

Perioperative Glucocorticoid Treatment of Soft Tissue Reconstruction in Patients on Long-term Steroid Therapy

The Experience of 6 Cases Using Reversed Posterior Interosseous Flap for Hand Neoplasm Surgery

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Introduction: Long-term steroid therapy is associated with increased postoperative morbidity. Whether to use a stress dose of glucocorticoids (GCs) in surgical patients remains controversial. In the present study, we reported our experience in perioperative GC treatment of 6 patients on long-term steroid therapy for autoimmune diseases undergoing hand reconstruction using reversed interosseous flap.

Methods: The reversed interosseous flap reconstructions were performed after local extended resection of hand neoplasms. The patients were all diagnosed with autoimmune diseases and were undergoing long-term steroid therapy. Stress dose of GCs was not given in any case, and all the patients either remained on their baseline maintenance dose or decreased the dose until the morning of the operation day. Hypotension, water-electrolyte imbalance, hypoglycemia, and other symptoms of adrenal insufficiency were carefully assessed. Appearances of flap complications were recorded.

Results: None of the patients developed hypotension or other symptomatic adrenal insufficiency. Flap infection, venous congestion, or complete or partial loss of flap was not observed in any patient. Effusion underneath the flap was developed in only 1 case and was solved by proper drainage.

Conclusions: It is safe, reliable, and versatile to use reversed interosseous flap to repair hand defects in patients on long-term steroid therapy. A stress dose of GCs might not be necessary in this procedure and other equally moderate soft tissue reconstructive surgeries.

Key Words: adrenal insufficiency, hand reconstruction, perioperative glucocorticoids, posterior interosseous flap, stress-dose steroids

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Long-term steroid therapy has long been used to treat a variety of autoimmune and inflammatory diseases. However, it is associated with an increased perioperative risk of developing complications related to inhibition of the hypothalamic-pituitary-adrenal axis in surgical patients.¹ This inhibition causes an insufficient stress response, an impairment of

healing, and various endocrine and metabolic adverse effects, including increased susceptibility to infection. Supraphysiologic “stress-dose” glucocorticoids (GCs) have routinely been considered the perioperative standard of care over the past 6 decades for these patients.^{2–4} Recently these years, however, developing evidence is beginning to suggest that such a practice may not be necessary.^{4,5}

In the field of reconstructive surgery, it is hard to evaluate the amount of disturbance various procedures would cause to the internal environment of the patients, thus making consensus on whether and how to use perioperative stress-dose GCs hard to reach.

Soft tissue reconstruction of the hand has always been uneasy for surgeons. The coverage of exposed muscle, tendon, and bone is challenging because of limited availability of local flaps. The posterior interosseous flap is a fasciocutaneous flap, which can be proximally or distally based as an island flap. Since first described by Lu et al,⁶ Penteado et al,⁷ and Zancolli and Angrigiani⁸ independently, and innovated by other surgeons afterward,^{9,10} it has become the prior choice for hand reconstruction in many institutions.^{11–13}

This article seeks to present our experience of perioperative management in 6 patients on long-term steroid therapy for autoimmune diseases undergoing reversed posterior interosseous flap for soft tissue hand reconstruction.

MATERIALS AND METHODS

This study was approved by the ethics committee. Informed consent was obtained from each patient.

From March 2008 to September 2016, 6 patients with autoimmune diseases who have received long-term steroid therapy were referred to our department because of hand neoplasm. They were 4 women and 2 men with ages ranging from 34 to 73 years. The original autoimmune diseases were systemic lupus erythematosus in 3 patients, dermatomyositis in 2 patients, and scleroderma in 1 patient. Their prior steroid therapy period ranged from 10 to 67 months. Rheumatologists and dermatologists were consulted in all 6 cases: 4 patients continued their usual dose of GCs, and the other 2 patients decreased the dose of GCs to 30 mg prednisone per day until the morning of the operation day (Table 1).

Locations of neoplasms in the patients were as follows: dorsum of the hand in 3 patients, radial half of the hand in 1 patient, and ulnar half of the hand in 2 patients. The largest flap measured in our study was 9 × 6 cm, and the smallest flap was 5 × 2.5 cm. All the patients received preoperative Doppler test in order to exclude anatomical variations.

All the operations were conducted under general anesthesia. None of the patients received a stress dose of GCs during the operation. The surgical technique was described in other articles^{13–15} with no significant modification. The inset of the flap was provided by splitting

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TABLE 1. Original Autoimmune Diseases and GC Treatment

Patient	Age, y	Sex	Autoimmune Disease	GC Therapy (Prednisone)	GC Adjustment (Prednisone)
1	55	F	SLE	40 mg/d	Remain 40 mg/d
2	34	F	SLE	10 mg/d	Remain 10 mg/d
3	40	F	SLE	30 mg/d	Remain 30 mg/d
4	67	M	Scleroderma	40 mg/d	Decrease to 30 mg/d
5	73	M	Dermatomyositis	60 mg/d	Decrease to 30 mg/d
6	54	F	Dermatomyositis	20 mg/d	Remain 20 mg/d

F, female; M, male; SLE, systemic lupus erythematosus.

the skin bridge of the pivot point in all the cases, and the defects of donor sites were all skin grafted (Fig. 1).

All the patients resumed their routine steroid treatment on the second day after the operations. Blood pressure, electrolytes, and blood glucose were carefully monitored after the operations. Symptoms suggestive of adrenal insufficiency such as orthostatic hypotension, myalgia, nausea, vomiting, diarrhea, and asthenia were closely supervised. Conditions of the flap were assessed regularly after the operation. Any postoperative complication was recorded.

RESULTS

None of the patients developed hypotension, water-electrolyte imbalance, hypoglycemia, or other symptoms suggestive of adrenal insufficiency during the perioperative period. Recurrence of the original autoimmune diseases was not observed in any patient.

The posterior interosseous flaps survived in all the cases. No flap infection, venous congestion, or complete or partial loss of flap was observed in any patient. Effusion underneath the flap was noticed in 1 patient and cured by proper drainage (Table 2). Skin grafted on the donor sites survived in all the cases. All the patients were evaluated in terms of pinch and grip functions as long as the temperature,

turgor, and color of the flaps in the follow-up. The longest follow-up period was 24 months, and the shortest was 5 months. At the end of follow-up, all cases showed no significant functional limit. All flaps provided stable coverage and reasonable contour. No patient reported donor skin graft color mismatch. All the patients were satisfied with their functional and aesthetic outcomes.

DISCUSSION

The definite perioperative management of patients on long-term steroid therapy has not reached a consensus. Furthermore, there are few data available regarding the true incidence of perioperative adrenal insufficiency, especially in the field of reconstructive surgery. Since the potential danger of long-term steroid therapy in surgical patients was described by Fraser et al¹⁶ and Lewis et al¹⁷ in 1952 and 1953, a stress dose of GCs was advised to prevent adrenal insufficiency perioperatively. According to Salem et al,¹⁸ the dose of perioperative steroid coverage depends on the degree of surgical stress. Based on this theory, long-term GC-treated patients preparing for a reversed posterior interosseous flap reconstruction need an extra 50 to 75 mg hydrocortisone or equivalent. However, recent studies revealed that patients receiving therapeutic doses of GCs did not routinely require stress doses perioperatively as long as they continue to receive their usual daily dose.^{4,5} In 2 independent studies, patients even stopped steroid therapy before the surgery, and there was no significant difference in regard to adrenal insufficiency.^{19,20} In our study, stress-dose GCs were not administered in any patient. The patients either received their usual dose or decreased dose of GCs before the surgeries according to the advice of rheumatologists and dermatologists. None of the patients experienced hypotension or other symptoms suggestive of adrenal insufficiency. Furthermore, the progress of the original autoimmune disease was not detected in any patient. Our result is in coincidence with the studies above.

The patients' conditions might be one of the reasons why stress dose of GCs was not necessary in our study; there were no trauma-caused hand defects, unlike in many other studies. The requirement of supplemental GCs for stress might be less in a delicate tumor removal operation than that in a trauma-caused emergency surgery. All the patients in our study were receiving therapeutic dose of GCs owing to primary autoimmune diseases, and none of them received replacement dose of GCs for hypothalamic-pituitary-adrenal axis hypofunction. For those on physiologic replacement dose of GCs, a supplemental dose in the perioperative period might be required.⁴

Another major concern is the association between long-term steroid therapy and the increased postoperative morbidity.² Fortunately, none of our patients experienced any major complications after surgery. Generally, the posterior interosseous flap reconstruction is a moderate operation that only mildly interferes with internal environment compared with a major surgery, thus leading to a lower complication rate.

The effect of GCs on flap reconstruction is complicated. On the one hand, additional GCs are able to reduce inflammation, thus preventing flap edema and consequent venous congestion in an early set. On the other



FIGURE 1. A, Eversion of the reversed posterior interosseous flap in the operation. B, Appearance of the same reversed posterior interosseous flap and the donor site 2 weeks after operation.

TABLE 2. Characteristics of Neoplasm, Size of Flap, and Complications

Patient	Age, y	Sex	Pathology of Skin Neoplasm	Lesion Site	Size of the Flap, cm	Complications and Follow-up
1	55	F	SCC	Radial half of the hand	8.0 × 4.0	None, 11 mo
2	34	F	BCC	Dorsum of hand	5.0 × 2.5	None, 24 mo
3	40	F	SCC	Ulnar half of the hand	5.5 × 3.0	None, 13 mo
4	67	M	Squamous of atypical hyperplasia	Dorsum of hand	9.0 × 6.0	Infusion, 9 mo
5	73	M	SCC	Dorsum of hand	7.5 × 4.0	None, 5 mo
6	54	F	SCC	Ulnar half of the hand	6.0 × 3.5	None, 7 mo

BCC, basal cell carcinoma; F, female; M, male; SCC, squamous cell carcinoma.

hand, extra GCs would increase the probability of infection, which might directly lead to failure of flap reconstruction. In our study, prophylactic antibiotics were given for 24 hours after the operation, and no flap infection was noticed. The only complication observed was effusion underneath the flap in a single case and was successfully managed by proper drainage. However, no evidence suggested that the effusion was directly associated with GC treatment.

Local extended resection is the primary treatment for hand malignant tumor, while wound coverage of secondary defects can be challenging. The reversed posterior interosseous flap is an axial flap, based on the retrograde posterior interosseous artery, to provide coverage of the hand. It is proved to have many distinct advantages including its easy preparation, single-stage procedure, and nonrequirement for microvascular anastomosis. Besides, it achieves an excellent skin texture and does not require the sacrifice of radial or ulnar artery, making it an excellent option for hand reconstruction.^{11–13} Costa et al¹² concluded that the major indications of reversed posterior interosseous flap are reconstruction of the first web space up to the interphalangeal joint of the thumb, dorsal hand defects up to the metacarpal joints, and large defects on the palm-ulnar border of the hand. The location of defects in our study involves multiple hand subunits including dorsum, radial, and ulnar half of the hand. According to Zhang et al,²¹ anatomical variations were observed in only 2 patients so far. In consistence to previous studies, we found no anatomical variations in all 6 cases, suggesting its reliable blood supply. However, perioperative Doppler examination is still an essential step in this method. Another advantage of the reversed posterior interosseous flap is a guaranteed quality of the skin paddle suitable for volar wrist, dorsum of the hand up to base of fingers, and dorsum of the thumb.

In our clinical study, we have demonstrated that reversed posterior interosseous flap is not only an excellent tool to cover hand defects, but also causes little biological stress to patients with autoimmune diseases and is not compromised by chronic steroid treatment. Based on the reasons above, we believe that reversed posterior interosseous flap is a prior choice among all existing hand reconstruction techniques.

In conclusion, our study demonstrated that reversed interosseous flap is safe, reliable, and versatile to repair hand defects in patients on long-term steroid therapy for autoimmune diseases. A stress dose of GCs is not necessary in these patients.

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