SHORT REPORT

A comparison between anterolateral thigh perforator flap and abdominal pedicle flap in repair of hand injuries and tissue defects

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Abstract

The purpose of this study was to compare the outcome of anterolateral thigh perforator flap and abdominal pedicled flap repair for treating traumatic tissue defects of the hand. A total of 140 patients with hand trauma tissue defects were randomly divided (random number table) into Group A and Group B, with 70 cases in each group. Group A was given anterolateral thigh perforator flap repair, while Group B was given abdominal pedicled flap repair. The healing time of wounds in Group A was noted to be shorter than that in Group B ($p<0.001$). At one week after surgery, VAS score, serum IL-6 and TNF-α levels in Group A were 4 times lower than those in Group B ($p<0.001$ for all). Anterolateral thigh perforator flap repair works more effectively on traumatic tissue defects of the hands than abdominal pedicled flap repair. It reduces pain, shortens wound healing time, and lowers serum IL-6 and TNF-α levels.

Keywords: Anterolateral thigh perforator flap, abdominal pedicled flap repair, traumatic tissue defects, hand, IL-6, TNF-α.

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Introduction

Once a traumatic tissue defect occurs in the hand, it can affect its function and the patient's daily life. It cannot be directly sutured due to the special function of the hand, so flap grafting is necessary to address the issue.[1]

Abdominal pedicled flap repair is a surgical procedure commonly used to treat hand trauma.[2] Although it ensures survival of the flap and rapid restoration of blood supply to the donor area, the abdominal skin used in this procedure—which is less extensible and delicate than the skin of the extremities, with some pigmentation problem and no transverse palm and finger lines—can affect the patient's subjective feelings together with the resultant non-sensory, poor-looking, mostly bulky flap.[3]

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A perforator flap is a flap whose blood supply is provided only by a small perforator artery (≥0.5mm in calibre after crossing the deep fascia).[4] Perforator flap repair is a new development in flap surgery because of its flexibility in design, less trauma to the donor area, ease of grafting, and good appearance of the recipient area.[5] The anterolateral thigh perforator flap has been suggested to be an ideal free flap donor area.[6] It is more effective in repairing traumatic tissue defects of the hand.[7]

However, the abdominal flap is still thought to have its irreplaceable advantages in the repair of traumatic soft tissue defects of the hand. Technical conditions allowing, the choice of the anterolateral thigh perforator flap can better reconstruct the patient's hand in both form and function.[8]

The purpose of this study was to compare the outcome of anterolateral thigh perforator flap and abdominal pedicled flap repair for treating traumatic tissue defects of the hand.

Patients, Methods and Results

This was a retrospective study. The study was conducted in the People's Hospital of Yuyao, China, from April 2019 to August 2021. The estimated sample size was calculated using G* Power.[9] A total of 140 patients with hand trauma tissue defects were selected as the research subjects. Inclusion criteria were: clear history of hand trauma and soft tissue defects; indication and request for surgery; had undergone skin flap grafting; unilateral trauma; signed informed consent. Exclusion criteria were: hand fracture requiring amputation; allergy to anaesthetic drugs; immunodeficiency or coagulation disorders; accompanied by other defects. The patients were randomly divided (random number table) into Group A and Group B, with 70 cases in each group.

Group A underwent anterolateral thigh perforator flap repair. Wounds were routinely debrided before surgery. The location of the anterolateral femoral penetrating vessels was routinely determined by colour ultrasound Doppler and marked. The donor flap was designed according to the area and shape of the wound defect, ensuring that the diameter of the flap exceeded the recipient area by 0.3-0.5 cm. The anteromedial side of the flap was incised to reach the surface of fascia lata, the flap was lifted free, the skin's

penetrating branches were located, 1-2 thick penetrating branches were selected as the flap's blood supply vessels, and the extent of the flap was determined.[8] The deep adipose tissue and peripheral fascia were cut away, and the flap was thinned. The flap was moved to the recipient area once it had good blood supply and anastomosed with the corresponding nerve and artery.

Group B was given abdominal pedicled flap repair. Wounds were routinely debrided before the surgery was performed. The skin defect was observed, and a suitable thoracoabdominal flap was selected. According to the extent of the soft tissue defect, the flap was positioned in the abdomen. The flap area needed to be enlarged by 10% compared with the trauma area. During repair, it is necessary to ensure that the flap tissue surface was upward, and the edge should be trimmed bevelled to the distal end. After surgery, the affected limb was fixed with a pressure dressing, which was changed once every three days.[9] Wound healing time was observed in both groups. The pain level of patients was assessed by visual analogue score (VAS) before and one week after surgery; the higher the VAS score, the more severe the pain. The levels of interleukin-6 (IL-6) and tumour necrosis factor-α (TNF-α) were measured by enzyme-linked immunosorbent assay (ELISA) Double-antibody Sandwich Method after centrifugation of 5ml venous blood was collected from both groups of patients under fasting before and one week after surgery. Postoperative complications were observed in both groups.

SPSS 25 was used to analyse the data. Kolmogorov-Smirnov test was adopted for the normal distribution of measurement data. The measurement data which followed the normal distribution were expressed as mean ± standard deviation, and independent sample t-test was used. The count data were expressed by n (%), and chi-square test was used. The $p<0.05$ was considered as significant.

Among the 70 cases in Group A, 37 (52.9%) were males and 33 (47.1%) were females; aged 21-54 years, with an average of 33.76±4.22 years; trauma area ranged from 6.0 cm×8.0 cm to 13.0 cm×9.0 cm; left hand injury was observed in 38(54.3%) cases, right hand injury was observed in 32 (45.7%) cases; car accident injury was observed in 24 (34.3%) cases, heavy object injury was seen in 21 (30.0%) cases, machine crush injury was found in 16 (22.9%) cases, and machine belt twisting injury was observed in 9 (12.9%) cases.

Among the 70 cases in Group B, 36 (51.4%) were males and 34 (48.6%) were females; aged 22-55 years, with an average age of 33.95±5.04 years; trauma area ranged from 5.0 cm×7.0 cm to 12.0 cm×10.0 cm; left hand injury was observed in 39 (55.7%) cases, right hand injury was observed 31 (44.3%) cases; car accident injury was encountered in 25 (35.7%) cases, heavy object injury was observed in 22 (31.4%) cases, machine crush injury was observed in 15 (21.4%) cases, and machine belt twisting injury was seen in 8 (11.4%) cases.

Table-1: Comparison of clinical indicators.

Clinical indicators	Group A (n=70) Mean±SD	Group B (n=70) Mean±SD	*p*-value
Healing time of the wounds (d)	7.30±0.49	13.27±1.01	<0.001*
VAS score before surgery	7.01±0.55	6.99±0.63	0.775*
VAS score at 1 week after surgery	3.21±0.41	3.83±0.38	<0.001*
Serum IL-6 before surgery (ng/mL)	1.57±0.20	1.54 0.16	0.253*
Serum IL-6 at 1 week after surgery (ng /mL)	0.85±0.11	1.07±0.12	<0.001*
Serum TNF-α before surgery (ng/mL)	1.42±0.18	1.44±0.15	0.552*
Serum TNF-α at 1 week after surgery (ng/mL)	0.38±0.05	0.61±0.06	<0.001*

*:Independent sample t-test; SD: Standard deviation; VAS: Visual analogue score; IL-6: Interleukin-6; TNF-α: Tumour necrosis factor-α.

Table-2: Comparison of postoperative complications.

Postoperative complications	Group A (n=70) n (%	Group B (n=70) n (%
Vein drainage disturbance of distal flap	2 (2.9)	3 (4.3)
Partial necrosis of distal flap	1 (1.4)	3 (4.3)
Flap infection	2 (2.9)	2 (2.9)
Stiffness in the joints	3 (4.3)	4 (5.7)
The overall complication rate	8 (11.4)	12 (17.1)
***p*-value**	0.334#	

#:chi-square test.

The healing time of the wounds in Group A was relatively shorter than that in Group B ($p<0.001$, Table 1). Before the surgery, differences in VAS score, serum IL-6 and TNF-α levels between the two groups were not statistically significant ($p=0.775$, 0.253, 0.552, respectively, Table 1); one week after the surgery, VAS score, serum IL-6 and TNF-α levels in Group A were 4 times lower than those in Group B ($p<0.001$ for all, Table 1).

The occurrence of postoperative complications in Group A was encountered in 8 (11.4%) cases, and the occurrence of postoperative complications in Group B was 12 (17.1%) cases.

There was no significant difference in the occurrence of postoperative complications between the two groups ($p=0.334$, Table 2).

Conclusion

Anterolateral thigh perforator flap repair works more effectively on traumatic tissue defects of the hands as compared to abdominal pedicled flap repair. It reduces pain, shortens wound healing time, and lowers serum IL-6 and TNF-α levels.

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