



Plastic Surgery

REHABILITATION OF HAND BURN PATIENTS IMPLEMENTING OCCUPATIONAL THERAPY

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ABSTRACT Patients with burns to their hands require rehabilitation for their early return to work and good quality of life. The aim of this study was to evaluate the effect of early intervention with occupational therapy in patients with burns to their hands. This study included 60 patients with second or third degree hand burns. Patients were included to the study 2 weeks after their burn wounds and grafted areas had healed. They had 3 occupational therapy sessions per week for 8 weeks. These sessions included active and passive range of motion exercises, stretching exercises, active resistive exercises and practicing activities of daily living. Before and after the 8 weeks of occupational therapy using the DASH questionnaire, functionality of the hand was assessed. Before intervention with occupational therapy, the average DASH score was 62.5, and after 8 weeks of occupational therapy it was 30.4 (average difference between the pre-intervention and post-intervention DASH scores is 32.1 points, $p < 0.001$). After 8 weeks of occupational therapy, patients performed daily living activities with relatively very less difficulty, and functionality of the hands was also increased. This study suggests that early intervention with rehabilitative therapies is beneficial and may result in improved hand function.

KEYWORDS : occupational therapy, hand surgery, burns

INTRODUCTION

Burn injuries are one of the most disturbing and major burden to global health. Furthermore, they severely affect a person's quality of life and health.¹ Burn injuries damage skin and underneath connective tissue which cause scarring, and in the case of hand burns, it causes unpleasant alterations to the shape of the patient's hands which lead to psychological effects to the patient.² Burn scars are both a functional and cosmetic burden for the patient. Contracture in the area of the burn is additional risk for patients. Overall, epithelialisation occurs in the natural process of wound healing. Delay in application of skin grafts during the process of epithelialisation changes the shape of the scar and puts the patient at risk for contracture.³ Contracture starts in the joints, followed by the muscles and tendons, and finally it causes a restriction in the range of motion of joints.⁴ Even though each hand is less than 3.0% of the total surface area of the body, the hand burns fall under the "major damage" category.⁵ By losing hand functionality, people lose 54% of their total functionality.^{1,6} Hand burns also have social, biological and psychological consequences affecting the individual's quality of life. A comprehensive treatment plan for hand burn patients is very helpful because even minor burns to the hands have psychosocial and cosmetic consequences with limiting functionality.^{7,8}

The main goal in treatment is early intervention and rehabilitation. Passive motion, focused treatment, and using surgical intervention or skin grafts are part of overall treatment.⁹ This requires an interdisciplinary team approach that includes plastic surgeons, occupational therapists, physical therapists and psychologists. For better treatment outcome, every team member should start as early as the day the patient is admitted to hospital.^{5,10} Rehabilitation of burn patients involves restoring and improving their strength, helping them realize the extent of their burn problem, and encouraging them for activities. The main aim of rehabilitation is restoring functionality along with improving the cosmetic appearance of the burn areas.¹¹ Reaching desired functionality levels requires targeted planning, implementation of the plan and monitoring of the effectiveness of the rehabilitation interventions in restoring hand functionality.^{13,14} The roles of physical therapists and occupational therapists in the burn centre include: prescribing splints and using compressive therapies to maintain proper conditions for healing and prevent deformity, facilitating the patient in adapting to activities of daily living by providing assistive devices, and training patients to use them. Additionally, they develop therapeutic activities to increase flexibility and reduce tension in the skin, maintaining range of motion and muscle strength and increasing overall functionality.¹⁵ The main goal of occupational therapy is to maintain and improve patients' ability to function in their professional life and routine social life. The aim of this study was to evaluate the effectiveness of occupational therapy in improving hand functionality.

Methods

This study was approved by the Ethics Committee of the Gujarat University. Patients were given a detailed explanation of the research objectives along with Informed consent who wished to participate in the study. This study included 60 patients with second or third degree burns to their hands, aged between 18 to 55 years old. These patients were referred to the Civil Hospital Ahmedabad in Gujarat. The study included patients 2 weeks after the day their burn wounds had healed. Patients undergone early tangential excision with STSG or conservative management with dressings were included. Grafted wounds healed in 5 days and dressed superficial wounds healed after 5-10 days. During this healing period, active and passive physiotherapy with or without splint was given in all flexor surface and extensor surfaces of hand wounds. Patients who did not want to take part in the occupational therapy treatment sessions, or missed 4 or more sessions, were excluded from the study. The patients were referred to the Occupational Therapy Department in Civil Hospital Ahmedabad. Patients were given with a demographic questionnaire on both personal and burn information. Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was used to evaluate the functionality of the patient's hands.¹⁷ Each patient was given the DASH score for their hand functionality before starting of 8 weeks of occupational therapy. The DASH questionnaire is contained total 38 items. There are 30 main questions, 4 questions in the "work module" and 4 questions in the "sports/performing arts module". The DASH questionnaire is fulfilled by the patient. Score ranges from 0 to 100, where 0 denotes no disability and 100 denotes full disability. The degree of disability of the upper limb is measured using the 5-point Likert Scale. All patients were given occupational therapy for 8 weeks which include visit of occupational therapist 3 times a week, for 1-1.5 hours per session. All the sessions were given by senior occupational therapists. The exercises included but were not limited to the following:

Reduction of edema
positioning (splint if necessary)
range of motion exercises
passive and active range of motion
active resistive exercises
stretching exercises
practising activities of daily living (using the injured hand)
using a spoon
getting dressed
writing
closing and opening bottles, zippers and buttons

The DASH questionnaire was completed again after the patients had undergone 8 weeks of occupational therapy. We evaluated the effect of occupational therapy on patients with burns to their hands by comparing pre-therapy DASH scores with post-therapy scores. The test results were

assessed using mean and frequency values. A KS Test was applied to compare the pre-therapy and post-therapy DASH Scores. The results were verified using a Wilcoxon test. All the data were analyzed using the SPSS Software, Version 19 (SPSS Inc, Chicago, Ill). The pa value for significance was set as $P < 0.05$. Results A total of 60 patients (36 males, 24 females) with an average age of 37.4 ± 7.6 years old were included in the study. Of these, 90 % had second or third degree burns. For 40% of the patients, hot liquids were involved in causing the burn, 33% were burned with gas and the others were burned by electricity, chemicals or flames. The total burn surface area in patients was 19.26 ± 9.70 . The burn areas are presented in Table I.

Table I - Description Of Burn Areas In Patients

Burn Area	Frequency	Percent
Fingers (flexor and extensor)	8	13.3
Hands (flexor and extensor)	2	3.3
Hands and face	4	6.7
Hands and feet	8	13.3
Hands, trunk and face	4	6.7
Hands and trunk Hands	4	6.7
Right hand	4	6.7
Left hand	10	16.7
Hands, feet and trunk	2	3.3
Trunk and right hand	2	3.3
Neck, right hand and foot	2	3.3
Hands, feet and face	2	3.3
Hands palmar area	2	3.3
Hands, face and neck	4	6.7
Total	60	100

Hand Functionality Results

The average DASH score before occupational therapy was 62.5, and after occupational therapy, score was 30.4 (a difference of 32.1 points). This indicates that before occupational therapy intervention, patients had a difficulty performing activities of daily living (ADLs) but after intervention they had less challenges with ADLs. During the early stages of treatment, patients experienced weakness, pain and moderate to severe limitations. Patients had less pain and less weakness in the latter stage of treatment. The DASH results are presented in Table II.

Table II - DASH results

		DASH Mean (SD)
Pre-Test	62.5	
Post-Test	30.4	
Change		32.1

DISCUSSION

Patients with hand burns face functional deficits like limited range of motion, joint articulation. With early intervention and comprehensive treatment from an occupational therapy team to gain maximum performance, controlling the splinting, exercise, and scar treatment, it is possible to go towards a full recovery and return to activities of daily living. 18 an increase in range of motion, improvement in coordination and restoration of power can be observed in patients' hands by consistent rehabilitation. Patients who guided by interdisciplinary team have a greater chance of regaining full independence, reaching to their daily activities and having a better quality of life. 19

Patients received occupational therapy over the course of 8 weeks in this study. Elevation exercises, reversible massage, ACE bandages and passive mobilization were useful in reducing swelling. Splinting, passive and active mobilization and stretching exercises were useful in treating scars and preventing contracture. 22,23 Functional improvement was observed in the patients' hands, with DASH scores before occupational therapy being 62.5 and going down to 30.4 after therapy. The average change was 32.1 points. There is no difference between patients with burns limited to the hands, or if other areas of the body are involved including the hands. As shown in Table I, only 10 out of the 60 patients in this study had burns strictly limited to the hands. Other studies have shown this data, with a study by Abdelfettah et al. having the DASH score going down from 71.56 to 19.27 after rehabilitation in 18 patients. 24 Two other studies, one by Schneider et al. and another by Omar et al., started intervention in patients since they were hospitalized. Hand functionality was verified by the Jebson and Motor Test. 26 This study suggest that including occupational therapy treatment is effective in the rehabilitation process of hand burn patients. In a study performed by Tang et al. it was shown that even in

moderate to severe burns patients who participated in rehabilitation interventions had improved physical and mental health, with better activities of daily living. 27

CONCLUSION

The goals of occupational therapy include restoring activities of daily living such as carrying items, opening and closing doors, using keys, writing, eating, dressing and personal care. This study has concluded that with occupational therapy intervention, such as utilization of active or passive exercises, stretching exercises, proper positioning with a splint, and training patients for activities of daily living, patients are better able to perform such activities with less difficulty. Performance evaluation with the DASH questionnaire allows therapists to follow up on patient overall improvement and functional ability.

REFERENCES

- World Health Organization: Disease and injury regional mortality estimates for 2008. Health statistics and information systems. Retrieved September 4, 2015, from http://www.who.int/healthinfo/global_burden_disease/estimates_regional-04-20/2008en/index.html.
- Maslauskas K, Rimdeika R, Rapolienė J, Ramanauskas T: Analysis of burned hand function (early versus delayed treatment). *Medicina*, 41(10): 846-51, 2005.
- Schneider JC, Holavanahalli R, Helm P, Goldstein R, Kowalske K: Contractures in burn injury: defining the problem. *J Burn Care Res*, 27(4): 508-14, 2006.
- Byrne M, O'Donnell M, Fitzgerald L, Shelley OP: Early experience with fat grafting as an adjunct for secondary burn reconstruction in the hand: technique, hand function assessment and aesthetic outcomes. *Burns*, 42(2): 356-65, 2016.
- Germann G: Hand reconstruction after burn injury: functional results. *Clin Plast Surg*, 44(4): 833-44, 2017.
- Perera MM, Nanayakkarawansa PP, Katulanda P: Effects of burn on the mobility of upper limb/s, functions of hand/s & activities of daily living. *Int J Physiother Res*, 3(1): 832-38, 2015.
- Hwang YF, Chen-Sea MJ, Chen CL: Factors related to return to work and job modification after a hand burn. *J Burn Res*, 30(4): 661-7, 2009.
- Cowan AC, Stegink-Jansen CW: Rehabilitation of hand burn injuries: current updates. *Injury*, 44(3): 391-6, 2013.
- Salehi SH, Fatemi MJ, Sedghi M, Niazi M: Effects of early versus delayed excision and grafting on the return of the burned hand function. *J Res Med Sci*, 21: 109, 2016.
- Tilley W, McMahon S, Shukalak B: Rehabilitation of the burned upper extremity. *Hand clinics*, 16(2): 303-18, 2000.
- Johnson SP, Chung KC: Outcomes assessment after hand burns. *Hand clinics*, 33(2): 389-97, 2017.
- Falder S, Browne A, Edgar D, Staples E et al.: Core outcomes for adult burn survivors: a clinical overview. *Burns*, 35(5): 618-41, 2009.
- Anzarut A, Chen M, Shankowsky H, Tredget EE: Quality-of-life and outcome predictors following massive burn injury. *Plast Reconstr Surg*, 116(3): 791-7, 2005.
- Lin SY, Chang JK, Chen PC, Mao HF: Hand function measures for burn patients: a literature review. *Burns*, 39(1): 16-23, 2013.
- Omar MT, Hegazy FA, Mokashi SP: Influences of purposeful activity versus rote exercise on improving pain and hand function in pediatric burn. *Burns*, 38(2): 261-8, 2012.
- Amini D: Occupational therapy interventions for work-related injuries and conditions of the forearm, wrist, and hand: a systematic review. *Am J Occup Ther*, 65(1): 29-36, 2011.
- Mousavi SJ, Parmianpour M, Abedi M, Askary-Ashtiani A et al.: Cultural adaptation and validation of the Persian version of the Disabilities of the Arm, Shoulder and Hand (DASH) outcome measure. *Clin Rehabil*, 22(8): 749-57, 2008.
- Tufaro PA, Bondoc SL: Therapist's management of the burned hand. In: Skirven TM et al. (eds.): "Rehabilitation of the hand and upper extremity", 317-341, Mosby Inc, Philadelphia, 2011.
- Williams T, Berenz T: Postburn upper extremity occupational therapy. *Hand clinics*, 33(2): 293-304, 2017.
- Simons MA, Kimble RM: Pediatric Burns. In: JH Stone, M Blouin (eds): *International Encyclopedia of Rehabilitation*, 2012. Available online: <http://cirrie.buffalo.edu/encyclopedia/en/article/119/>
- Skirven TM, Osterman AL, Fedorczyk J, Amadio PC: Rehabilitation of the hand and upper extremity, 2-Volume Set E-Book: Expert Consult. Elsevier Health Sciences, 2011.
- Pan BS, Vu AT, Yakuboff KP: Management of the acutely burned hand. *J Hand Surg*, 40(7): 1477-84, 2015.
- Brown M, Chung KC: Postburn contractures of the hand. *Hand clinics*, 33(2): 317-31, 2017.
- Abdelfettah Y, Atannaz J, Kassimi EH, Lmidmani F et al.: Functional outcome after rehabilitation of the burned hand: 18 cases. *Ann Phys Rehabil Med*, 54: e27, 2011.
- Rrecaj S, Hysenaj H, Martinaj M, Murtezani A et al.: Outcome of physical therapy and splinting in hand burns injury. Our last four years' experience. *Materia Socio-Medica*, 27(6): 380, 2015.
- Schneider JC, Qu HD, Lowry J, Walker J et al.: Efficacy of inpatient burn rehabilitation: a prospective pilot study examining range of motion, hand function and balance. *Burns*, 38(2): 164-71, 2012.
- Tang D, Li-Tsang CW, Au RK, Li KC et al.: Functional outcomes of burn patients with or without rehabilitation in mainland China. *Hong Kong J Occup Ther*, 26: 15-23, 2015.