Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Case Reports / Case Studies
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 14, Number 03, Pages 1178-1182 (2026)
DOI: https://doi.org/10.24843/mifi.000002362

Multimodal physiotherapy rehabilitation for chronic burn injury with hypertrophic scarring: a case report

Yandani[1], Andi Rahmaniar P[2], Masfufah[3]

[1,2]Physiotherapy Professional Study Program, Faculty of Nursing, Universitas Hasanuddin, Makassar, South Sulawesi, Indonesia
[3]Dr. Tadjuddin Chalid General Hospital, Makassar, South Sulawesi, Indonesia

Corresponding author:
Name: Yandani
E mail: yandairwd90@gmail.com
Phone: +62 853 4226 0540

Received 8 August 2026; Revised 17 August 2026; Accepted 18 August 2026; Published 29 September 2026.
©2026 The Authors. Published by the Physiotherapy Study Program, Faculty of Medicine, Udayana University, in collaboration with the Indonesian Physiotherapy Association (Ikatan Fisioterapi Indonesia). This is an open-access article distributed under the terms of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).

Abstract

Background: Chronic burn injury may cause hypertrophic scarring, pain, restricted joint movement, and functional limitations.
Objective: To describe changes during four sessions of multimodal physiotherapy rehabilitation in a patient with chronic burn injury and hypertrophic scarring.
Methods: This descriptive single case report involved a 64-year-old man six months after burn injury. Outcomes included pain using the Numeric Rating Scale, active range of motion using a goniometer, muscle strength using Manual Muscle Testing, functional independence using the Barthel Index, and scar characteristics using the Vancouver Scar Scale. Program comprised ultrasound, scar massage, active range of motion exercise, wrist stretching, strengthening, and proprioceptive neuromuscular facilitation over four weekly sessions. Reporting followed CARE.
Results: Resting pain decreased from 7 to 4, pressure pain from 3 to 1, and movement related pain from 8 to 5. Shoulder abduction increased from 74° to 82°, shoulder adduction from 66° to 70°, elbow flexion from 122° to 137°, wrist extension from 42° to 50°, ulnar deviation from 53° to 58°, wrist flexion from 14° to 18°, and radial deviation from 19° to 22°. Manual Muscle Testing remained 4/5. Vancouver Scar Scale characteristics were unchanged. Barthel Index remained 100.
Conclusion: After four sessions, the patient showed reduced pain and increased active range of motion, while muscle strength, function, and scar characteristics remained unchanged. These observations describe one patient and cannot establish treatment effectiveness or causality.

Keywords
Burns; Cicatrix; Pain; Range of Motion; Physical Therapy Modalities

Introduction

Burn injury can produce persistent physical impairments after wound healing, particularly when the injury affects the upper extremity or crosses joints. Pain, restricted joint movement, weakness, scar related limitations, and difficulty performing activities of daily living may continue after the acute phase and can interfere with participation in rehabilitation. Physiotherapy is therefore an important component of burn rehabilitation, with exercise, mobility training, scar management, and other physical interventions used according to the patient's clinical presentation.[1,2]

Hypertrophic scarring is a recognized consequence of burn injury. Scar characteristics may include changes in vascularity, pigmentation, pliability, and height, and scars involving areas close to joints may contribute to movement restriction.[3] Conservative scar management commonly includes massage, stretching, mobilization, and exercise, although the magnitude and consistency of clinical effects vary across interventions and patient populations.[4,5]

Exercise based rehabilitation is also used to preserve or improve joint mobility and physical function after burn injury. Active and passive range of motion exercises, stretching, strengthening, and progressive exercise are incorporated into rehabilitation programs according to the patient's impairments and tolerance.[6,7] Mechanical stretching and related interventions may be used when scar related restriction is associated with reduced joint mobility.[4]

Therapeutic ultrasound has been investigated as an adjunct in the management of post burn contractures and scars. However, available studies use different treatment parameters and combinations of interventions, and the evidence does not establish a single therapeutic ultrasound dose as independently effective for chronic hypertrophic scar.[8] The ultrasound parameters used in the present case should therefore be regarded as part of the documented clinical protocol rather than as a validated independent treatment dose.

Proprioceptive neuromuscular facilitation may be incorporated into upper extremity rehabilitation to facilitate coordinated movement. General PNF literature describes potential effects on range of motion and muscular function, while burn specific evidence remains limited.[9] Accordingly, PNF in the present case is considered a component of a broader multimodal program rather than an independently evaluated intervention.

The clinical relevance of this case lies in the documentation of several outcome domains during a short rehabilitation period in a patient with chronic burn injury and hypertrophic scarring. The purpose was not to establish efficacy or novelty of a particular intervention combination, but to describe observed changes in pain, active range of motion, muscle strength, functional independence, and scar characteristics within one clinical episode.

Methods

This case report used a descriptive single case design and was reported with reference to the CARE guideline.[10] The intervention description was organized according to the TIDieR framework.[11] The case was managed in the Physiotherapy Installation of RSUP Dr. Tadjuddin Chalid, Makassar, during April and May 2026.

The patient was a 64 year old man with chronic burn injury. The injury occurred after exposure to fire from pertalite. The initial burn involved the neck, right chest, right arm, right thigh, and glans penis. The patient was admitted to the hospital on 15 November 2025. He reported pain and generalized chills at admission and had diabetes mellitus treated with metformin and glimepiride. The author confirmation reported a total body surface area of 20% and described the burn as full thickness, while noting that an earlier record had described part of the injury as deep partial thickness. The final clinical description available to the authors was full thickness burn involving the right upper extremity. Wound closure had occurred, but the exact date was not documented. Skin grafting was not documented in the available record. The physiotherapy target scar was located on the right arm. No diagnosis of contracture was recorded; joint stiffness of the right upper extremity was documented.

At baseline, the physiotherapy problems included pain, restricted active movement of the right shoulder, elbow, and wrist, reduced muscle strength, hypertrophic scar characteristics, and perceived difficulty with activities of daily living. Pain was assessed using the Numeric Rating Scale from 0 to 10 under resting, pressure, and movement conditions. Active range of motion was measured with a standard goniometer. The author reported that measurements followed Norkin and White procedures. The patient was assessed in supine and sitting positions as appropriate, without manual stabilization except that the hand was placed on a table during wrist measurement. Baseline and post intervention measurements were performed by the same physiotherapist under the same reported conditions.

Muscle strength was assessed with Manual Muscle Testing on a 0 to 5 scale for the shoulder, elbow, and wrist. Functional independence was assessed with the Barthel Index. The author subsequently confirmed that the Barthel Index was 100 at baseline; therefore, the earlier value of 95 in the revised manuscript was treated as an inconsistency and was not retained in the final outcome table. The Vancouver Scar Scale was used to describe vascularity, pigmentation, pliability, and height through observation and palpation of the scar. The VSS is widely used in burn scar assessment, although its clinimetric evidence has limitations.[12,13]

The intervention was a multimodal physiotherapy rehabilitation package delivered once weekly for four sessions. The sessions were conducted on 29 April, 6 May, 13 May, and 20 May 2026, with approximately 30 minutes per session and six-day intervals between sessions. The author reported that the same dose was used across the four sessions. The available treatment records were not retained, so session by session fidelity cannot be independently verified.

Therapeutic ultrasound was applied to the scar using 3 MHz frequency, 0.8 to 1.0 W/cm² intensity, continuous mode, and 8 minutes of treatment with slow circular movement over the scar. Because no source directly validates this exact combination as an independently effective dose for chronic hypertrophic scar, the parameters are reported as the actual clinical protocol rather than as an evidence based therapeutic threshold. Scar massage used circular, longitudinal, and transverse techniques for approximately 5 minutes, with three repetitions of each technique during each session.

Active range of motion exercise was performed for the shoulder, elbow, and wrist with eight repetitions for one set for each joint during each session. Wrist flexor and extensor stretching was held for 30 seconds for three repetitions and one set. Strengthening consisted of grip strengthening and active resisted exercise, with eight repetitions for two sets for each exercise. Resistance was adjusted according to patient tolerance. PNF consisted of an upper extremity D1 flexion and extension pattern using combination of isotonic contractions and manual resistance. The flexion component moved the hand toward the contralateral shoulder, followed by D1 extension against manual resistance. Eight repetitions were performed for one set. A brief pause of approximately three seconds was used at the end position before returning against resistance. Moderate manual resistance was applied at a level that allowed completion of the pattern without provoking pain.

Treatment was adjusted according to tolerance. The author reported that modification would have been considered if substantial pain increase, excessive fatigue, discomfort, skin irritation, redness, swelling, inflammation, or reopening of the wound occurred. Treatment would have been stopped for intolerable pain or skin damage. No adverse or unexpected events occurred during the four sessions, and no intervention modification was required.

The intervention was provided by a clinical physiotherapy student during professional physiotherapy clinical practice under the supervision of a licensed clinical physiotherapist. All sessions took place in the Physiotherapy Installation of RSUP Dr. Tadjuddin Chalid, Makassar. The patient also performed home exercise consisting of active range of motion, wrist stretching, and light scar massage. He also frequently performed hand grip exercise and reported playing badminton. These activities were not controlled and therefore represent potential concurrent influences on the observed outcomes.

The available documentation indicates that the patient attended all four sessions and that all planned components were reportedly provided. However, no treatment record was available for independent session by session verification. The author confirmed that no intervention modification occurred. A formal patient perspective interview was not conducted, but routine clinical questioning during the sessions elicited patient reports that right arm pain gradually decreased, arm movement became easier, and daily activities, particularly bathing, became easier.

The case did not have a documented ethical approval certificate or waiver. According to the author's confirmation, institutional policy treated a single case report as not requiring review by a research ethics committee, and no approval number was issued. This statement should be checked against the policy of the institution or target journal before publication. The author also confirmed that consent for publication was obtained orally rather than in written form. Because CARE and most journals require or strongly prefer documented consent for publication, this remains a publication readiness issue rather than a data issue.

Outcome data were summarized descriptively by comparing baseline and post intervention measurements. Absolute changes were calculated where two values were available. No inferential statistical tests, p values, confidence intervals, or effect sizes were calculated because this was a single case without a comparator or repeated baseline.

Results

The clinical timeline is summarized in Table 1. The burn injury led to hospital admission on 15 November 2025. Wound care continued until the wounds were reported as dry in February 2026. Previous physiotherapy had been received before the present clinical episode, but exact dates were not available. The four documented study sessions occurred on 29 April, 6 May, 13 May, and 20 May 2026, with final outcome assessment after the fourth session.

Table 1. Timeline of the patient's burn injury and physiotherapy rehabilitation

Time point	Clinical event
15 November 2025	Hospital admission after burn injury caused by fire from pertalite
November 2025 to February 2026	Wound care and healing period
February 2026	Wounds reported as dry
Before April 2026	Previous physiotherapy reported; exact dates unavailable
29 April 2026	Physiotherapy session 1
6 May 2026	Physiotherapy session 2
13 May 2026	Physiotherapy session 3
20 May 2026	Physiotherapy session 4 and final assessment

The baseline clinical findings are summarized in Table 2. Pain was present at rest, with pressure, and during movement. Manual Muscle Testing was 4/5 in the assessed shoulder, elbow, and wrist regions. The VSS showed purple vascularity with a score of 3, hyperpigmentation with a score of 3, firm pliability with a score of 2, and a scar height of 4 mm with a score of 2. The author confirmed a 20% TBSA burn and a right arm scar as the target of physiotherapy.

Table 2. Clinical outcomes before and after four sessions of multimodal physiotherapy rehabilitation

Outcome	Baseline	Post intervention	Absolute change
Resting pain, NRS	7	4	−3
Pressure pain, NRS	3	1	−2
Movement related pain, NRS	8	5	−3
Right shoulder abduction, AROM	74°	82°	+8°
Right shoulder adduction, AROM	66°	70°	+4°
Right elbow flexion, AROM	122°	137°	+15°
Right wrist extension, AROM	42°	50°	+8°
Right wrist ulnar deviation, AROM	53°	58°	+5°
Right wrist flexion, AROM	14°	18°	+4°
Right wrist radial deviation, AROM	19°	22°	+3°
MMT, shoulder, elbow, wrist	4/5	4/5	0
Barthel Index	100	100	0
VSS vascularity	Purple, score 3	Purple, score 3	No change
VSS pigmentation	Hyperpigmentation, score 3	Hyperpigmentation, score 3	No change
VSS pliability	Firm, score 2	Firm, score 2	No change
VSS height	4 mm, score 2	4 mm, score 2	No change

The most pronounced documented change in active range of motion was a 15° increase in right elbow flexion. Shoulder abduction and adduction also increased, as did wrist extension, flexion, and radial and ulnar deviation. Pain scores decreased across all three assessed conditions. Manual Muscle Testing remained 4/5. The Barthel Index was 100 at both assessments based on the author's subsequent confirmation, so no change in functional independence score was recorded. VSS vascularity, pigmentation, pliability, and height were unchanged.

The intervention components and their clinical targets are summarized in Table 3. Because the package included multiple components and concurrent home exercise, no outcome can be attributed to ultrasound, scar massage, stretching, strengthening, or PNF individually.

Table 3. Description of the multimodal physiotherapy rehabilitation intervention according to the TIDieR framework

TIDieR component	Description
Brief name	Multimodal physiotherapy rehabilitation
Why	To address pain, restricted active range of motion, reduced muscle strength, scar related impairment, and functional concerns
Materials	Therapeutic ultrasound device, standard goniometer, materials for scar massage, grip strengthening equipment, and manual resistance for PNF
Procedure	Ultrasound, scar massage, active range of motion exercise, wrist stretching, strengthening exercise, and upper extremity PNF
Provider	Clinical physiotherapy student under supervision of a licensed clinical physiotherapist
Setting	Physiotherapy Installation, RSUP Dr. Tadjuddin Chalid, Makassar
When and how much	Four sessions, once weekly, approximately 30 minutes per session, on 29 April, 6 May, 13 May, and 20 May 2026
Tailoring	Resistance and exercise intensity were adjusted according to tolerance and avoidance of pain
Modification	No modification occurred; predefined triggers included substantial pain, excessive fatigue, discomfort, skin irritation, inflammation, wound reopening, intolerable pain, or skin damage
Planned fidelity	The patient attended all four sessions and all planned components were reportedly provided
Actual fidelity	Session by session treatment records were unavailable, so exact fidelity could not be independently verified

The author reported that the patient also performed home exercise between sessions, including active range of motion, wrist stretching, and light scar massage. Frequent hand grip exercise and badminton were also reported. These activities were not standardized and may have influenced the observed course.

No adverse or unexpected events were reported during the four sessions. The patient reported subjectively that right arm pain gradually decreased and that arm movement and bathing became easier. These statements were obtained during routine clinical questioning rather than through a formal patient perspective interview.

Discussion

This case documented reductions in pain and increases in several active range of motion measures over four sessions of multimodal physiotherapy rehabilitation, whereas Manual Muscle Testing and the recorded Vancouver Scar Scale characteristics remained unchanged. The Barthel Index remained 100 at baseline and after treatment according to the author's subsequent confirmation. The findings therefore describe short term clinical observations rather than an estimate of treatment effectiveness.

The reduction in resting, pressure, and movement related pain occurred during a period in which the patient received several interventions concurrently. Scar massage and exercise are commonly incorporated into burn rehabilitation, and reviews have reported variable effects across conservative scar management approaches.[4,14] In the present case, however, the multimodal design prevents attribution of the observed pain reduction to any individual component. Natural recovery, previous rehabilitation, changes in activity, and repeated exposure to the assessment procedure may also have contributed.

Several active range of motion measures increased, with the largest absolute change observed in right elbow flexion. The pattern included changes at the shoulder, elbow, and wrist rather than a change confined to a single joint. Exercise and mobility training are established elements of burn rehabilitation and may support maintenance or recovery of movement.[1,2,6,7] The observed changes are compatible with the clinical goals of the rehabilitation program, but compatibility with a treatment goal should not be interpreted as evidence that the program caused the changes.

The increase in active range of motion should also be distinguished from changes in scar tissue properties. The Vancouver Scar Scale findings for vascularity, pigmentation, pliability, and height remained unchanged. Consequently, the present case does not provide objective evidence of improved scar pliability or elasticity. The VSS is useful for clinical description of burn scar characteristics, but published reviews have identified limitations in its reliability, validity, responsiveness, and interpretability.[15,16]

The absence of change in Manual Muscle Testing from 4/5 to 4/5 should be interpreted in the context of the short treatment period and the characteristics of the measurement. Four sessions may not have been sufficient to produce a change detectable by manual muscle testing, particularly when baseline strength was already relatively preserved. The finding therefore indicates that no change was detected with this measure during the observation period rather than demonstrating that neuromuscular adaptation did not occur.

The Barthel Index requires particular caution because the author confirmed a baseline score of 100. The earlier manuscript value of 95 was inconsistent with the subsequent author confirmation and was therefore removed from the final analysis. The unchanged score indicates that no change in the measured Barthel Index occurred during the observation period. The patient's report that bathing became easier is clinically relevant but should not be treated as a change in the Barthel Index because the corresponding item score was not documented separately.

Therapeutic ultrasound was one component of the intervention package. Evidence in post burn contracture rehabilitation has investigated ultrasound as an adjunct, but treatment parameters vary across studies.[8] The present 3 MHz continuous protocol at 0.8 to 1.0 W/cm² for 8 minutes should therefore be understood as the clinical dose used in this case, not as a validated dose for chronic hypertrophic scar. The study does not permit an independent assessment of the contribution of ultrasound.

PNF was similarly delivered as one component of the package. General literature describes PNF as a method that may influence range of motion and muscular function, and a registered study has specifically investigated PNF in upper extremity burns.[9,17] However, the available evidence does not justify attributing the changes in this case to PNF alone. The intervention should therefore be interpreted as part of the multimodal rehabilitation process.

The patient also performed home exercise and other physical activities between sessions, including hand grip exercise and badminton. These concurrent activities are important because they could have influenced pain, movement, or perceived function independently of the supervised sessions. Their frequency and intensity were not standardized, and no treatment record was available to establish exact adherence or dose across individual sessions.

The case has several limitations. First, it represents a single patient without a comparator and without repeated baseline measurements, so natural recovery and spontaneous variation cannot be separated from changes observed during the treatment period. Second, the intervention consisted of multiple components, preventing attribution of an outcome to an individual modality. Third, only four sessions were observed, limiting the ability to assess changes in muscle strength and scar characteristics that may require longer follow up. Fourth, some measurement procedures, including exact goniometric landmarks and stabilization details, were incompletely documented. Although the same assessor performed baseline and post intervention assessments under the same reported conditions, residual measurement variability cannot be excluded. Fifth, home exercise and independent physical activity were not controlled. Finally, the VSS and MMT may have limited sensitivity to small short term changes.

The main clinical value of the case is the simultaneous description of pain, active range of motion, muscle strength, functional independence, and scar characteristics. This multidimensional approach can help clinicians document different aspects of a patient's clinical course without assuming that all outcome domains change at the same rate. Future case series or controlled studies should use standardized prospective treatment records, repeated baseline measurements, clearly defined intervention doses, longer follow up, and systematic documentation of home activity.

Conclusion

After four sessions of multimodal physiotherapy rehabilitation, this patient with chronic burn injury and hypertrophic scarring showed reductions in resting, pressure, and movement related pain and increases in several active range of motion measures. Manual Muscle Testing and the recorded Vancouver Scar Scale characteristics remained unchanged, while the Barthel Index remained at 100 according to the author's final confirmation. These findings describe the observed clinical course of one patient over a short treatment period. They do not establish treatment effectiveness or causal relationships and cannot be generalized to other patients. The case illustrates the value of documenting multiple clinical domains when monitoring rehabilitation progress in chronic burn injury.

In this case, pain and selected active range of motion measures changed during four sessions, whereas Manual Muscle Testing and Vancouver Scar Scale characteristics did not. Multidimensional assessment may help describe short term clinical changes without assuming that all rehabilitation outcomes respond at the same rate.

Author Contribution

Yandani: Conceptualization, Methodology, Investigation, Data Curation, Writing Original Draft, Writing Review and Editing.
Andi Rahmaniar P: Methodology, Supervision, Writing Review and Editing.
Masfufah: Investigation, Clinical Supervision, Writing Review and Editing.

Acknowledgments

The authors would like to thank the institution where the study was conducted, the academic supervisors, and the healthcare professionals who provided guidance, access, and assistance during the data collection process. The authors also thank the patient for participating in this case report and providing the opportunity for the clinical information to be documented.

Conflict of Interest Statement

The authors declare no conflict of interest related to the preparation or publication of this case report.

Funding Sources

This case report received no specific funding from any governmental, private, commercial, or nonprofit organization.

Ethics Statement

According to the author's confirmation, this single case report was considered not to require research ethics committee approval under the institutional policy reported by the author, and no approval number was issued. The author confirmed that consent for publication was obtained orally rather than in writing. Written informed consent for publication was therefore not available. The applicability of the institutional policy and the acceptability of oral publication consent should be verified by the target journal before publication.

References

1. Abonie US, Ackah M, Mudawarima T, Rockson A. Effectiveness of physiotherapist-led exercise interventions for burn rehabilitation: a systematic review and meta-analysis. PLoS One. 2024;19(12):e0316658.
2. Cartotto R, Johnson L, Rood JM, Lorello D, Matherly A, Parry I, et al. Clinical practice guideline: early mobilization and rehabilitation of critically ill burn patients. J Burn Care Res. 2023;44(1):1-15.
3. Mony MP, Harmon KA, Hess R, Dorafshar AH, Shafikhani SH. An updated review of hypertrophic scarring. Cells. 2023;12(5):678.
4. Edger-Lacoursière Z, Zhu M, Jean S, Marois-Pagé E, Nedelec B. Evidence supporting conservative scar management interventions following burn injury: a review article. J Burn Care Res. 2025;46(3):504-514.
5. Greenhalgh DG. Strategies to reduce burn scarring. Burns Open. 2024;8(4):100371.
6. Palackic A, Suman OE, Porter C, Murton AJ, Crandall CG, Rivas E. Rehabilitative exercise training for burn injury. Sports Med. 2021;51(12):2469-2482.
7. Rivas E, Foster J, Crandall CG, Finnerty CC, Suman-Vejas OE. Key exercise concepts in the rehabilitation from severe burns. Phys Med Rehabil Clin N Am. 2023;34(4):811-824.
8. Riaz HM, Ashraf Cheema S. Paraffin wax bath therapy versus therapeutic ultrasound in management of post burn contractures of small joints of hand. Int J Burns Trauma. 2021;11(3):245-250.
9. Winter L, Huang Q, Sertic JVL, Konczak J. The effectiveness of proprioceptive training for improving motor performance and motor dysfunction: a systematic review. Front Rehabil Sci. 2022;3:830166.
10. Gagnier JJ, Kienle G, Altman DG, Moher D, Sox H, Riley D. The CARE guidelines: consensus-based clinical case reporting guideline development. J Med Case Rep. 2013;7:223.
11. Hoffmann TC, Glasziou PP, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. BMJ. 2014;348:g1687.
12. Gutierrez A, Carmichael A, Feldman SR, Chandy RJ. Keloid treatment assessment measures: a literature review. JEADV Clin Pract. 2024;3(2):419-432.
13. Knight D, Parks J. 108 An introductory systematic review of the Vancouver Scar Scale: versions, validations and utilizations. J Burn Care Res. 2025;46(Suppl 1):S86.
14. Santuzzi CH, Gonçalves Liberato FM, Fachini de Oliveira NF, Sgrancio do Nascimento A, Nascimento LR. Massage, laser and shockwave therapy improve pain and scar pruritus after burns: a systematic review. J Physiother. 2024;70(1):8-15.
15. Sullivan T, Smith J, Kermode J, McIver E, Courtemanche DJ. Rating the burn scar. J Burn Care Rehabil. 1990;11(3):256-260.
16. Tyack Z, Simons M, Spinks A, Wasiak J. A systematic review of the quality of burn scar rating scales for clinical and research use. Burns. 2012;38(1):6-18.
17. Higgins M, Greer C. Proprioceptive neuromuscular facilitation for the upper extremity and scapula: review and update on rehabilitation of shoulder pathology. Int J Sports Phys Ther. 2025;20(9):1407-1419.