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Evaluation of Clinical Efficacy of Combination of Surgery and Rehabilitation for Treatment of Scar Contracture after Hand Burn

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Abstract: Objective: To evaluate the clinical efficacy of combination of surgery and rehabilitation for patients with scar contracture after hand burn. **Methods:** Subjects of data calculation in this study were 66 patients with scar contracture after hand burn who were admitted from May 2018 to May 2019. The subjects were divided into regular group and combined group according to random number table method. The regular group (n=33) received surgical treatment alone. The combined group (n=33) patients were given surgery combined with rehabilitation. Recovery of hand function, efficacy of clinical treatment, hand function recovery and ADL score were calculated and compared between the two groups of patients with scare contracture after hand burn. **Results:** Efficacy, recovery of hand function (finger, finger flexion and extension, palm and finger adduction or abduction, daily activity, wrist rotation, wrist flexion and extension, appearance and sensory function) and ADL score were more superior in combined group when compared with regular group patients with scar contracture after hand burn. $P<0.05$, the indicator data showed statistical significance. **Conclusion:** Surgery combined with rehabilitation therapy shown significant value for patients with scar contracture after hand burn.

Keywords: *Surgery; Rehabilitation therapy; Hand burn; Scar contracture; Clinical efficacy*

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Treatment of hand burn is a relatively common clinical treatment. Hand burn is divided into three different types according to degree of burn: severe burn, moderate burn and mild burn[1]. In patients with mild burn, subcutaneous deep tissues are not damaged and will not result in many scar. However, degree of burn is greater for patients with moderate burn and severe burn, in which connective tissue scar contracture may occur which seriously threatens the function of patient's hand. Surgical treatment is generally given to patients with affected finger function due to scar contracture after hand burn. However, it is not able to significantly improve scar contracture, thus combination with rehabilitation treatment is required[2]. This study evaluated the clinical efficacy of surgery alone and surgery combined with rehabilitation for 66 patients with scar contracture after hand burn who were admitted between May 20, 2019 and May 2019.

1 Materials and methods

1.1 Basic information

This study investigated 66 patients with scar contracture after hand burn who were admitted between May 2018 and May 2019. They were grouped according to randomized digital table method, with 33 patients in each group. In regular group, ratio of male to female was 16:17, maximum age was 44 years old, minimum age was 20 years old, and median age was (33.54±4.22) years old. In combined group, the ratio of male to female was 17:16, maximum age was 45 years old, minimum age was 21 years old, and median age was (34.22±3.21) years old. Basic data of the patients with scar contracture after hand burn in regular group and combined group were statistically analyzed. $P>0.05$, the statistical analysis showed no significance between

the indicator data.

Inclusion criteria of subject: fulfilled the clinical judgment criteria of scar contracture after hand burn, met surgical indication, patients and patients' family members understood the content of treatment and voluntarily signed consent form. This study was submitted to medical ethics committee and was approved by relevant personnel.

Exclusion criteria of subject: patients with mental disorder, patients with impaired cardiopulmonary function and patients who were not able to cooperate with treatment were excluded.

1.2 Methods

Regular group patients were give surgery alone for scar removal. According to large serrated shape, incision was made along the edge of scar contracture. Scar tissues were separated by sharp and blunt incision to ensure complete resection and full exposure of subcutaneous tissue. Performance of incision and separation in patient should avoid damage to tendon and other important blood vessels. Deformity in patient was corrected, tourniquet was released and bleeding site was applied pressure using hot saline gauze to stop bleeding completely. Treatment process of wound repair was carried out according to the actual condition of scar. Resection of skin was carried out based on the ratio of wound. Suture process required intermittent and continuous treatment, to fix the functional sites well.

Combined group patients were given surgery combined with rehabilitation therapy. (1) Exercise of fingers: medical staffs provided guidance for patients to flex and stretch each finger joint correctly. Exercise of thumbs and palms: training for fine activities such as chopsticks usage and washing. (2) Intervention using hot application: after healing of wound in patient, rehabilitation treatment using hot application was given by medical staff, 10 minutes for each time, 2 to 3 times per day. (3) Exercise using elastic gloves: patients were reminded by medical staffs to wear elastic gloves every day, with wearing time exceeded 12 hours each day. Pressure of glove was adjusted timely according to patient's tolerance status. Pressure was controlled within the range between 1.5 and 3.6 kpa.

1.3 Analysis of indicators

Efficiency, recovery of hand function and ADL score of clinical treatment for patients with scar contracture after hand burn in regular group and combined group were observed.

(1) Ability of daily activity of patients with scar contracture after hand burn in regular group and combined group was evaluated by using ADL score quantitative score table. Total score was 100. Patients who were not able to take care of themselves after treatment and needed assistance from others were recorded as less than 20. Patients who needed assistance from others after treatment and could complete a small part of activities independently were recorded as 20–40 points. Patients who needed assistance from others after treatment and could complete most activities independently were recorded as 41–60 points. Patients who were basically independent in life activities after treatment were recorded as more than 60 points. Higher value indicated better ability of living.

(2) Recovery of hand function mainly included fingers, finger flexion and extension, palms, finger adduction or abduction, daily activities, wrist rotation, wrist flexion and extension, appearance, and sensory function.

(3) Patients who showed recovery in clinical indicators and physical signs, being able to live independently and showed prominent improvement of finger function were considered to be markedly effective. Patients who showed improved clinical indicators and physical signs after treatment, with acceptable living ability and slight recovery of finger function were considered to be effective. Patients who did not meet the above criteria were considered to be ineffective.

1.4 Statistical analysis of data

Efficacy and hand function recovery of clinical treatment for patients with scar contracture after hand burn in both regular and combined groups were expressed in the form of rate (%); chi-square test was applied. ADL score of patients with scar contracture after hand burn in regular group and combined group was expressed in the form of (mean±standard deviation); t-test was applied. All data of the 66 patients with scar contracture after hand burn were recorded in SPSS17.0 for Windows computer software for processing. $P<0.05$ showed that indicator data had statistical significance.

2 Results

2.1 Calculation of efficacy of clinical treatment for patients with scar contracture after burn in regular group and combined group

Results of indicator calculation showed that efficacy of clinical treatment for patients with scar contracture

after hand burn in combined group was 96.97%, which was significantly higher than that of regular group (75.76%). *P<0.05*, indicator data showed statistical significance.

Table 1. Comparison of clinical treatment efficiency for patients with scar contracture after hand burn in regular and combined groups

Group	Case	Markedly effective	Effective	Ineffective	Efficacy of clinical treatment
Combined	33	17	15	1	96.97%
Regular	33	13	12	8	75.76%
X^2					6.3041
P					0.0120

2.2 Calculation of ADL score of patients with scar contracture after hand burn in regular group and combined group

Results of indicator calculation showed that when pre-intervention ADL score of scar contracture patients in combined group were compared with regular group, *P>0.05* and there was no statistical significance between the data indicators. When post-intervention ADL score of scar contracture patients in combined group compared with the data of regular group, *P<0.05* and the indicator data showed statistical significance.

Table 2. Comparison of ADL score of patients with scar contracture after burn in regular group and combined group

Group	Case	Before intervention	After intervention
Combined	33	33.54±3.11	76.56±3.02
Regular	33	33.51±3.54	59.66±3.18
t		0.0365	22.1371
P		0.9709	0.0000

2.3 Calculation of hand function recovery of patients with scar contracture after burn in regular group and combined group

Results of indicator calculation showed that comparison of fingers, finger flexion and extension, palms, finger adduction or abduction, daily activities, wrist rotation, wrist flexion and extension, appearance and sensory function between combined group and regular group of patients with scar contracture after hand burn showed *P<0.05*. The indicator data showed statistical significance.

Table 3. Comparison of hand function recovery in patients with scar contracture after burn of regular group and combined group

Group	Case	Finger	Finger flexion and extension	Palm	Finger adduction or abduction	Daily activity	Wrist rotation	Wrist flexion and extension	Appearance	Sensory function
Combined	33	7.54±0.22	7.41±0.21	7.664±0.11	7.54±0.22	7.89±0.18	7.34±0.21	7.81±0.11	8.22±0.31	7.94±0.25
Regular	33	6.77±0.22	6.33±0.24	6.554±0.21	6.21±0.27	6.77±0.28	6.54±0.18	6.44±0.24	7.33±0.15	7.24±0.32
t		14.2170	19.4545	26.8974	21.9370	19.3288	16.6156	29.8099	14.8458	10.4583
P		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3 Discussion

Back of hand is a common part of hand burn, thus there is higher chance for contracture deformity to occur on back of hand. Hands have important value among all the other functional parts of human body. If scar contracture occurs on hands due to burn, prompt treatment is needed instead of surgical treatment when scar tissues are established. There are two types of hand scar contracture: severe contracture and mild contracture[3]. Deformity of hand after burn is a common type of post-burn deformity. Deep burn of hand will give rise to scar contracture after healing of the wound, which affects hand activities. This will lead to adverse consequences if not treated in timely manner[4, 5].

Results of this study showed that comparison of clinical treatment efficiency, hand function recovery and ADL score of patients with scar contracture after

burn between combined group and regular group showed $P<0.05$. The data of indicator had statistical significance.

The study by Jin Kai-Feng, Wang Xi-Hua, Lu Zheng-Gang et al.[6] showed that comparison of TAM score of patients with scar contracture after hand burn between observation group (198.67±21.08) with control group (144.43±16.65) showed $P<0.05$, the indicator data had statistical significance. When nail clipping (3.26±0.51), eating (3.56±0.55), combing hair (3.68±0.72), brushing teeth (3.38±0.68), washing face (3.61±0.52), dressing (3.55±0.61), and wearing shoes (2.57±0.47) of patients with scar contracture after hand burns in observation group was compared with control group, $P<0.05$ and the index data had statistical significance. These confirmed that surgery combined with professional rehabilitation therapy can improve therapeutic efficacy and improve daily living ability for patients with scar contracture after hand burn, in agreement with the results of this study.

Based on the above conclusions, surgery combined with rehabilitation therapy showed more advantageous therapeutic effect than surgery alone for patients with scar contracture after hand burn.

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