Received: 17 July 2021 | Revised: 27 September 2021 | Accepted: 1 October 2021

DOI: 10.1111/iwj.13704

ORIGINAL ARTICLE

IWJ WILEY

Limb edema in critically ill patients: Comparing intermittent compression and elevation

Mehdi Ahmadinejad[1] | **Farideh Razban**[2,3] | **Yunes Jahani**[4] | **Faezeh Heravi**[3,2]

[1]Department of Anesthesiology, Shahid Bahonar Hospital, Afzalipour Faculty of Medicine, Kerman University of Medical Sciences, Kerman, Iran

[2]Nursing Research Center, Kerman University of Medical Sciences, Kerman, Iran

[3]Department of Critical Care Nursing, Razi Faculty of Nursing and Midwifery, Kerman University of Medical Sciences, Kerman, Iran

[4]Modeling in Health Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Correspondence
Faezeh Heravi, B.Sc., M.Sc. in Critical Care Nursing, Kerman University of Medical Sciences, Medical University Campus, Haft-Bagh Highway, Kerman, 7616913555, Iran.
Email: Heravi_f@yahoo.com

Abstract

Intensive care unit (ICU) patients are at high risk for limb edema, which caused complications such as pain, joint contracture, limited range of motion and atrophy of the limbs. Thus, this study was conducted to compare ICU patients' upper limb edema between two groups with the intervention of limb elevation and intermittent pneumatic compression (IPC). In this quasi-experimental before and after study, 40 patients were recruited. One upper limb was randomly assigned to the upper limb elevation (ULE) group and the other one was assigned to the IPC group. The circumference of the wrist and the middle of the arm were compared between and within groups. Results showed that in both groups of IPC and ULE and all five sessions (unless the second session of ULE), participants' arm and wrist edema were reduced significantly after the interventions (arm: $P < .01$; wrist: $P < .0001$). The differences between the two groups of ULE and IPC in regards to limb edema reduction were not significant. Although there was no significant difference between IPC and ULE intervention in the removal of edema, ULE seems to be more feasible and practical, which should be assessed in future studies.

KEYWORDS

critical care, elevation, intermittent pneumatic compression, limb edema

Key Messages

- in the study, one upper limb of 40 ICU patients was elevated, and for the other upper limb, an intermittent pneumatic compression device was utilised. Then, upper limb edema was compared between two groups of limbs.
- the critically ill patients' wrists and arms edema, after the intervention of limb elevation and intermittent pneumatic compression reduced significantly.
- limb elevation and intermittent pneumatic compression were equally effective in reducing upper limbs edema.
- no side effects were observed when using limb elevation and intermittent pneumatic compression, which in this respect may be superior to pharmacological interventions.

1 | INTRODUCTION

Critically ill patients in intensive care units (ICUs) are at high risk for edema because of special conditions such as immobility, utilisation of mechanical ventilation, low serum albumin levels, kidney disease and heart failure.[1] Edema refers to the obvious swelling caused by an increase in the interstitial fluid that can be either local or systemic.[2] Edema and expansion of the interstitial compartment usually occur at the expense of the intravascular compartment, leading to intravascular volume depletion and disturbances in tissue perfusion.[3] Edema increases the risk of ulceration. It decreases arterial, venous and lymphatic flow and puts more distance between the capillary bed and the cells thereby, compromise skin and supporting tissues oxygenation and nutrition.[4,5]

The most common sites of edema are the hands and feet.[2] Local complications of limb edema include pain, change in motion and joint contracture, limited range of motion and atrophy of the limbs.[6] These complications subsequently affect the strength, performance and beauty of the limbs and delay recovery in the long term.[7] Also, they increase the length of hospital stay and costs.[8] Edema management is a constant challenge for experts to reduce edema as quickly as possible and with the least complications.

Therapies employed to reduce edema are divided into two categories of pharmacological and non-pharmacological. With pharmacological therapies and diuretics, the symptoms of edema improve, but the tissue perfusion decreases.[9] The most common non-pharmacological methods in this regard are limb elevation, massage, cryotherapy and compression. Limb elevation can help reduce the edema from the end of the limb with the help of gravity. Intermittent limb compression can also cause interstitial fluid to flow into the lymph and reduce edema with reciprocating movements.[10] In a guideline developed by Schwahn-Schreiber et al under the guidance of the German Society of Phlebology in 2018, intermittent pneumatic compression (IPC) is recommended to treat edema. They recommended using IPC in post-traumatic edema, treatment-resistant venous edema, lipedema and edema related to hemiplegia along with sensory impairment. Also, according to this guideline, if it is performed correctly, its complications will be very rare. Elsewhere, it was reported that it can even be utilised prophylactically to prevent edema.[11] After reviewing the research literature, no study was found to compare the effect of the two methods of limb elevation and IPC on the edema of limbs. In a study, Aquil et al compared two methods of thromboembolic deterrent (TED) stockings and IPC and muscle pump activator (MPA) devices on edema, blood flow and urinary excretion of patients after kidney transplantation. The results showed that the MPA method was more effective in reducing edema than IPC and TED.[12] Tsang et al[13] investigated the effect of limb elevation alone or in combination with IPC on the ankles of students who were at the risk of edema because of a situational position. The results showed that both methods reduced patients' foot edema, but the limb elevation method combined with IPC was more effective. According to the review of the research literature, no study is found on comparing the two methods of limb elevation and IPC.

2 | METHODS

2.1 | Design

This was a quasi experimental before and after study, comparing upper limb edema between two groups with interventions of upper limb elevation (ULE) and IPC in critically ill patients.

2.2 | Sample and setting

This study was performed in three trauma ICUs. With a 95% confidence, α error rate of 5% and 80% power, the required sample size was calculated to be 35 upper limbs of critically ill patients in each groups. To increase confidence in the findings, the sample size considered included 40 upper limbs. The exclusion criteria comprised (a) pitting edema less than 2 mm in the upper limbs, (b) consciousness level of more than 8 based on Glasgow Coma Scale (GCS), (c) receiving an intervention to treat edema before the study (such as diuretics), (d) diagnosis of deep vein thrombosis, (e) the presence of an untreated ulcer or infection in the hand, (f) amputation or fracture in the studied hand, (g) the presence of a central venous catheter in the subclavian vein and (h) active or untreated cancer.

2.3 | Randomisation and allocation

In this study, simple randomisation was employed and single sequence of random assignments was generated. Right and left upper limb of eligible participants were randomised using random number allocation in Excel and allocated to one of IPC and ULE groups. The generated random sequence was respectively sealed in encoded opaque envelopes. The statistician generated the random allocation sequence and envelopes. The clinical researcher enrolled participants by the envelope sequence.

2.4 | Instruments and measurements

In this study, tape measure and sloping board were utilised after obtaining the standard licence from Sepehr Laboratory of Tehran (standard code for tape measure: 92S3144 and standard code of sloping surface: 92S0.143). The IPC device utilised in this study was made in Korea (DL2003V3 model).

Pitting edema was graded on a scale of 1+ to 4+ based on depth of indentation (respectively 2, 4, 6, 8 mm) and the length of time take to return to baseline (respectively disappears rapidly, 10-15 seconds, 1-2 minutes, 2-5 minutes).[14]

2.5 | Intervention

First, the edema of both hands of participants was measured based on the pitting edema scale. Also, the wrist and middle arm circumference were measured and recorded with a tape measure (in cm). To ensure the reliability of the measurements, these measurements were performed twice by two researchers (the first and corresponding author).

The upper limb in the ULE group was fixed on a sloping board at a 30° angle for 30 minutes. The upper limb was placed on a sloping board so that the person was on supine position, and the shoulders were bent 30° away from the body and the elbows were bent 70°. The IPC was utilised for the other upper limb for 30 minutes so that the limb was placed in a cuff and consecutively filled with the set pressure and time. The pressure created to reduce edema was between 25 and 60 mmHg.[15] In the present study, the pressure of 50 mmHg was applied.

These two interventions were performed for each patient during 5 sessions in 5 consecutive days, and each session was performed for 30 minutes. In each session, before and after the intervention, the wrist and the middle arm circumference were measured and recorded. The measurement time was 8 to 12 A.M and 4 to 7 P.M. During each session, the capillary filling and the occurrence of pressure ulcers in each limb were examined by the researcher. It should be noted that during 5 sessions, all patients received routine care and daily physiotherapy of the upper limbs.

It was impossible to withheld information about the assigned interventions for each upper limb from the researchers who administer the interventions and measure the outcomes. Nevertheless, the data analyst was kept blinded to the allocation.

2.6 | Ethical considerations

The present study was approved by Kerman University of Medical Sciences (Tracking code: 920159) and was conducted after obtaining the permission of Institutional Review Board (Code of Ethics: IR.KMU.REC.1392.179). In the sampling stage, written consent was obtained from the families of the patients participating in the study. The family members of the potential participants were assured that participation in the research is absolutely voluntary, and the patient will be free to discontinue participation at any time.

2.7 | Data analysis

Data of this study were analysed using descriptive statistics including relative and absolute frequency as well as central and dispersion indexes (mean and standard deviation). The pair *t*-test was employed to compare edema before and after the interventions within each group. Moreover, a linear regression test with a random effect was utilised to compare edema between two groups. Data were analysed using SPSS version 21 software.

3 | RESULTS

As illustrated in Figure 1, 56 patients assessed for eligibility and 13 patients excluded with reasons of pitting edema less than 2 mm (n = 5), GCS > 8 (n = 4), receiving diuretics (n = 3) and upper limb fracture (n = 1). Right and left upper limb of eligible participants (n = 43) were randomly assigned to one of IPC (n = 43) and ULE groups (n = 43). The intervention discontinued in 3 patients because

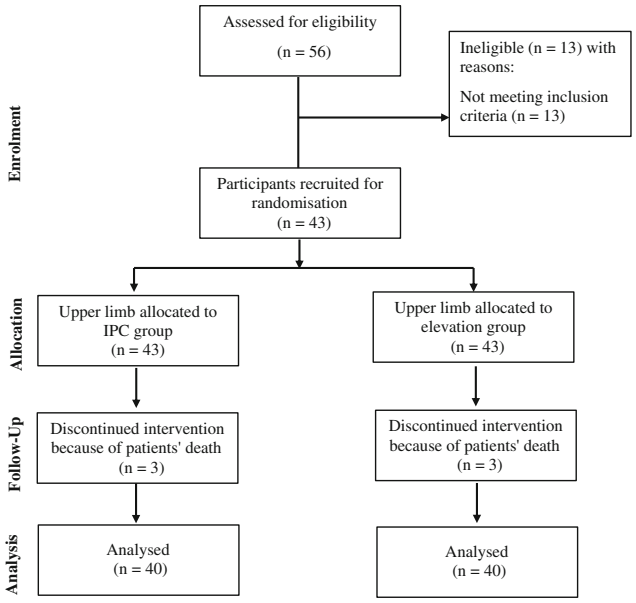

FIGURE 1 Flow diagram showing the study recruitment process

TABLE 1 The participant characteristics

Variable		Minimum	Maximum	Mean ± SD or N (%)
Age		18	85	46.20 ± 21.30
Gender	Male	—	—	32 (80.00%)
	Female	—	—	8 (20.00%)
Related medical service	Neurosurgery	—	—	29 (72.50%)
	General surgery	—	—	5 (12.50%)
	Internal medicine	—	—	6 (15.00%)
Length of ICU stay (day)		3	100	17.15 ± 20.90
Albumin level		2.10	4.80	3.92 ± 0.52
APACHE II score		40	91	62.10 ± 10.22
GCS		3	8	5.00 ± 1.80
Edema grade	1	—	—	11 (27.50%)
	2	—	—	21 (52.50%)
	3	—	—	8 (20.00%)

Abbreviations: APACHE, acute physiology and chronic health evaluation II; GCS, Glasgow Coma Scale; ICU, intensive care unit; N, number; SD, standard deviation.

TABLE 2 Comparing arm edema, before and after interventions within upper limb elevation and IPC groups

		Mean ± SD (cm)		Mean (before-after) (cm)	t	95% CI	*P*-value
First day	IPC	Before	27.62 ± 5.29	0.59 ± 1.09	3.37	0.23, 0.93	.002
		After	27.03 ± 5.34				
	ULE	Before	27.76 ± 5.61	0.46 ± 1.01	2.87	0.13, 0.78	.007
		After	27.30 ± 5.58				
Second day	IPC	Before	27.05 ± 5.17	0.58 ± 0.69	5.55	0.37, 0.79	<.0001
		After	26.47 ± 5.05				
	ULE	Before	27.40 ± 5.51	0.42 ± 1.38	1.92	−0.02, 0.86	.06
		After	26.98 ± 5.52				
Third day	IPC	Before	27.31 ± 5.05	0.80 ± 0.99	5.06	0.48, 1.11	<.0001
		After	26.51 ± 5.08				
	ULE	Before	27.89 ± 5.68	0.52 ± 1.12	2.90	0.15, 0.87	.006
		After	27.37 ± 5.56				
Fourth day	IPC	Before	27.05 ± 5.15	0.59 ± 0.67	5.59	0.38, 0.81	<.0001
		After	26.46 ± 5.13				
	ULE	Before	27.70 ± 5.55	0.64 ± 0.81	5.03	0.38, 0.90	<.0001
		After	27.06 ± 5.50				
Fifth day	IPC	Before	27.51 ± 5.37	0.85 ± 1.16	4.60	0.47, 1.21	<.0001
		After	26.66 ± 5.40				
	ULE	Before	27.72 ± 5.67	0.65 ± 1.04	3.95	0.32, 0.99	<.0001
		After	27.07 ± 5.73				

Abbreviations: CI, confidence interval; cm, centimetre; IPC, intermittent pneumatic compression; ULE, upper limb elevation.

they died before the fifth session. Finally, the measured data of 40 patients (40 right upper limb and 40 left upper limb) that completed five intervention sessions were analysed.

As shown in Table 1, 40 patients with the mean age of 46.2 ± 21.3, 17.15 ± 20.90 days length of ICU stay, APACHE II (*Acute Physiology* And Chronic Health Evaluation II) Score of 62.1 ± 10.22, GCS of 5.00 ± 1.80 and albumin level

TABLE 3 Comparing wrist edema, before and after interventions within limb elevation and intermittent pneumatic compression (IPC) groups

		Mean ± SD (cm)		Mean (before-after) (cm)	t	95% CI	*P*-value
First day	IPC	Before	18.64 ± 1.40	0.42 ± 0.60	4.46	0.23, 0.62	<.0001
		After	18.22 ± 1.49				
	ULE	Before	18.69 ± 1.53	0.42 ± 0.47	5.61	0.27, 0.57	<.0001
		After	18.26 ± 1.42				
Second day	IPC	Before	18.59 ± 1.42	0.40 ± 0.41	6.15	0.27, 0.53	<.0001
		After	18.19 ± 1.43				
	ULE	Before	18.46 ± 1.73	0.44 ± 0.44	6.34	0.30, 0.58	<.0001
		After	18.02 ± 1.60				
Third day	IPC	Before	18.57 ± 1.44	0.55 ± 0.39	8.87	0.43, 0.68	<.0001
		After	18.02 ± 1.44				
	ULE	Before	18.56 ± 1.56	0.61 ± 0.50	7.69	0.45, 0.77	<.0001
		After	17.95 ± 1.51				
Fourth day	IPC	Before	18.47 ± 1.51	0.47 ± 0.59	5.08	0.29, 0.66	<.0001
		After	18.00 ± 1.43				
	ULE	Before	18.30 ± 1.49	0.37 ± 0.46	5.17	0.23, 0.52	<.0001
		After	17.93 ± 1.53				
Fifth day	IPC	Before	18.41 ± 1.38	0.37 ± 0.49	4.77	0.21, 0.53	<.0001
		After	18.04 ± 1.49				
	ULE	Before	18.38 ± 1.55	0.56 ± 0.54	6.43	0.38, 0.73	<.0001
		After	17.82 ± 1.53				

Abbreviations: CI, confidence interval; cm, centimetre; IPC, intermittent pneumatic compression; ULE, upper limb elevation.

TABLE 4 Comparing wrist and arm edema between limb elevation and intermittent pneumatic compression (IPC) groups

	Variable[a]	Mean estimated under the model (cm)	t	95% CI	*P*-value
First day	Arm circumference	−0.29	−1.28	(−0.76-0.16)	.21
	Wrist circumference	0.15	1.37	(−0.07-0.38)	.17
Second day	Arm circumference	−0.16	−0.92	(−0.51-0.19)	.36
	Wrist circumference	−0.003	−0.04	(−0.19-0.18)	.97
Third day	Arm circumference	0.07	0.31	(−0.4-0.55)	.75
	Wrist circumference	0.04	0.47	(−0.15-0.24)	.64
Fourth day	Arm circumference	0.004	0.02	(−0.33-0.34)	.98
	Wrist circumference	−0.03	−0.26	(−0.25-0.19)	.79
Fifth day	Arm circumference	0.02	0.1	(−0.43-0.47)	.92
	Wrist circumference	0.13	1.12	(−0.1-0.36)	.26
Total	Arm circumference	0.16	0.31	(−0.89-1.22)	.75
	Wrist circumference	0.05	1.11	(−0.04-0.14)	.26

Abbreviations: CI, confidence interval; cm, centimetre.
[a]Upper limb elevation is the reference group.

of 3.92 ± 0.52 were recruited in this study. Majority of them were male (80.00%), under the service of neurosurgery (72.50%), and had grade 2 pitting edema (52.50%).

Results showed that in the both groups of IPC and ULE and all five sessions (unless second session of ULE), participants' arm (Table 2) and wrist (Table 3) edema

were reduced significantly after the interventions (arm: $P < .01$; wrist: $P < .0001$). In Tables 2 and 3, "mean" refers to the mean reduction in arm and wrist circumference in the unit of centimetre.

In Table 4, wrist and arm edema are compared between ULE and IPC groups and ULE considered as a reference group. As illustrated in this table, in all of five sessions, the differences in two groups of ULE and IPC in the regards of wrist and arm edema reduction were not significant. According to Table 4, it is estimated that in a total of five sessions, the mean arm circumference in IPC group was 0.16 cm more than that in the elevation group, although this difference was not statistically significant ($P = .75$). Also, it is estimated that totally the mean wrist circumference in IPC group was 0.05 cm more than that in ULE group, but this difference was not statistically significant ($P = .26$).

4 | DISCUSSION

This study aimed to compare limb edema between two groups with ULE and IPC intervention. Results showed that participants' limb edema were reduced significantly after the utilisation of IPC, which was consistent with the results of the study conducted by Hammond et al[16] Hammond et al reported that IPC was effective in reducing arm and trunk edema, reducing pain, improving range of motion and flexibility of the limbs and softening fibrotic tissue in patients with breast cancer.[16] In contrast to the results of the present study, Ridner et al[17] reported that IPC did not reduce the size of the trunk and its function in 13 breast cancer patients studied. However, participants reported that the utilisation of IPC improved their symptoms. Ridner et al attributed the probable cause of improvement in symptoms to the placebo effect of the intervention.[17] The low sample size and lack of control group in the study conducted by Ridner et al can be among the possible causes of differences in their results with those of our study.

Results showed that participants' limb edema were reduced significantly after upper limb elevation. The results of the present study, consistent with the results of Yamazaki et al,[18] showed that elevation of limbs leads to a decrease in edema. They reported that hand elevation of in-patients whose hands had undergone surgery as a result of radial bone fractures led to a decrease in edema.[18] In contrast to the results of the present study, Baker et al[19] reported that the edema of the patients' hand that was elevated after fasciotomy surgery was not significantly different from that of the control group. The reason for the difference in the results of the present study with those of Baker et al can be attributed to differences in the number of elevation sessions. Baker et al performed elevation intervention in one session, while in the present study, it was performed in five sessions.[19]

The results of the present study showed that the differences in two groups of ULE and IPC in the regards of limb edema reduction were not significant. Rucinski et al[20] compared the effects of three methods of elastic stockings along with limb elevation, the IPC along with limb elevation and limb elevation alone in the foot edema of patients with knee sprains. The results of this study showed that the two methods of elastic stockings and IPC led to an increase in the patients' feet edema and the edema decreased in patients who received only the elevation of upper limb.[20] Differences in the results of Rucinski et al with those of the present study could be because of differences in the research populations. In another study, Tsang et al[13] investigated the effect of elevation of limb alone and its combination with IPC on the ankles of 12 students who were at the risk of edema because of situational position. The results showed that both methods reduced edema, but limb elevation showed a greater effect.[13] This difference with the results of the present study can be attributed to the fact that Tsang et al did not perform IPC alone. Also, Tsang et al reported that 5 minutes after the completion of the elevation intervention, its effect on the reduction of edema was eliminated, while the effect of the elevation intervention combined with IPC was more lasting.

5 | LIMITATIONS

The present study has some limitations. The study was based on a sample of critically ill patients that were mostly under the service of neurosurgery (72.50%) and all of them had GCS < 8. Hence, there are limitations in generalising the results from this sample to all ICU patients. Moreover, because of the lack of a control group, the study design does not allow the claim of the effectiveness of the IPC and ULE on limb edema. The results merely indicted that limb elevation and intermittent pneumatic compression were equivalent in the remove of arm and wrist edema in critically ill patients.

6 | CONCLUSION

Results showed that limb edema were reduced significantly after the utilisation of IPC and ULE, and there was no significant difference in this regard between two intervention groups. Because of higher easiness of ULE compared to IPC, using elevation to reduce upper limb

edema seems to be more feasible and practical, which should be assessed in future studies. In addition, because of lack of control group in this study, further studies needed to examine the effectiveness of these interventions in limb edema. It is suggested that the effect of these interventions on lower limb edema be tested in future studies as the result might be different from upper limbs. Despite the introduction of various guidelines and protocols for reducing edema, their effectiveness has not yet been adequately assessed. It is also recommended to conduct further studies on risk factors and predisposing factors of edema in patients admitted to the ICU.

CONFLICT OF INTEREST

The authors declare no conflicts of interest

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author.

REFERENCES

1. Webb A, Angus D, Finfer S, Gattinoni L. *Oxford Textbook of Critical Care*. New York: Oxford University Press; 2020.
2. Brown D, Edwards H, Seaton L, Buckley T. *Lewis's Medical-Surgical Nursing: Assessment and Management of Clinical Problems*. Amsterdam: Elsevier Health Sciences; 2017.
3. Schrier RW. *Manual of Nephrology: Diagnosis and Therapy*. Philadelphia: Wolters Kluwer Health; 2015.
4. Ninbanphot S, Narawong P, Theeranut A, Sawanyawisuth K, Limpawattana P. Development and validation of CAVE score in predicting presence of pressure ulcer in intensive care patients. *Heliyon*. 2020;6(8):e04612.
5. Fortner P. *Burn Care Update, An Issue of Perioperative Nursing Clinics*. Vol 7, 7. Amsterdam: Elsevier Health Sciences; 2012: 11-13.
6. Hinkle JL, Cheever KH. *Brunner & Suddarth's textbook of medical-surgical nursing*. Philadelphia: Wolters Kluwer; 2018.
7. Ochalek K, Pacyga K, Curyło M, Frydrych-Szymonik A, Szygula Z. Risk factors related to lower limb edema, compression, and physical activity during pregnancy: a retrospective study. *Lymphat Res Biol*. 2017;15(2):5-171.
8. Miller LK, Jerosch-Herold C, Shepstone L. Effectiveness of edema management techniques for subacute hand edema: a systematic review. *J Hand Ther*. 2017;30(4):14.
9. Tessari M, Tisato V, Rimondi E, Zamboni P, Malagoni AM. Effects of intermittent pneumatic compression treatment on clinical outcomes and biochemical markers in patients at low mobility with lower limb edema. *J Vasc Surg Venous Lymphat Disord*. 2018;6(4):10-510.
10. Ratchford E, Evans N. Approach to lower extremity edema. *Curr Treat Options Cardiovasc Med*. 2017;19(3):1–9.
11. Schwahn-Schreiber C, Breu F, Rabe E, et al. S1 guideline on intermittent pneumatic compression (IPC). *Hautarzt*. 2018; 69(8):11.
12. Aquil S, Alharbi B, Navaratnam R, Sharma H, Luke P, Sener A. Use of a muscle pump activator leads to improved lower limb Edema, lower limb blood flow, and urine output compared with standard TED stockings and compression devices following kidney transplant: a randomized controlled trial. *Transplant Proc*. 2019;51(6):6.
13. Tsang KK, Hertel J, Denegar CR. Volume decreases after elevation and intermittent compression of postacute ankle sprains are negated by gravity-dependent positioning. *J Athl Train*. 2003;38(4):4.
14. Petersen SW. *Advanced Health Assessment and Diagnostic Reasoning*. Burlington, Massachusetts: Jones & Bartlett Learning; 2016.
15. Villeco JP. Edema: a silent but important factor. *J Hand ther*. 2012;25(2):153–162.
16. Hammond T, Mayrovitz H. Programmable intermittent pneumatic compression as a component of therapy for breast cancer treatment-related truncal and arm lymphedema. *Home Health Care Manag Pract*. 2010;22:5-402.
17. Ridner S, Murphy B, Deng J, Kidd N, Galford E, Dietrich M. Advanced pneumatic therapy in self-care of chronic lymphedema of the trunk. *Lymphat Res Biol*. 2010;8:6-215.
18. Yamazaki H, Hayashi M, Miyaoka S, et al. Venous perfusion assist system has no additional effect compared to simple elevation on post-operative edema in patients with distal radial fracture treated with volar locking plate fixation: a randomized controlled trial. *J Orthop Sci*. 2019;24(3):5-446.
19. Baker R, Field J, Gozzard C, Wyatt M, Robertson Y. Does postoperative hand elevation reduce swelling? A randomized study. *J Hand Surg*. 2010;35:3.
20. Rucinkski THD, Prentice W, Shields E, Cote-Murray D. The effects of intermittent compression on edema in postacute ankle sprains. *J Orthop Sports Phys Ther*. 1991;14(2):4.

How to cite this article: Ahmadinejad M, Razban F, Jahani Y, Heravi F. Limb edema in critically ill patients: Comparing intermittent compression and elevation. *Int Wound J*. 2022; 19(5):1085-1091. doi:10.1111/iwj.13704