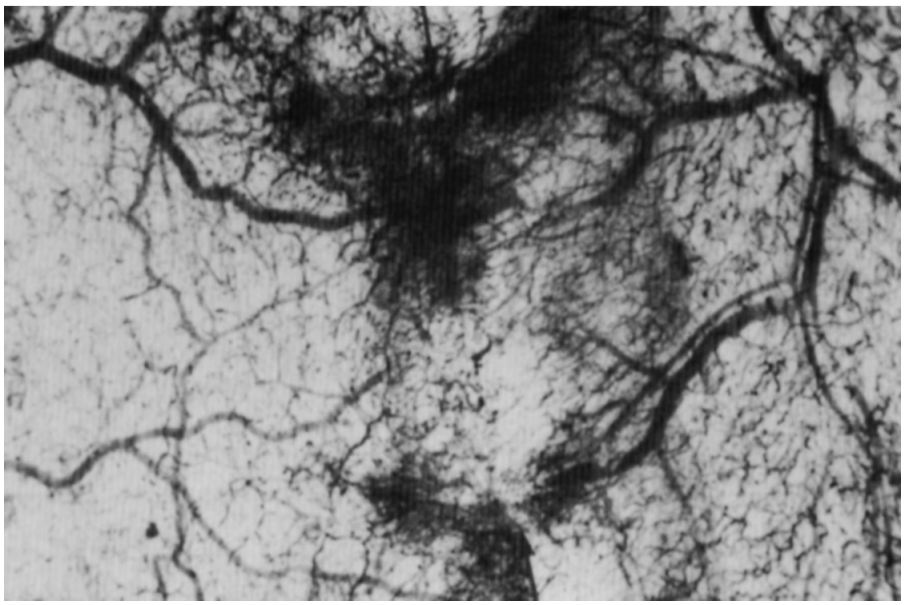


Fig. 4 Slight revascularization at the distal margin of the flap (group 3, 3 days postoperatively, ×10)

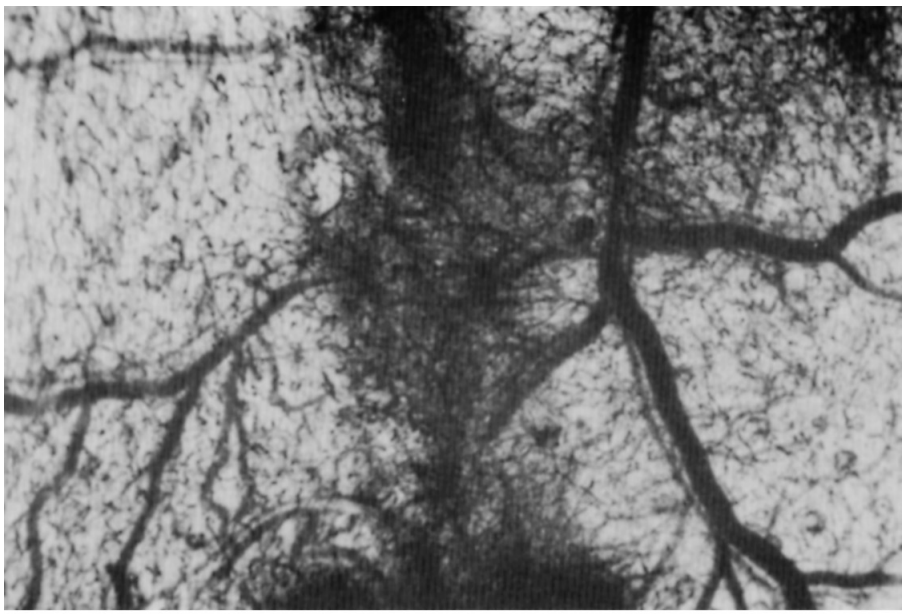


Fig. 5 Flap margin was crowded with new capillaries. (control group, 5 days postoperatively, ×10)

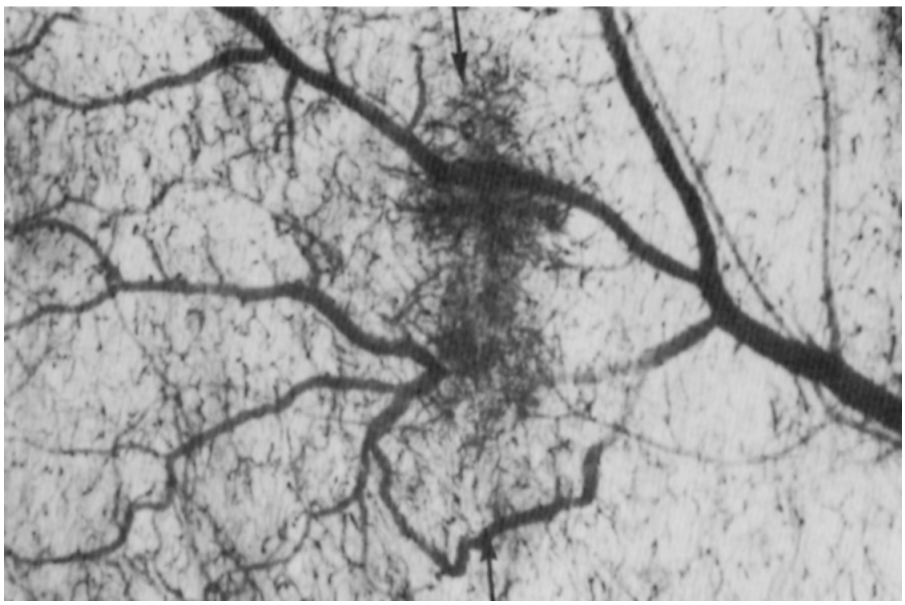


Fig. 6 Revascularization was almost established. (group 3, 5 days postoperatively, ×10)

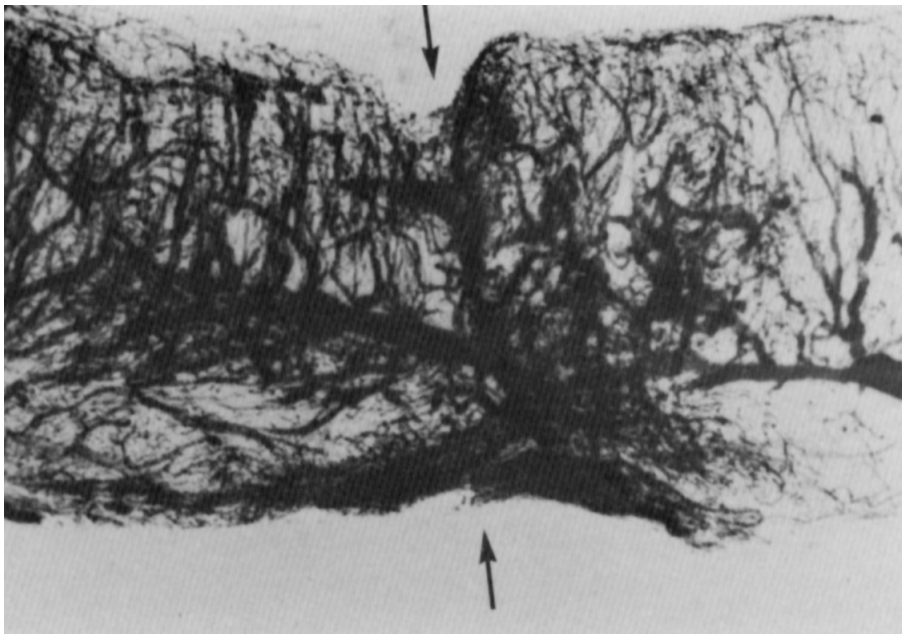


Fig. 7 In cross section vascular communications were mainly found to be in the subdermal layer. (group 3, 5 days postoperatively, ×20).

CONCLUSION

Revascularization between the flap margin and recipient bed was established in Group 3 more quickly that in the control group.

Our results appear to coinside with Malaker's experiments. That being, that the primary reason for the beneficial effects on flap survival is the early establishment of revascularization.

This also means that solcoseryl is responsible for improvement of the flap's circulation.

Further investigation is required to determine the mechanism of this phenomenon.

SUMMARY

The effect of solcoseryl on skin flap survival was studied by using 1.5 × 6 cm caudally plotted rat dorsal pedicle flaps. The results showed solcoseryl to have potential application in the treatment of skin flaps in danger of necrosis.

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