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Functional outcomes of upper extremity in rural household following burn injury in the course of epilepsy: A case report

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ABSTRACT

The most frequent site of burn injury in rural households are hands, Spilling of liquids like tea, water are the most frequent causes of burn in rural households. Properly planned comprehensive physiotherapy rehabilitation is very essential to obtain full-fledged functional recovery. A single hand holds lower than 3% of the TBSA. After the incident of burn, the patient underwent contracture release surgery in which the distal and middle interphalangeal joint of the right 5th phalanges was amputated. Skin flaps were raised and modelled, and the corners of the proximal interphalangeal joint were nibbled with a bone nibbler. All margins were manipulated in the manner of a fisherman. The split-skin graft was taken from the right thigh and placed over the right wrist, with silk sutures holding it in place followed by a sterile dressing and the patient was shifted towards the ward. Various outcome measures like NPRS, Tampa Kinesiophobia Scale, FIM, Burn Specific Scale, Likert Scale, Burn anxiety Inventory, Burn depression checklist, and Hospital-Acquired Depression Scale were used along with the physiotherapeutic interventions to track the progress. Surgical management was achieved but to bring him back to his pre- pathology life, a comprehensively designed rehabilitation is very beneficial. The outcome obtained was effective medically and correlated with numerous health benefits in overall health-related quality of life. Thus, improving physical functioning and bringing a patient back to his normalcy and resuming her occupation back.

Keywords: Burns, rehabilitation, contracture release, split–skin graft, prehension interventions, occupation, quality of life.

1. INTRODUCTION

According to the latest WHO reports, near-about 180,000 burn deaths occur every year in low to middle income countries. Hands burns are ranked amongst the most devastating injuries occur to mankind. Accidental burns are

common in rural households with more prevalence among females. The dorsal skin is thin and highly mobile, while the palmar skin is sensory-rich and the musculotendinous system is delicately balanced which puts all systems at risk and can affect the life roles of women of any age (Moore et al., 2009). However, a burn can result in multiple chronic crippling deformities leading to life-long professional limitations, thus decreasing the overall quality of life. Post-burn loss of tissue occurs as a result of a cascade of events like protein denaturation caused by burn injuries or UV radiation-induced skin abrasions. Just after their occurrence, the process of wound repair is followed immediately by the excitation of toxic inflammatory mediators, found in the perfused surface. Other factors include oxidants, and proteases, which damage skin and capillary endothelial cells, resulting in tissue necrosis of the area (Singh et al., 2007). To calculate the percentages of burn-in human body 2 methods are used 1) Wallace Rule of nine 2) Lund and Browder's rule. Burns are classified as according to their depth as superficial thickness burn, superficial partial-thickness burn, deep partial thickness burn, full-thicknesses burn (Pramod et al., 2016).

Whitson and Allen outlined certain factors that contribute to post-burn hand deformities, which include prolonged edema around the area, wound or suture infection, poor positioning of extremity, and extended immobilization. The prevalence rate of occurrence of hypertrophic scarring is substantially greater in burns that do not recover within the initial 3 weeks (Son et al., 2021). Pain post-burn injury can be a serious cause of concern which can hamper physiotherapy rehabilitation results. As it lead to the development of fear and anxiety disorders. Patients' health-related quality of life, duration of healing, and functional status are all negatively impacted by pain and the resulting kinesiophobia. Early rehabilitation in the clinic is recommended for the prevention of contracture and hypertrophic scars caused by unusual positions because of pain and kinesiophobia. Individuals affected with hand burns have higher chances of developing impairments in ADLs, occupation work, and fine motor tasks. These are directly related to severity, grade, percentage, and localization of burn (Lester et al., 2013).

2. PATIENT INFORMATION

A 60 year old female with dominance of right side, a tailor by profession reported to physiotherapy out-patient department, with complaints of inability to extend the wrist along-with weakness of right wrist and fingers. On taking thorough history of patient, it was revealed that patient hails from rural household and was apparently alright 3 months back, when suddenly while cooking food at "chullah" started experiencing episodes of seizures and burned her forearm, wrist and fingers. She was immediately rushed to emergency unit where she was she was routinely treated for burn and underwent Split skin graft which was harvested from thigh along-with 18 stitches at the burned area. Patient was advised physiotherapy treatment but due to financial issues she did not continue the session. Significant medical history present as he is a known case of seizures since childhood. Currently, the patient is managed conservatively with antibiotics, analgesics and antiepileptic drugs.

Operative History

Under all Aseptic Precautions, parts over the right upper and lower limb were painted and draped. A release incision was given over dorsal aspect of right palm extending proximally up to 7-8cm above the wrist joint, and laterally 4 cm medially 2 cm. Contracture bands were removed, distal and middle interphalangeal joint of the right 5th phalange was amputated and edges of the proximal interphalangeal joint were nibbled with a bone nibbler, skin flaps were raised and approximated. All margins were manipulated with fishing fashion. A split- Skin graft was taken from the right thigh and placed over the right Wrist and placed in situ using Silk sutures. The ulnar gutter slab was made on the right upper limb followed by a sterile dressing and the patient was shifted to the ward.

3. CLINICAL FINDINGS

Before starting the rehabilitation, written and oral consent was obtained from the patient. On observation, the build of the patient was mesomorph; there was a presence of a scar of approximately 20 cm. The scar was adherent and healthy. Distal and middle interphalangeal joints of the right 5th phalange were amputated. She was wearing a wrist splint. On palpation grade 2 tenderness was present over the incision area. On the NPRS scale pain grade was 6/10 on activity and 2/10 on rest. The pre- rehabilitation range of motion and manual muscle testing are mentioned in Table 1 and Table 2.

Table 1 ROM Assessment On day 1 of physiotherapy treatment

Joint	Joint Movement	Right limb		Left limb	
		Active	Passive	Active	Passive
Elbow Joint	flexion	0-140	0-150	0-150	0-150

	extension	0	0	0	0
Wrist Joint	flexion	0-30	0-35	0-60	0-60
	extension	0-30	0-35	0-60	0-60
	radial deviation	0-5	0-10	0-20	0-20
	ulnar deviation	0-5	0-10	0-20	0-20

Table 2 Manual Muscle Testing On day 1 of physiotherapy treatment

Muscle groups	Right	Left
elbow flexors	4/5	5/5
elbow extensors	4/5	5/5
wrist flexors	3/5	5/5
wrist extensors	3/5	5/5
wrist supinators	3/5	5/5
wrist pronators	3/5	5/5

Timeline of Events

The patient suffered a burn injury on 21.12.2021, on 31.12.21 patient underwent surgery for contracture release over the right wrist joint with a Split skin graft. Date of Discharge from AVBRH on 21.01.22, Patient visited Physiotherapy OPD on 24.02.22, and last day of physiotherapy session 26.03.33.

Therapeutic Intervention

The effects of burn on an individual are multiple and diverse, necessitating extensive and individualized therapy for the victim. The wound was properly examined to identify extent of burn (Image 1), and rehabilitation was planned week-wise with goals to achieve each week followed by progression in intervention and rationale. To keep an approach that incorporates a multidisciplinary team approach and active involvement of caregivers and relatives. Apt education will help the family understand the condition and prognosis of the patient, but will also boost the patient's participation in the program resulting in faster results and a better prognosis.

There is substantial proof that prior rehabilitation has numerous favorable impacts on patients with a burn. During the initial rehabilitation, we will focus on improving the ranges of affected joints, to minimize peripheral Edema, to treat painful joints and facilitating better tolerance, improving muscle strength, power, endurance, psychological counseling, and bringing back patient to her pre-injury level, thus helping her to resume her occupation back. Physiotherapy rehabilitation is described in (Table 3). The home exercise program was properly explained to the patient and was asked to come for regular follow-ups after 20 days.

Table 3 Describing various Physiotherapeutic interventions for Week 2 rehabilitation.

SR NO.	PHYSIOTHERAPY GOALS	THERAPEUTIC INTERVENTION	TREATMENT REGIMEN AND RATIONALE
Week 1 1.	To reduce pain at suture site.	Cryotherapy application	Cryotherapy was applied wrapped in a clean cloth for 04 minutes thrice a day.
2.	To maintain joint integrity and mobility.	Passive, active and active-assisted range of motion exercises (Image 4).	10 reps twice a day.
3.	To decrease pain and muscle spasms.	Joint mobilizations of wrist and fingers (Image 2).	10 reps thrice a day.
4.	To decrease tightness across the burned areas.	Slow sustained stretching (Image 3).	Stretch for 5 min, each followed by a 30 - 45 sec hold.
Week 2: 1.	To accelerate healing and improve tendon extensibility.	Ultrasound Therapy	3 MHz, 0.821W/cm^2 for 4- 6 minutes.
2.	To break adhesions, inhibit	Scar Mobilization	8-10 minutes using coconut oil and

	contracture formation, and loosen scar tissue.		gels.
3.	To prevent the progression of contracture.	Icing, positioning, and ROM exercises.	(10 min stretch) Involves capsular and pericapsular changes.
4.	To increase the strength of muscles of the Upper and lower limb.	Manual Resistive exercises with minimal resistance were begun.	(4 days/week with 8-10 rep)
5.	To enable proper grasping and taking hold.	Prehension and grip activities like holding the key, and pen were taught along with spherical, cylindrical, hook grip was taught.	Each activity was repeated 20 times twice a day.
Week 3: 1.	To educate the patient and family members about his current health status.	Patients and family members should be educated about the importance of designed rehabilitation and exercise regimens.	Education about early ambulation, positioning and resuming ADLs.
2.	Improve breathing patterns and respiratory rate.	Deep and Diaphragmatic breathing exercises.	15 reps× 2 sets thrice a day were taught with a rest interval of 30 sec between each set.
3.	To enhance dynamic skills	Task-oriented training	To gain occupation independence Build strength of muscles and aid in improving cognition.
Week 4: 1.	Improve cognition of the patient	By using a variety of patient-friendly activities rather than challenging activities.	(5-6 sessions of sessions daily) along with the whole protocol of Week 1,2 ,3.

Image 1 Extent of the burn in the patient.

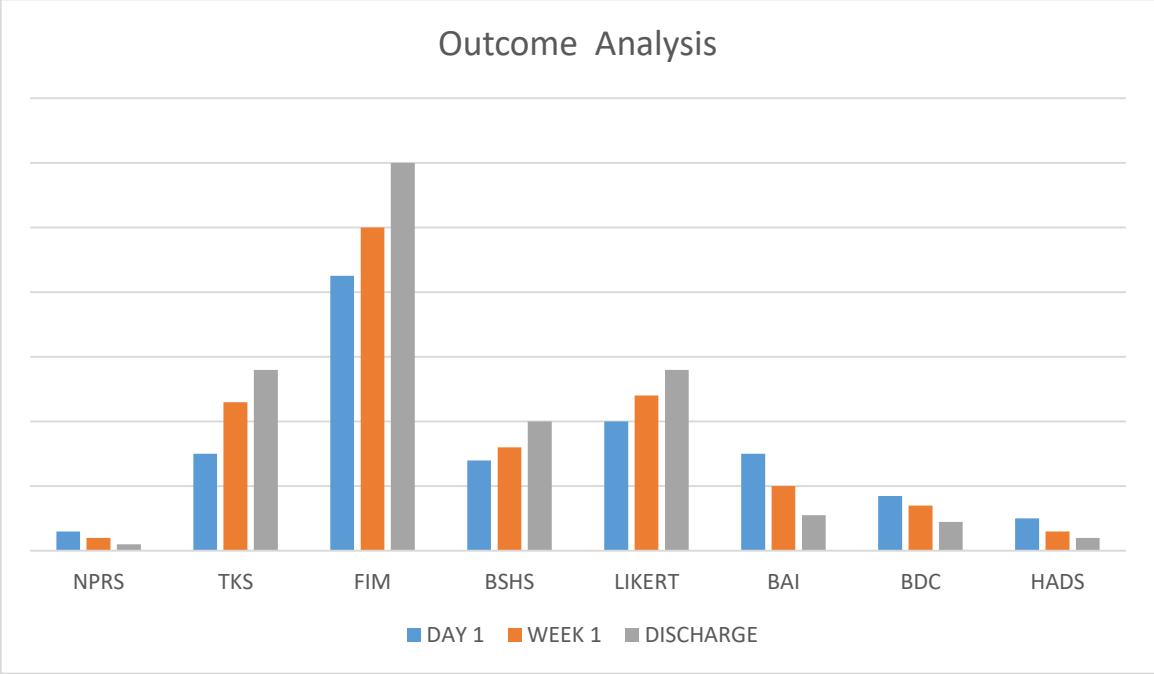
Image 2 Depicting radio-ulnar mobilization

Image 3 Stretching for Wrist Flexors

Image 4 AROM exercises for fingers.

Outcome Measures

Outcome measures like NPRS, Tampa Kinesiophobia Scale, FIM, Burn Specific Scale, Likert Scale, Burn anxiety Inventory, Burn depression checklist, and HADS were used. Scores were taken on day 1, 2 weeks, and on the last day of the session then simultaneously progression was seen (Graph 1). Similarly patient also demonstrated tremendous improvement in ROM, MMT (Table 4 and 5). Patient adherence and tolerability were assessed by building a good rapport with the patient and gaining the patient's confidence along-with with noticing week-wise progression.



Graph 1 Describing Outcome Analysis from Day 1, Week 1 to Day of discharge.

Table 4 ROM progression at day 1 and last day of physiotherapy rehabilitation

Joint	Joint Movement	Right limb (pre-rehab)		Right limb (post-rehab)	
		Active	Passive	Active	Passive
Elbow Joint	flexion	0-140	0-150	0-150	0-150
	extension	0	0	0	0
Wrist Joint	flexion	0-30	0-35	0-50	0-55

	extension	0-30	0-35	0-40	0-40
	radial deviation	0-5	0-10	0-20	0-20
	ulnar deviation	0-5	0-10	0-20	0-20

Table 5 Muscle Strength progression at day 1 and last day of physiotherapy rehabilitation

Muscle groups	Right (pre-rehab)	Right (post-rehab)
elbow flexors	4/5	5/5
elbow extensors	4/5	5/5
wrist flexors	3/5	5/5
wrist extensors	3/5	5/5
wrist supinators	3/5	5/5
wrist pronators	3/5	5/5

4. DISCUSSION

Rehabilitation is a necessary and core component of burn treatment. "Burns Rehabilitation" encapsulates physical, psychological, and interpersonal aspects of patient care, and burn patients frequently face challenges in either one of these areas following an injury. The primary objective of burn rehabilitation is to mitigate the negative impacts of the injury in terms of range of motion, contracture development, and scarring impact. According to Seyyah and Topez, (2021) the early physiotherapy and rehabilitation program used after upper extremity burn injuries were found to have a positive effect on pain, and kinesiophobia. Patients suffering from burn injuries could perhaps seek treatment as soon as possible. Upper extremity burns are a largely unreported epidemic. Burn treatment in the developing world faces significant challenges due to limited healthcare resources, poor infrastructure, and a shortage of trained providers. Survivors face a lifetime of disability with few options for assistance.

Despite these challenges, much burn-related pain and suffering can be avoided or reduced through education, simple interventions, and basic care. Advocacy and improved access to care are both required (Sasor and Chung, 2019). Long-term outpatient care is needed for a burned patient to ensure maximum function and minimal cosmetic defects throughout multiple growth periods. Over the years, scars may interfere with normal function over time which may necessitate additional surgery.

Current research indicates that integrating an informational burn rehab program tailored the needs of burned patients and can improve their quality of life. As a consequence, a well-planned and comprehensive programme is required. Meeting patients' needs and tailoring their concerns can small risks, encourage wellness and health, and enhance quality of life (Elsherbiny et al., 2018).

5. CONCLUSION

Our rehabilitation goal is to facilitate the patient's recovery by avoiding postoperative complications. Various physiotherapeutic approaches were implemented to make patient return to their pre- pathological status. A 4 week- of physiotherapy regime had a positive and beneficial influence on the patient's condition and subsequently allowed him to start his ADLs and resume back his occupational work as she was the only earner in the family.

Authors' contributions

ARS led the assessment and various interventions for the patient, SP suggested changes for manuscript processing, and NB and SS made the necessary corrections for the publication. Overall every author contributed equally.

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Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study.

Abbreviations

TBSA: Total body surface area

WHO: World Health Organization

ADLS: Activities of daily living
NPRS: Numerical Pain Rating Scale
ROM: Range of Motion
MMT: Manual Muscle Testing
AVBRH: Acharya Vinobha Bhave Rural Hospital
FIM: Functional Independence Measure
AROM: Active Range of Motion

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Conflicts of interest
The authors declare that there are no conflicts of interests.

Data and materials availability
All data associated with this study are present in the paper.

REFERENCES AND NOTES

1. Elsherbiny OE, El Fahar ME, Weheida S, Shebl A, Shrief WI. Effect of burn rehabilitation program on improving quality of life (QoL) for hand burns patients: a randomized controlled study. Eur J Plast Surg 2017; 41(4): 451–458. doi: 10.1007/s00238-017-1379-7
2. Lester ME, Hazelton J, Dewey WS, Casey JC, Richard R. Influence of Upper Extremity Positioning on Pain, Paresthesia, and Tolerance: Advancing Current Practice. J Burn Care Res 2013; 34(6): e342–e350. doi: 10.1097/BCR.0b013e3182788f52
3. Moore ML, Dewey WS, Richard RL. Rehabilitation of the Burned Hand. Hand Clin 2009; 25(4): 529–541. doi: 10.1016/j.hcl.2009.06.005
4. Pramod PS, Diwate DA, Nidhi A. Effectiveness of Physiotherapy in burns: A Case study. VIMS J Physiother Case Rep 2016; 1(1):21–24.
5. Sasor SE, Chung, KC. Upper Extremity Burns in the Developing World: A Neglected Epidemic. Hand Clin 2019; 35(4): 457–466. doi: 10.1016/j.hcl.2019.07.010
6. Seyyah M, Topuz S. The Effect of Physiotherapy and Rehabilitation on Pain, Kinesiophobia and Functionality in Upper Extremity Burns. Arch Hand Microsurg 2021; 10:233-240 doi: 10.5455/handmicrosurg.73526.
7. Singh V, Devgan L, Bhat S, Milner SM. The pathogenesis of burn wound conversion. Ann Plast Surg 2007; 59(1): 109–115. doi: 10.1097/01.sap.0000252065.90759.e6
8. Son D. Correction of hand deformities after burns. Arch Hand Microsurg 2022; 27(1):12–22. doi: 10.12790/ahm.21.0131