1

Investigative Research on Treatments For Severe Trauma to the Upper Limbs

— Toward Recovery of Function After Work-Related Amputation and Smooth Work Reinstatement —

Field name "Work related trauma such as limb amputation and bone fractures"

The local industry of Tsubame city in Niigata prefecture is the manufacture of western-style cookware. As such there are many medium and small-sized businesses that deal with metalworking, and finger trauma occurs frequently.

After the opening of the Tsubame Rosai Hospital in 1979, the "Work-Related Hand Surgical Center" was established. Many cases of occupation finger trauma were treated, and up to now, there have been 187 cases of successful reconnection of wrists and finger amputation and 141 cases of reconstruction after crushing injury. From among these cases, 82 cases in which more than five years have passed since the injury occurred were considered in our investigation. After obtaining consent from 50 of the 82 cases, we examined the function recovery level and ability to return to work based on the relationship between the Hand Injury Severity Score (HISS) (Fig. 1) at the time of injury and the Tamai evaluation standard (Table 3) at the time of the investigation.

The results showed that the higher the HISS score at the time of injury the more the level of recovery deteriorates after hand surgery [1, 2, 3, 4] (Fig. 2). Moreover, we clarified that the higher the HISS score is, returning to the original work becomes more difficult, and it becomes increasingly likely that the patient must change the type of work or cannot return to work [1, 2, 3, 4] (Fig. 3).

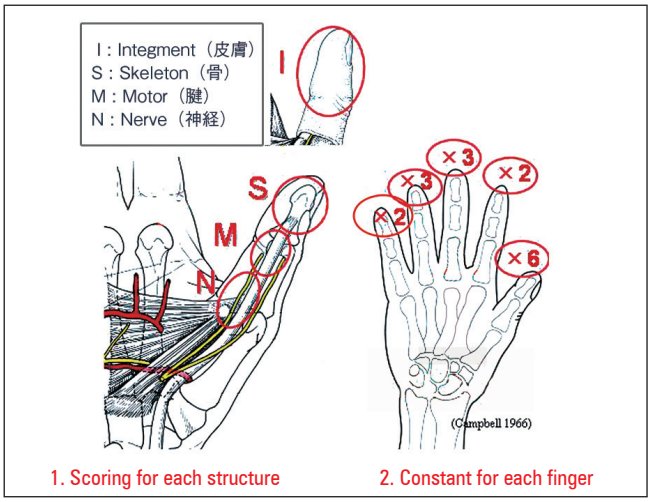

Fig. 1. Method for assessing hand injury severity score (HISS)

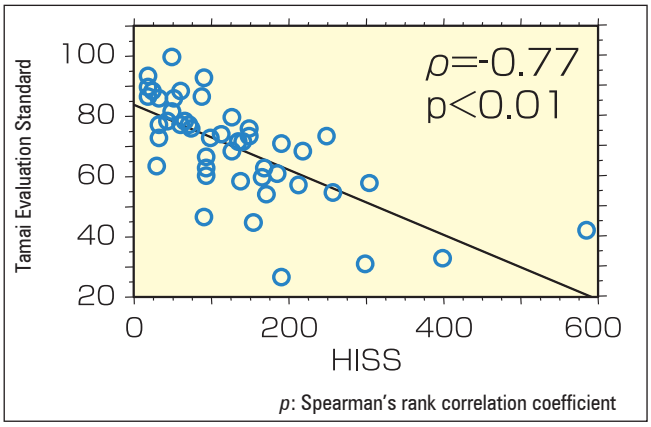

Fig. 2. Correlation between hand injury severity score (HISS) at the time of injury and the Tamai evaluation standard at time of investigation

Table 3. Tamai Evaluation Standard

Tamai Evaluation Standard

- Range of motion (20 pts)
- Daily living activities (20 pts)
- Perception (20 pts)
- Subjective symptoms (10 pts)
- Appearance (10 pts)
- Patient satisfaction level (20 pts)
- Occupation: Return to original work (0 pts)
  Change in occupation (-5 pts)
  Unable to return to work (-10 pts)
- Judgment of results: Excellent 80-100 pts.
  Good 60-79 pts.
  Satisfactory 40-59 pts.
  Not satisfactory 39 or less pts.

Perfect score of 100 pts is the best result
As the degree of injury increases the score decreases

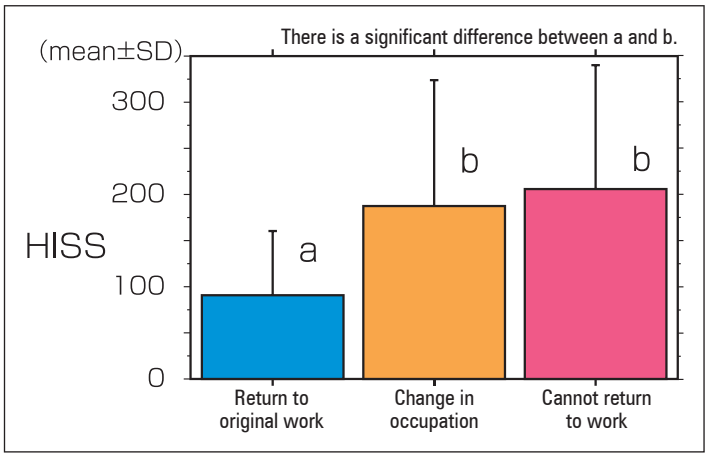

Fig. 3. Hand injury severity score (HISS) at the time of injury and ability to return to work

For amputation or crushing of multiple fingers, in order to plan the improvement in the function of the fingers "transpositional replantation" is carried out in cases where replantation is impossible after thumb amputation. The hallux is engrafted and the thumb is reconstructed by carrying out the "Wrap Around Flap method" (WAF) (Fig. 4).

Accordingly, based on seven cases where "transpositional replantation" was carried out and in nine cases in which we employed the WAF method, we also investigated the hand function after replantation and the ability to return to work. All the cases where "transpositional replantation" was performed were successful. Moreover, we could not discern any significant difference in the degree to which hand functionality returned or the rate for returning to work in the "transpositional replantation" cases compared to the cases where the same finger was replanted [3, 4]. Also for the WAF method, we could not discern any significant difference in functionality such as the range of motion of the thumb in cases where the thumb was replanted [3, 4].

These results show that based on the advances in various treatment methods hand function after hand / finger amputation can be maintained and it is possible to return to the workplace. In the future, in order to increase the number of cases where patients return to work, we believe that the employer should be informed of the estimated time to recover and that it is important that the process of returning to work advance smoothly.

Fig. 4. Wrap Around Flap (WAF) method

References:

1) Matsuzaki H., Narisawa H., Miwa H., and Toishi S.: Predicting functional recovery and return to work after mutilating hand injuries: Usefulness of hand injury severity score. J Hand Surg, 34A:880-885, 2009.
2) Matsuzaki H.: Investigative research on treatments for severe trauma to the upper limbs – Toward smooth work reinstatement of injured workers. Japan Labour Health and Welfare Organization, Clinical Research Center for Occupational Trauma, 2007.
3) Matsuzaki H.: Investigative research on treatments for severe trauma to the upper limbs – Toward smooth work reinstatement of injured workers (Part 2). Japan Labour Health and Welfare Organization, Clinical Research Center for Occupational Trauma, 2008.
4) Matsuzaki H., et al.: Research, development, and dissemination related to reconstruction of work-related injury resulting from crushing or traumatic amputation and expanding the range of movement after hand surgery, Research report. Japan Labour Health and Welfare Organization, Clinical Research Center for Occupational Trauma, 2008.

* Reference 3 can be viewed at **http://www.research12.jp/h13/index.html**, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.
* Reference 4 can be viewed at **http://www.research12.jp/h13/index2.html**, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.