



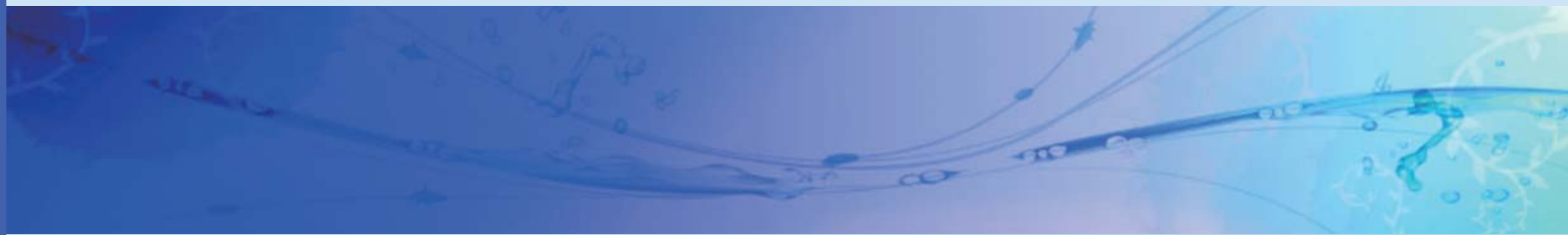
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リンパ浮腫管理の研究と実践

LYMPHOEDEMA RESEARCH AND PRACTICE



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研 究

健康女性におけるセラミックボールを用いた足温機器の下腿静脈還流促進効果と安全性の検証

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要 旨

セラミックボールを用いた足温機器は、湯を使用せず簡単に足を温めることができるため、下腿の静脈性浮腫ケアの1つとして期待できる。しかし、下腿の静脈還流効果や安全性は評価されていない。本研究の目的は、健康女性における足温機器の下腿静脈還流促進の効果と安全性を検証することである。

研究デザインは、事前事後テストデザインで、対象者は20歳以上から65歳未満の健康女性24名とした。介入は、足部を足温機器の中にいれて15分間安静を保つこととし、対照は、介入前に足温機器のない状態で15分間安静を保つこととした。評価項目は、大伏在静脈の血管径、足首の周囲径、足底部の皮膚温度とした。

介入前の血管径は中央値0.8 mm（四分位範囲0.6–1.3）、介入後は0.9 mm（0.7–1.3）であり、介入後に有意に増加した（ $p=0.001$ ）。介入前の周囲径は中央値22.75 cm（22.10–23.80）、介入後は22.70 cm（22.13–23.28）で、有意な差は認められなかった（ $p=0.081$ ）。足底部の皮膚温度の最大値は、30.3–39.8℃であり、介入前の足底部の皮膚温度から平均 $3.8\pm1.3^{\circ}\text{C}$ 上昇した。低温熱傷の有害事象は発生しなかった。

以上より、セラミックボールを用いた足温機器は、健康な成人女性において、静脈還流を促進する効果があることが明らかとなった。また、低温熱傷を引き起こすことなく、安全に使用できる。

キーワード：足温機器、静脈性浮腫、下腿、静脈還流、健康成人

はじめに

高齢者は、下腿に慢性的な静脈性浮腫が生じやすい状態にある。先行研究では、長期療養施設に入所する高齢者の約66%に身体のいずれかに浮腫が生じており、その中でも下腿に浮腫が最も多く出現していたとされている¹⁾²⁾。高齢者の浮腫の原因で最も多いのは、静脈性浮腫である。静脈の弁不全による静脈逆流、深部静脈血栓症などの静脈閉塞による静脈還流不全、不動状態などの

筋ポンプ機能不全が起こると静脈高血圧が起こり³⁾、慢性静脈不全をきたし、下腿に浮腫が生じる。筋力低下に伴い、日中の座位時間が長くなると、重力の影響により、体内の水分が下腿や足背部に移動し、下腿の中でも特に下腿や足背部に浮腫が多く現れる⁴⁾。

高齢者の下腿浮腫は、感染症や創傷のリスクを高め、身体的、社会的、心理的 Well-being に影響を与えるため⁵⁾、積極的にケアをするべきである。先行研究では、介護老人福祉施設に入所している高齢者に対して、足浴

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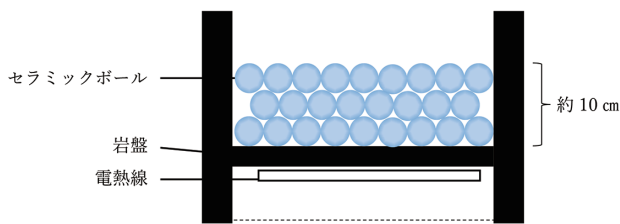


図1 足温機器の構造

大きさは、幅 470×奥行 470×高さ 315 mm である。

岩盤は、変成岩でできており、セラミックボールは、大きさが直径 8 mm で、原材料比率はシリカ 70%、アルミナ 20% である。

が浮腫軽減に効果があったとしており⁶⁾⁷⁾、高齢者への浮腫ケアとして期待できる。足浴は、足部を温めることにより末梢血管が拡張し、静脈還流が促進するため、細胞間隙に貯留した水分を回収する能力が上がることにより静脈性浮腫の軽減に効果があると考えられる。しかし、足浴は湯を使用するため、「湯こぼれ」や「湯温管理」「準備、後始末が大変」といった湯を使用することによる問題点が指摘されており⁸⁾⁹⁾、ケアをする上で取り入れにくい現状がある。

我々は、足浴にかわる新しい機器として、セラミックボールによる遠赤外線の温熱効果を利用した足温機器に着目した。セラミックボールを用いた足温機器は、大量のセラミックボールの中に足を入れることにより、実際に湯に足をつけているような感覚を得ることができる。湯を準備する手間がなく、さらに湯温の管理をする必要がないことから簡便であるため、医療、介護現場において看護者の負担を増やさずにケアを実践できる。先行研究では、遠赤外線を用いた足温機器にて、皮膚血流量は統計学的に有意ではないが、加温後に上昇したと報告されており¹⁰⁾、静脈性浮腫に対して効果が期待できる。しかし、先行研究で用いた足温機器は、ドーム型の形状で、その中にある電熱線が温まることにより足を温める仕組みであるため、皮膚に直接熱が伝わるセラミックボールを使用した足温機器とは静脈還流促進効果が異なる可能性がある。そのため、セラミックボールを使用した足温機器による静脈還流促進効果を検証する必要がある。

また、セラミックボールを用いた足温機器の安全性の評価はされていない。セラミックボールを用いた足温機器に用いられている電熱線は 60～80℃に設定されており、足部に低温熱傷を起こす危険性が考えられる。

そのため、本研究では、低温熱傷のリスクを考慮し、下腿に知覚障害がなく研究者に対して熱さを訴えられる健康な成人女性を対象とした予備的な調査として位置づ

け、研究目的は、健康成人女性における足温機器の下腿の静脈還流促進効果を検証すること、安全性を検証することとした。

研究方法

1. 研究デザインと対象者

研究デザインは、事前事後テストデザインで、対象者は、1つの職場で対象者を募った。ポスターの掲示および機縁法にて、包含基準に合う対象者をリクルートした。対象者の包含基準は、20歳以上から65歳未満の女性とした。対象者を女性とした理由は、女性は女性ホルモンの影響により下腿浮腫を発生しやすいため¹¹⁾、男性より静脈還流促進効果を検証しやすいと考えたためである。除外基準は、1) 下肢の知覚障害のあるもの、2) 研究者とコミュニケーションがとれないもの、3) 下肢に創傷のあるものとした。調査期間は2020年3月から10月までだった。

2. 足温機器

足温機器（お・も・て・な・し・あしゆ[®]、株式会社ユメロン黒川）の構造を図1に示す。大きさは、幅 470×奥行 470×高さ 315 mm である。温熱機器は、電熱線で岩盤を加温することにより、遠赤外線を放出するセラミックボールが温まり、足部を温める構造になっている。岩盤は、遠赤外線放射率が高く、かつ蓄熱性が高い変成岩でできている。セラミックボールは、大きさが直径 8 mm で、原材料比率はシリカ 70%、アルミナ 20% である。周囲には銀イオンを吹き付け抗菌処理が施されている。セラミックボールは温熱機器内に深さ約 10 cm になるまで敷き詰められている。実験中は、電熱線の温度は 60℃に固定して行った。

3. 介入方法（図2）

介入は、座位にて足部を足温機器の中にいれて15分間安静を保つこととし、対照は、介入前に座位にて足温機器のない状態で15分間安静を保つこととした。対象者には、実験前日のアルコール摂取、実験2時間前のカフェインを含む飲み物の摂取、喫煙、過度な運動を禁止した。また、日内変動によるむくみが発症しやすい、午後2時以降に実験を実施して実験条件を統一した¹²⁾。実験当日は、研究者が用意した身体を圧迫しない形状の寝衣、半ズボン、靴下、足用のビニール袋を装着した。靴下と足用のビニール袋は、感染予防対策として足部を覆う目的で使用した。介入時、足部は内果と外果を通る線上までセラミックボールの中に入れ、岩盤に直接足部が当たらないようにした。足の動きによる影響を最小限にするため、実験中は足関節と膝関節は90度の屈曲に保

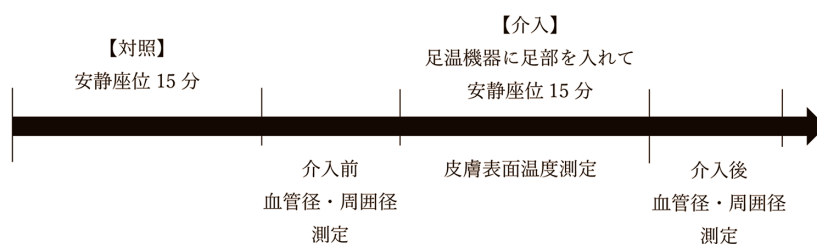


図2 実験のプロトコルと実験中の様子

ち、足を可能な限り動かさないよう指示した。

4. 評価項目

1) 対象者の基本属性

対象の属性として、年齢、Body Mass Index（以下BMI）、内服薬を調査した。また、浮腫の自覚症状の有無について質問した。

2) 静脈還流の評価

静脈還流の評価として、介入前後の右下腿の大伏在静脈の血管径を測定した。大伏在静脈は下肢の皮静脈であり、大伏在静脈の血管径の変化は、健康な女性における静脈還流促進の効果を評価する際に用いられている¹³⁾。大伏在静脈の血管径の測定は、座位にて大腿部内側に超音波診断装置（SonoSite iViz、富士フイルム株式会社）を短軸方向にあて、大伏在静脈の血管径を測定した。介入前後で同様の部位を測定するために、介入前に超音波診断装置のプロープを置いた位置の端にシールでマーキングを行った。プロープは、リニア型で周波数帯域が6-13 MHzのものを使用した。超音波測定は、超音波測定の専門家からレクチャーを受け、十分にトレーニングを積んだ2名の研究者で実施し、介入前後の測定は同一の研究者が実施した。研究者2名の大伏在静脈の血管径の級内相関係数ICC（1, 3）は、0.974（測定者TU）、

0.985（測定者YM）だった。

また、サブアウトカムとして、足首の周囲径を測定した。足首の周囲径は、静脈還流の促進により細胞外液が回収され足首の周囲径が減少する可能性があるため評価項目とした。足首の周囲径は、幅0.5 cmの布製のメジャーを用いて、座位で測定した。測定部位は、内果と外果を通る位置で行った。周囲径測定は、浮腫の専門家からレクチャーを受け、十分トレーニングを積んだ4名の研究者で実施し、介入前後の測定は同一の研究者が実施した。研究者4名の周囲径の級内相関係数ICC（1, 3）は、1.000（測定者TU）、0.999（測定者YM）、0.999（測定者0.999（測定者CK）、0.999（測定者YS）だった。

3) 足部皮膚の安全性の評価

安全性の評価として、介入中15分間の足底部の皮膚温度を測定した。皮膚温用の温度計（LT-8A、グラム株式会社）のプロープを左足の種子骨上の皮膚に貼付し、皮膚表面温度の経時的変化を1分毎に測定した。対象者には、足部に熱さを感じた場合にはすぐに報告するように説明した。また、介入後の皮膚の肉眼的観察を行い、熱傷による皮膚トラブル発生の有無を評価した。

表 1 対象者の基本属性

年齢	20 代	3 名	12.5%
	30 代	6 名	25.0%
	40 代	3 名	12.5%
	50 代	9 名	37.5%
	60 代	3 名	12.5%
BMI	18.5 未満	3 名	12.5%
	25.0 未満	16 名	66.7%
	25.0 以上	5 名	20.8%
内服薬	小腸コレステロールトランスポーター阻害剤/ HMG-CoA 還元酵素阻害剤配合剤	4 名	16.7%
	抗ヒスタミン薬	1 名	4.1%
	骨粗鬆症治療薬	1 名	4.1%
	鬱病・躁状態治療剤	1 名	4.1%
	卵胞ホルモン製剤	1 名	4.1%
	なし	16 名	66.7%
浮腫の自覚症状	あり	3 名	12.5%
	なし	21 名	87.5%

表 2 血管径の変化

血管径		p 値
介入前 中央値（四分位範囲）mm	介入後 中央値（四分位範囲）mm	
0.8 (0.6–1.3)	0.9 (0.7–1.3)	0.001

5. 分析方法

大伏在静脈の血管径は介入により増加した場合を、足首周囲径は介入により減少した場合を、静脈還流促進効果があったとみなした。血管径、周囲径は、介入前後の中央値を Wilcoxon 符号付順位和検定を用いて比較した。統計ソフトは、SPSSv27 (IBM) を用いた。安全性の評価は、介入中の足底部の皮膚温度の経時的変化および介入後の皮膚の肉眼的観察を行い、低温熱傷の危険性を評価した。

6. 倫理的配慮

本研究は公立小松大学研究倫理審査委員会の承認を得て実施した (医倫 1908)。対象者には、研究の参加、途中での辞退は自由であること、有害事象が生じたときの対処、個人情報保護について文書および口頭にて説明を行い、同意が得られた対象者のみに介入を実施した。

結 果

1. 実験環境

実験中の室温は平均 $24.2 \pm 1.6^\circ\text{C}$ 、湿度は $50.6 \pm 9.4\%$ であった。

2. 基本属性 (表 1)

インフォームドコンセントを実施し、同意の得られた対象者は 24 名であり、全対象者が分析対象者であった。年齢は、50 代が最も多く 9 名 (37.5%) であった。BMI は、18.5 以上 25.0 未満の対象者が 16 名 (66.7%) だった。浮腫を引き起こす薬剤を使用している対象者はいなかった。また、3 名 (12.5%) の対象者に浮腫の自覚症状があった。

3. 血管径の変化 (表 2)

介入前の血管径は中央値 0.8 mm (四分位範囲 0.6–1.3) であり、介入後の血管径は中央値 0.9 mm (四分位範囲 0.7–1.3) であり、介入前と比較して介入後で

表3 周囲径の変化

周囲径		p 値
介入前 中央値（四分位範囲）cm	介入後 中央値（四分位範囲）cm	
22.75（22.10–23.80）	22.70（22.13–23.28）	0.081

表4 足底部の皮膚温度

皮膚温度最大値（℃）	皮膚温度上昇 平均±標準偏差（℃）
30.3–39.8	3.8±1.3

は、血管径が有意に増加していた（ $p=0.001$ ）。

4. 周囲径の変化（表3）

介入前の周囲径は中央値 22.75 cm（四分位範囲 22.10–23.80）、介入後の周囲径は中央値 22.70 cm（四分位範囲 22.13–23.28）であり、介入前と比較して介入後では、統計学的に有意な差は見られなかった（ $p=0.081$ ）。

5. 足底部の皮膚温度（表4）

足底部の皮膚温度は、全ての対象者が徐々に上昇し、15 分後に最大値を示した。足底部の皮膚温度の最大値は、30.3–39.8℃であり、介入前の足底部の皮膚温度から平均 3.8±1.3℃上昇した。介入後の足部に発赤や水疱は見られず、対象者の中に足部の熱さを訴えるものはいなかった。

考 察

この研究は、セラミックボールを用いた足温機器が健康成人女性の血管を拡張させ、静脈還流を促進することを示した最初の研究である。大伏在静脈の血管径は足温機器により足部を温めることにより増加し、静脈還流が促進したことを示した。先行研究では、遠赤外線を用いた足温機器による皮膚血流量への効果を評価し、加温 15 分後の皮膚血流量が上昇したとしている¹⁰⁾。本研究結果も大伏在静脈の血管径の増加が認められ、血流が上昇したと言えるため、先行研究を支持する結果となった。

セラミックボールを用いた足温機器は、足浴と同様に浮腫軽減に効果がある可能性が示唆された。先行研究では、お湯を用いた足浴にて、浮腫が軽減したとされている⁶⁾⁷⁾。そのメカニズムは、加温により血管拡張反射が生じ、皮膚末梢血管が拡張するため、静脈還流が促進し浮腫が軽減したと考えられる。本研究でも、大伏在静脈の血管径が増加したことから、静脈還流が促進したと評

価できる。足首の周囲径は統計学的に有意な差は認められなかったが、少なくとも増加はしておらず、静脈還流が促進し浮腫が軽減するという足浴が浮腫を軽減するメカニズムと矛盾しなかった。以上のことから、お湯を用いた足浴と同様に浮腫軽減効果がある可能性がある。本研究で足首の周囲径で有意に減少する結果が得られなかった理由は、対象者は健康な成人女性であり、慢性浮腫の対象者ではなかったためであると考ええる。今後、高齢者に発生している静脈性浮腫に対し、足温機器による加温を行い、下腿の浮腫軽減効果を検証していく予定である。足温機器と足浴による違いは足部の経時的な温度上昇がある。足温機器では、足底部の皮膚温度は徐々に上昇するのにに対し、足浴では加温直後に急激に上昇し、その後急激に低下することが報告されている¹⁰⁾。皮膚温度の上昇の違いが静脈還流に影響し、浮腫軽減効果が異なる可能性があり、今後足浴と比較した浮腫軽減効果を検証する必要がある。

セラミックボールを用いた足温機器は、低温熱傷を起こさず、安全に実施できることが本研究で明らかとなった。先行研究では、皮膚周囲の温度が 44℃ 以上となった場合、低温熱傷の危険性があるとされている¹⁴⁾。本研究の足温機器は、15 分間の加温で、最も高い皮膚温度の対象者で、39.8℃であった。また足部に発赤や水疱ができた例はなく、熱さの訴えもなかったことから、低温熱傷を生じることなく安全に実施できることが明らかとなった。しかし、下腿浮腫を有する高齢者は、皮膚知覚の低下や皮膚の脆弱化により低温熱傷の危険性は高い。今後、下腿浮腫を有する高齢者での安全性の検証が必要である。

研究の限界は、2 点ある。1 点目は 20 歳以上から 65 歳未満の女性を対象としたことである。静脈性浮腫が発生しやすい 65 歳以上の高齢者を対象に研究を実施した場合に、同様に静脈還流促進効果が得られるかは不明である。また、男性に女性と同様の静脈還流効果が得られるかは不明である。2 点目は研究デザインが 1 群の事前事後テストデザインである点である。今後は、下腿浮腫を有する高齢者へのランダム化比較試験を行っていく必要がある。

結 論

セラミックボールを用いた足温機器は、健康な成人女性において、静脈還流を促進する効果があることが明らかとなった。また、この足温機器は、低温熱傷を引き起こすことなく、安全に使用できることが明らかとなった。

利益相反

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Safety and efficacy of a foot warmer using ceramic balls to promote leg venous return in healthy women.

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ABSTRACT

A foot warmer using ceramic balls can easily be used to treat leg venous edema without the need for hot water. However, whether such foot warmers are safe for promoting leg venous return remains unknown. Therefore this study used a pre-post-test design to evaluate the safety and efficacy of a foot warmer for promoting leg venous return in healthy women. The study participants were 24 healthy women aged 20–65 years. The intervention involved the women placing their feet in a foot warmer and resting for 15 minutes, while the control involved resting for 15 minutes before intervention without using a foot warmer. The outcome measures were the diameter of the great saphenous vein, ankle circumference, and skin temperature in the planta pedis.

The median vein diameter was significantly increased after the intervention using a foot warmer (0.9 [0.7–1.3] mm vs 0.8 [0.6–1.3] mm; $p=0.001$). The median ankle circumference was 22.75 (22.10–23.80) cm before the intervention using a foot warmer and was 22.70 (22.13–23.28) cm after the intervention, a difference that was not significant ($p=0.081$). The maximum skin temperature in the planta pedis after the intervention was 30.3–39.8 °C after the intervention using a foot warmer, which was $3.8 \pm 1.38^{\circ}\text{C}$ higher than before intervention. No adverse events occurred.

These findings suggest that the foot warmers using ceramic balls promote venous return in health women, and they can be used safely without causing low temperature burns.

KEY WORDS : foot warmers, venous edema, legs, venous return, healthy adults

Research

Experience of patients with lymphoedema after breast cancer surgery: a meta-synthesis

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ABSTRACT

Objective: This study aimed to synthesize qualitative research evidence on breast cancer survivors' experiences with lymphoedema after surgery.

Methods: A systematic review of qualitative studies was conducted using a meta-aggregation approach. Data were collected from PubMed, CINAHL (EBSCO host), APA PsycInfo (EBSCOhost), Web of Science, and Ichushi Web (Japan Medical Abstracts Society).

Results: Three core categories were identified from 234 findings and 12 categories across eight studies: Needs and social support, Change and challenge in daily life, Response and adaptation for future life.

Conclusion: Patient-centred care and social support related to lymphoedema after breast cancer surgery were considered to strengthen the explanation for the prevention of lymphoedema after breast cancer surgery, help regulate emotions associated with the development of lymphoedema, carefully explain the effects of lymphoedema on daily life according to patients and their families after breast cancer surgery and provide a study session on lymphoedema and a place for patients to learn.

KEY WORDS : breast cancer, lymphoedema, experience, meta-synthesis, systematic review

Introduction

According to global cancer statistics, the number of new cancer cases in women in 2020 was 9.2 million, and breast cancer accounted for 24.5% (2.3 million) of new cancer cases in women¹⁾. In Asia, the prevalence of breast cancer in Japan is 140.8 per 100,000 and 90,000²⁾.

Since the incidence of breast cancer in China is 166.44 per 100,000, the incidence can be estimated to be approximately 2.3 million³⁾. However, breast cancer morbidity does not immediately result in death. The advancement in cancer medicine has led to the development of various therapeutic regimens. These therapeutic interventions are used in the early detection

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and cure of breast cancer, including treating recurrent diseases. Moreover, the number of breast cancer survivors living with the disease is increasing⁴⁾.

For patients with breast cancer to live like themselves for a long time after treatment, they are alleviating the treatment complications is an essential aspect of care. Lymphoedema is one of the most painful complications associated with breast cancer treatment and the disease itself. Park reported that 24.9% of 450 patients with breast cancer developed lymphoedema^{5,6)}. As a result, many researchers have begun to pay attention to the quality of life of patients with breast cancer.

Lymphoedema is a common complication of breast cancer treatment, primarily owing to the effects of surgery and radiation therapy, and can develop after surgery. Breast cancer-related lymphoedema impairs the normal anatomy of the axillary region during surgery or radiation therapy. Therefore, it is caused by the inhibition of the circulation of the lymphatic pathways in the upper limbs and circulation of the lymphatic flow in the axilla and upper limbs^{7,8)}. Lymphoedema causes distress, such as swelling, numbness, malaise, infections, dysfunction, decreased self-esteem, and anxiety in the limbs, and severely affects the quality of life⁹⁾. In addition, breast cancer-related lymphoedema can cause physical and psychological distress to patients and psychological reactions, such as depression¹⁰⁾. It has been suggested that patients with breast cancer-related lymphoedema have lower mental and physical health scores than those without lymphoedema¹¹⁾. Therefore, to support patients with breast cancer living with the physical and psychological pain associated with lymphoedema, it is necessary to clarify the experience associated with lymphoedema in patients after breast cancer surgery.

Therefore, to comprehensively clarify the experience associated with lymphoedema after breast cancer surgery, we conducted this study using the meta-integration method, which integrates qualitative research results from existing research results. The results of this study will provide primary findings for research on the early prevention of lymphoedema and, in turn, suggestions for improving the quality of life of patients with breast cancer-related lymphoedema.

Purpose

This study integrates and reveals qualitative findings on the experience of patients who developed lymphoedema after breast cancer surgery.

Methods

1. Search strategy

The databases PubMed, CINAHL (EBSCOhost), APA PsycInfo (EBSCOhost), Web of Science, and Ichushi Web (Japan Medical Abstracts Society) were searched. We searched for qualitative 2010–2020 research literature published in Japanese and English on patients' experiences with postoperative breast cancer-related lymphoedema.

Moreover, we searched papers in English using MeSH terms ([Breast neoplasms] AND [Lymphedema] AND [perception]) combined with the title/abstract keywords ([Breast cancer OR breast tumor] AND [Lymphoedema OR Lymphedema] AND [experience OR narrative OR feeling OR effect OR stress OR coping]).

2. Inclusion and exclusion criteria

Female patients with breast cancer were included in the study. The exclusion criteria were as follows: (1) review literature in which the research design is quantitative research and secondary research, (2) literature that is not postoperative for breast cancer or does not present the patient's experience with lymphoedema, and (3) documents for which the full text cannot be obtained (excluding documents for which the full text cannot be obtained due to time constraints).

3. Literature screening

Two researchers independently selected, screened, and extracted the data, strictly following the selection and exclusion criteria. 1) Excel was used to remove duplicate documents. 2) The titles and abstracts of the literature were screened according to the selection criteria, excluding those that did not match. If there was a difference in the extraction results, discussions were held until an agreement was reached. 3) The full text of the selected studies was read and reconfirmed. The main contents of data extraction were the author, year of publication, research method, outline of research subjects, research content or phenomena, and main

results related to the purpose of this research from the literature.

4. Quality appraisal

Two researchers independently evaluated the quality of the literature according to the criteria of the 'Critical Appraisal Skills Programme (CASP)'¹²⁾. If there was a difference in the evaluation results, discussions were held until an agreement was reached. The evaluation tool 'CASP' consists of 10 items, and two researchers judged 'Yes', 'Cannot tell', or 'No' for each item.

5. Data synthesis

For meta-integration in this study, the integrative/ aggregative synthesis method was used¹³⁾. Four steps were involved in this procedure: (1) The results were repeatedly read carefully, and all parts representing the experience with lymphoedema after breast cancer surgery were extracted. (2) To faithfully express the extracted sentence as the content of the patient's experience in this paper, the code was expressed in a concise sentence based on the description of the subject's narrative regarding the experience. (3) Similar code contents were collected; they were expressed in one sentence, the meaning contents were expressed, and they were divided into subcategories. (4) The subcategories were aggregated based on the similarity of meanings until they were no longer organized. Moreover, those were classified into categories. (5) Categories were further grouped into the core category.

In the abovementioned analysis process, multiple researchers with qualitative research experience repeatedly examined and attempted to ensure its validity and reliability.

Results

1. Literature search

Figure 1 shows the results of the selection process. After a search of the databases, 1,815 related documents were collected. Two researchers independently read the title and abstract contents of 1,289 documents, in which duplicate documents (n=526) were deleted using Excel, and 12 documents that matched the purpose of the study were extracted. After careful reading of the entire text, eight documents were finally selected.

Eight articles were selected for meta-integration: six in English and two in Japanese. There were 329 female patients who underwent breast cancer surgery in the eight articles, of which 260 had lymphoedema. The participants' countries of residence were the United States, Africa, Singapore, and Japan (Table 1).

2. Quality appraisal

The results of the quality appraisal were reported in the included studies. All eight studies were assessed by two researchers who conducted independent evaluations of the seven selected articles based on the CASP. Regarding the CASP question, 'Was the research design appropriate to address the aims of the research?' a literature evaluation result was 'cannot tell'. Regarding the question, 'Has the relationship between the researcher and participants been adequately considered?' the evaluation results of six documents were 'cannot tell'. In all eight documents, none of the questions was evaluated as 'no'. Eight documents were selected for meta-integration: six in English and two in Japanese.

3. Review Core Categories

Table 2 presents an overview of the categories and subcategories. Twelve categories were identified from the 234 findings, and 35 subcategories were obtained across eight studies. Finally, three core categories were developed from the categories.

1) Core Category 1: Needs and social support

Lymphoedema imposed various restrictions on the daily life of patients. Therefore, lymphoedema patients have many needs and experiences in seeking support from those around them. This core category consists of four categories, which are described in detail below:

a. Category 1: Lack of social support and understanding

Due to the lack of social support for lymphoedema, patients consciously did not have a complete understanding. They were tired of repeatedly explaining to people around me about using elastic bandages and lymphoedema. They were also tired of repeatedly explaining to people around me about using elastic bandages and lymphoedema. In addition, they found it difficult to continue working because their colleagues at work did not help them, and they did not ask for help either.

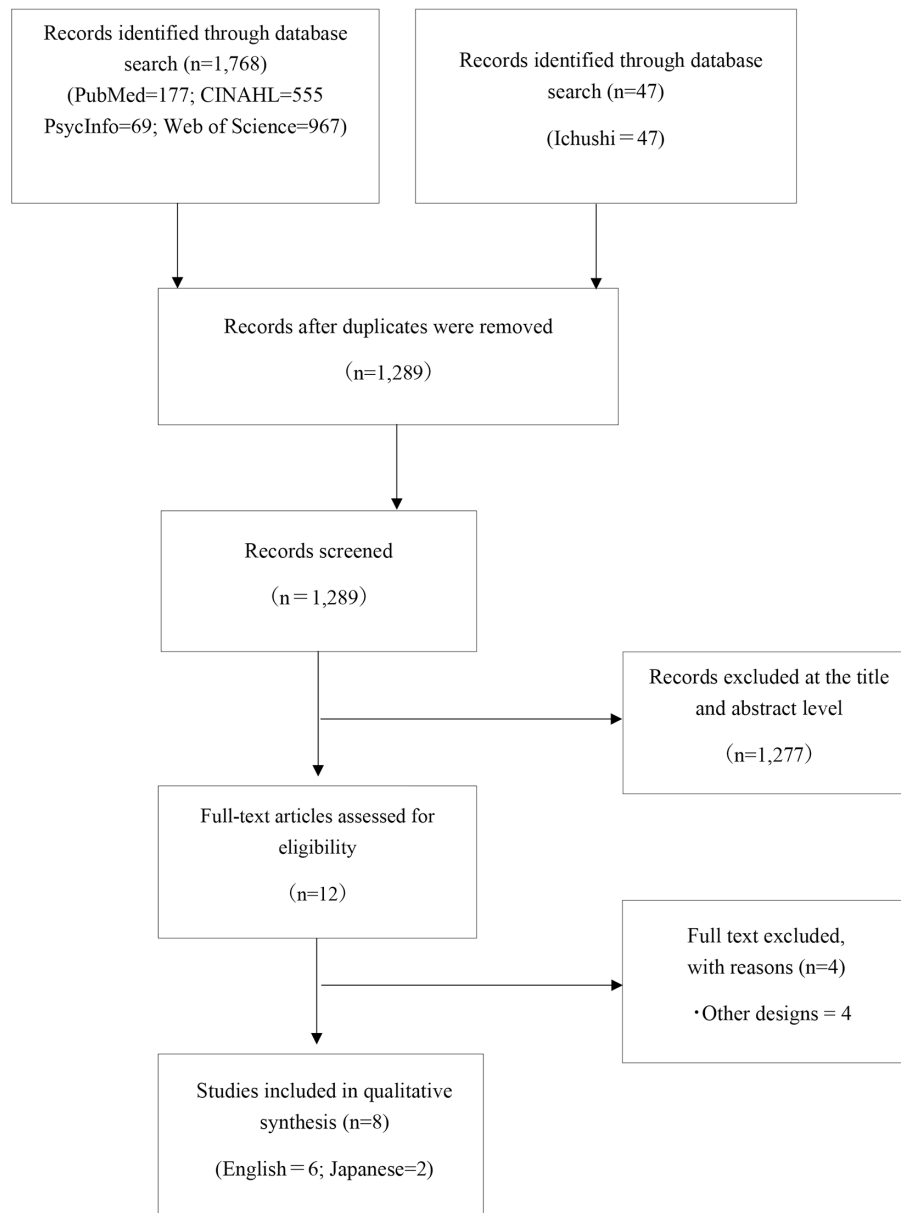


Figure 1 Flowchart of article selection

This included ‘*People do not understand it! I try to explain it to them; then I lock myself up in my room because I am too tired of explaining.*’ (#4)

b. Category 2: Support from society and family

The patient also felt that they were receiving support from society and their family in the wake of the lymphoedema. Their family helped them with drainage and bandages on the affected upper limbs, wearing bras, and doing household chores and encouraged them to see a doctor. They felt that their colleagues helped them at work and got support from church associates.

This included ‘*They (colleagues) would allow me that time off but paid. They (colleagues) allowed me the*

flexibility to work just to make it up.’ (#2)

c. Category 3: Lack of support from medical professionals

The patient felt that healthcare professionals and those around them did not understand them with lymphoedema. They wanted medical staff to provide knowledge about lymphoedema before the breast cancer surgery, not only provide a pamphlet after the surgery.

This included ‘*They [doctors/nurses] really didn’t talk to me about lymphedema. I think if someone, like a nurse, would have given me information, it would have helped.*’ (#5)

Table 1 Characteristics of the included studies

No.	Author/years	Aim of study	Treatment stage	Data collection method	State	Sample size	Study design
#1	Nakamura et al. (2010)	To clarify the difficulty in daily life and coping with patients with lymphoedema	More than three months after breast cancer surgery	Interviews	Japan	Six patients Lymphoedema stage I, two; stage II, four	Conceptual model of psychosocial adjustment to post-breast cancer lymphoedema
#2	Wanchai et al. (2012)	To compare lymphoedema experiences and lymphoedema management between breast cancer survivors from the two countries	Diagnosis with lymphoedema after surgery	Semi-structured interviews	America Africa	29 patients USA:18 South Africa:11	Qualitative research design
#3	Radina et al. (2015)	To compare the sexual experiences of women with and without breast cancer-related lymphoedema	Surgical treatment, including lumpectomy or mastectomy, sentinel lymph node biopsy, and axillary lymph node dissection	mixed-method approach	America	243 patients 176 survivors with BCRL and 84 survivors without BCRL	Cross-sectional design
#4	Maree et al. (2016)	To explore how people living with breast cancer-related lymphoedema experience this complication	Two months to five years after breast cancer surgery	Semi-structured interviews	South Africa	Eight patients lymphoedema stage II, six; stage II-III, 1; stage III, two	Unstructured interview
#5	Acebedo et al. (2016)	To explore the lived experience of Hispanic breast cancer survivors living with BCRL	Hispanic women who had developed breast cancer-related lymphoedema	Semi-structured interviews	America	13 patients living with BCRL for at least one year	Interpretive phenomenology
#6	Teraguchi et al. (2017)	To clarify the characteristics of daily life that affect weight loss in patients with lymphoedema after lactation	Diagnosed as upper limb lymphoedema after surgery	Interviews	Japan	Five patients diagnosed with lymphoedema within five years	Qualitative research
#7	Chan et al. (2018)	To explore the experience of Singaporean women living and coping with lymphoedema	More than three months after breast cancer surgery	Face-to-face interviews	Singapore	12 patients The onset of lymphoedema lasted more than one month	Phenomenological approach
#8	Sun et al. (2020)	To explore the ways that lymphoedema affects their work experience	More than 12 months after surgery and radiation treatment for breast cancer	Semi-structured interview	America	13 patients diagnosed with lymphoedema	Multiple-case study

Table 2 Categories and subcategories of meta-synthesis

Core Category	Category	Subcategory (# Literature number)
Needs and social support	Lack of social support and understanding	Tired of repeatedly explaining to people around me about using elastic bandages and lymphoedema. (#4, 7, 8)
		I find it difficult to continue working because my colleagues at work do not help me and I do not ask for help either. (#8)
	Support from society and family	My family helps me with drainage and bandages on the affected upper limbs, wearing bras, and doing household chores and encourages me to see a doctor. (#1, 3, 4, 5, 8)
		I feel that my colleagues at work help me take paid vacations and work, and my friends say that I have physical difficulty with lymphoedema. (#5, 8)
		Support from church associates. (#2)
	Lack of support from medical professionals	It is a pity that the medical staff did not provide knowledge about lymphoedema before breast cancer surgery and only provided a pamphlet after the surgery. (#1, 2, 5, 7)
		Healthcare professionals and those around them feel that they do not understand patients with lymphoedema. (#4, 5, 8)
		I feel that therapists and lymphoedema treatments are over standardized and breast cancer therapists do not care for lymphoedema. (#2, 4, 8)
	Seeking support for lymphoedema	Ask your healthcare practitioner about self-care for lymphoedema, including the use of sleeves and elastic bandages, and lifestyle precautions. (#1)
		I would like to find a lymph drainage facility or attend a seminar on lymphoedema. (#1, 7)
Change and challenge in daily life	Financial difficulties	The cost of combined treatment and equipment for lymphoedema is high, and subsidies do not help. (#1, 4, 7, 8)
	Negative emotions	The affected upper limb cannot be hidden without wearing long sleeves, and it feels like a person is looking down on it. (#1, 2, 4, 7, 8)
		Lymphoedema leads to financial and physical problems and is a heavy mental burden. (#1, 2, 5, 7, 8)
		I have a desire to live with cancer in the future, but I am worried about whether I can live my daily life alone while dealing with lymphoedema for the rest of my life. (#1, 2, 5, 8)
		I feel frustrated because my life is out of control because of lymphoedema. (#5, 7, 8)
		Lymphoedema worsens, and there is always the concern that oedema will worsen. (#1, 2, 4, 5, 6, 8)
	Limitations of daily life	It has an impact on daily life, including various household chores, such as picking up children and not being able to carry heavy objects on the affected upper limb. (#1, 2, 4, 5, 6, 7, 7, 8)
		I choose larger clothes to hide the affected upper limbs, but they do not fit my style. (#1, 2, 4, 6)
		Lymphoedema can interrupt or change work activities, service, or mood. (#1, 4, 5, 7, 8)
	Pain and distress due to upper limb lymphoedema	The affected upper limbs are lazy, numb, painful, itchy, swollen, and difficult to lift due to pain. There are night-time convulsions, insomnia, and a lack of rest during busy times. (#1, 4, 5, 6, 7, 8)
		Wearing bandages and sleeves can be time-consuming and annoying. (#2, 3, 8, 7)
		Bandages and sleeves are hot and uncomfortable, making it difficult to dress and keep clean. (#4, 7)
		Wearing sleeves and physical discomfort interfere with sexual life and have a severe adverse effect on sexual desire. (#3, 5)

Core Category	Category	Subcategory (# Literature number)
Response and adaptation for future life	Emotional adjustment	I do not think lymphoedema will worsen anymore because I am careful about my health and take great care of the affected upper limb. (#1)
		Since lymphoedema affects the upper limb, it does not become impossible to walk, and it seems that we can continue to associate the body with the affected upper limb. (#1, 5, 7, 8)
	Positive emotions	Even if I have lymphoedema, I want to keep the fun and energy of spending time with my family and live positively. (#1, 2, 5, 8)
		Even with lymphoedema, work is a part of my life, and I find it fun. (#8)
		I am grateful that I do not have oedema of the lower limbs, I have a sexual life, and I am able to do everything I need to do. (#3, 4, 7)
	Pain relief	Do not forcibly use the upper limbs for housework or adjust the posture during sleep and cover the affected upper limbs so as not to hurt them. (#1, 2, 8)
		Activities to promote lymphatic flow, such as arm extension, shoulder rotation, walking, and self-drainage. (#1, 2, 6)
		Be careful not to damage the affected side. (#6)
		Use compression devices to prevent exacerbation of lymphoedema. (#2)
		The effects of lymphoedema are always present but be aware of what you can do and rest when necessary. (#2, 7, 8)
		To reduce anxiety, avoid topics related to lymphoedema and do not include too much information. (#1)
	Expectations for faith	Hope for faith and believe that God can help you. (#1, 2, 4, 5, 8)

d. Category 4: Seeking support for lymphoedema

The patient would like to find a lymph drainage facility or attend a seminar on lymphoedema. They wanted to ask healthcare practitioners about self-care for lymphoedema, including the use of sleeves, elastic bandages, and lifestyle precautions.

This included *'It's the various methods of sharing, sharing the possibility of developing another condition; the symptom is one thing, also assuring that...there is help, you know'*. (#7)

2) Core Category 2: Change and challenge in daily life

Lymphoedema damages patients' limbs, bringing them financial difficulties and challenges in daily life, and patients have negative emotions. This core category consists of four categories, which are described in detail below:

a. Category 1: Financial difficulties

The patient felt that the cost of combined treatment and equipment for lymphoedema was high, and subsidies did not help.

This included *'That cellulitis experience really laid me up and financially it's very expensive'*. (#8)

b. Category 2: Negative emotions

The patient felt that Lymphoedema leads to financial and physical problems and a heavy mental burden.

This included *'I didn't really want to go out with all that much wrapping Well, just because it looked silly'*. (#8)

c. Category 3: Limitations of daily life

The patient chose more oversized clothes to hide the affected upper limbs, but they did not fit their style. The patient felt Lymphoedema impacted daily life, including various household chores.

This included *'I've had to tighten it up three or four times at work. Now, when I put it on, it is snug, but when it starts getting loose, I tighten it up more and more'*. (#5)

d. Category 4: Pain and distress due to upper limb lymphoedema

The patient wearing bandages and sleeves felt time-consuming and annoying. Due to pain, they felt night-time convulsions, insomnia, and lack of rest during busy times.

This included *'[it's] kind of hard to feel or look sexy while wearing compression bandages or a night sleeve'*. (#3)

3) Core Category 3: Response and adaptation for future life

Living with lymphedema, the patient had learned to adjust their emotions and pain relief. Faith made their emotions cheerful and full of hope for the future. This core category consists of four categories, which are described in detail below:

a. Category 1: Emotional adjustment

The patient did not think lymphoedema would worsen anymore. They were careful about their health and took great care of the affected upper limb.

This included *'Damage done already, la, so I get along with it, la'*. (#7)

b. Category 2: Positive emotions

The patient felt that even living with lymphoedema and work has a part of their life. They wanted to keep the fun and energy of spending time with their family and live positively.

This included *'I try to have a positive attitude. Mind is over matter'*. (#2)

c. Category 3: Pain relief

The patient tried to reduce anxiety, avoid topics related to lymphoedema and did not include too much information. They also did activities to promote lymphatic flow and used compression devices to prevent exacerbation of lymphoedema.

This included *'I got something to put my arm on, so that I could hit the keyboard a little bit. So I got some tables and elevated my arm, so I could reach the keyboard a little better'*. (#8)

d. Category 4: Expectations for faith

The patient was expected to develop lymphoedema. They had hope and faith, and believed that God could help them.

This included *'I believe that the Lord has healed me from cancer. The lymphoedema is now a secondary thing, but I believe He can heal it also'*. (#4)

Discussion

The contents of the patients' experiences with lymphoedema were described. Considering the characteristics of the patient's experience, we consider the viewpoint necessary to improve patients' quality of life with lymphoedema after breast cancer surgery.

This paper describes an ideal method of patient-cen-

tred care and social support related to lymphoedema after breast cancer treatment.

1. Need and social support

From the results of the meta-synthesis in this study, the experiences of the categories 'Lack of social support and understanding', 'Lack of support from medical professionals', 'Support from society and family' and 'Seeking support for lymphoedema' showed that the patient was tired of repetitive explanations, as people around them often asked them about the use of elastic bandages, which is one of the treatment methods for lymphoedema. The lack of help from colleagues at work also makes it difficult for patients to continue working. Thomas (2019) also suggested that the support and understanding of family, friends, and colleagues at work bring hope to patients in life¹⁴⁾.

The analysis results also showed that the patient did not know adequate lymphoedema before admission. Lymphoedema treatment is secondary because patients prioritize saving their lives during breast cancer treatment. When the patient wanted to ask questions about lymphoedema during hospitalization, the medical staff did not answer, implying that they did not have relevant knowledge about lymphoedema.

Therefore, the patient felt that the medical staff did not listen to their own words, which also highlighted the fact that the nature of the work was not understood. Henselmans (2012) also showed that patients face communication barriers with their healthcare providers¹⁵⁾.

The patient was disappointed because the medical staff did not provide knowledge about the progression of lymphoedema, self-care, and lymph drainage and fell into increasing anxiety about the symptoms of lymphoedema.

Conversely, family members and colleagues at work provide direct support for patients. Support from family members performing lymphatic drainage, such as daily life and housework of patients and co-workers cooperating with work, was thought to strengthen the positive emotions of patients. With this support, the patient felt that the people around him would watch over him. Moreover, the patient recognized that his fellow believers had understood him and obtained psychological support.

2. Change and challenge in daily life

From the results of the meta-synthesis in this study, the experiences of the categories 'Financial difficulties', 'Negative emotions', 'Limitations of daily life', and 'Pain and distress due to upper limb lymphoedema' showed that Physical discomfort could harm patients and prevent courtship in sexual life.

The patient had limited daily activities due to the physical pain caused by lymphoedema. Physical discomfort could harm patients and prevent courtship in sexual life. Nissen (2001) also showed that patients with breast cancer had cosmetic damage from mastectomy, which negatively affected them¹⁶⁾. Because lymphoedema of the upper limbs affects the appearance of the limbs, patients do not want to be seen by others, and the inability to go outdoors makes them feel isolated from the outside world. The patient will have feelings such as being unable to control his life and losing hope for the future due to the anxiety of worsening lymphoedema.

In addition, the cost of combined treatment and equipment for lymphatic drainage is prohibitive, and even with the subsidy, the patient is financially burdened. They want to be provided with healthcare subsidies.

3. Response and adaptation for future life

From the results of the meta-synthesis in this study, the experiences of the categories 'Emotional adjustment', 'Positive emotions', 'Pain relief', and 'Expectations for faith' showed that.

The patient devised a sleeping position in daily life and took measures to reduce the pain so as not to use the affected upper limb forcibly in housework. Patients also avoided talking about lymphoedema and negative emotions, such as not hearing anxious information.

Patients are treated with elastic bandages, lymphatic drainage, and intermittent air compression machines in their daily lives to prevent the exacerbation of upper limb lymphoedema. The patient actively asked the medical staff about using elastic bandages and precautions for daily life and took measures, such as a lymphoedema class and a search for a lymph drainage facility. In addition, patients were hopeful of their faith, had a positive feeling in the face of lymphoedema, and coordinated positive emotions, such as gaining confidence in their symptoms. By having positive emotions

and actively coping, patients exert their strength to relieve physical and psychological pain caused by lymphoedema.

4. Crucial viewpoints for improving the quality of life of patients with lymphoedema after breast cancer surgery

1) Patients with lymphoedema adjust their negative emotions themselves

The patient had physical distress due to lymphoedema and negative emotions due to restrictions on daily activities. The patient had negative emotions owing to changes in their body image. These negative emotions adversely affect a patient life with lymphoedema of the upper limbs. Negative emotions caused by body image changes can harm a patient's sexual life.

Expectations of the patient's faith led to coordinating negative emotions and actively facing life. This study suggests that patients can actively cope with lymphoedema by adjusting their negative emotions. Therefore, the ability of the patient to adjust to negative emotions is necessary for improving a patient's quality of life.

2) Support from family and colleagues

The cooperation of family members and colleagues at work improved the quality of life for patients with lymphoedema after breast cancer surgery. Obtaining help with housework and massage can significantly reduce the burden on the affected side of patients with lymphoedema after breast cancer surgery. Work is part of a patient's life, and with the help of colleagues, the patient can continue to work.

Support from colleagues, good family relationships, knowledge about lymphoedema, and support in the patient's daily life and work are necessary factors for improving their quality of life.

3) Healthcare professionals provide support and guidance for lymphoedema as part of the perioperative care for breast cancer

Based on the abovementioned characteristics of patients with lymphoedema after breast cancer surgery, the information provided by the medical staff on lymphoedema treatment, prevention of deterioration, and self-care for patients with lymphoedema is insufficient. Therefore, it can be said that providing support and guidance regarding lymphoedema as part of

perioperative medical care for breast cancer is essential in improving the quality of life of patients with lymphoedema.

5. Suggestions for patient-centred care and social support for patients with lymphoedema after breast cancer surgery

1) Strengthen the explanation for prevention of lymphoedema after breast cancer surgery

Patients with breast cancer considered that lymphoedema was secondary, with the highest priority being to complete breast cancer surgery and prevent life-threatening conditions after hospitalization.

Therefore, it is essential to provide patient-centred care, including information, such as communicating the possibility of developing lymphoedema during the postoperative period and providing guidance on lymph drainage, self-care, and daily exercise on the affected side.

An explanation of the need to observe and measure the thickness of both upper limbs should be provided to the patient for early postoperative detection of upper limb lymphoedema. It is necessary to explain to the patient that they do not overdo and overload the upper limbs during housework.

2) Support for regulating emotions is associated with the development of lymphoedema

Patients with lymphoedema develop negative emotions; therefore, psychological guidance, such as adjusting their emotions and listening to their distress, is necessary. The patient should be advised to interact with family and friends to release negative emotions when they realize that they are experiencing psychological distress and face the burden of lymphoedema in a stepwise manner.

3) Careful explanation of the effects of lymphoedema on daily life according to patients and their families after breast cancer surgery

The nurse should tell the patient how to relieve the pain, numbness, and swelling of the affected side of lymphoedema, perform manual lymphatic drainage by themselves, and be careful not to injure the affected side. It is also essential to inform patients about using elastic bandages and air compression machines at the stage of lymphoedema. As for family support, it is necessary to explain the family-specific situations and methods that

help the patient in their daily life, and that support can be excellent for the patient.

4) Provision of a study session on lymphoedema and a place for patients to learn

The patient experiences physical and psychological distress due to lymphoedema. Patients must receive psychological support, share information about lymphoedema, and release negative emotions. Therefore, nurses need to provide a place for patients to learn through study sessions on lymphoedema.

Study limitations

The literature collected in this study may not be sufficiently comprehensive due to language and search and the selection and exclusion criteria. The survey included eight documents, some of which did not mention the influence of the researcher's values and cultural background, which may have affected the accuracy of the research results.

The participants of this study were diverse and heterogeneous in their unique values and cultural backgrounds. It represents the results of studies in different medical backgrounds in several countries and comprehensively reveals patients' experiences with lymphoedema after breast cancer surgery.

Conclusion

This study showed that patients with cancer-related lymphoedema have limitations in daily life, negative emotions, and a lack of social support and understanding.

Patients with lymphoedema adjusted their negative emotions and obtained support from their families and colleagues. Healthcare professionals can support and guidance for lymphoedema as part of the perioperative care for breast cancer. Patient-centred care and social support should be related to lymphoedema after breast cancer surgery.

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Disclosure

We have no conflicts of interest to disclose. The first

author bore research expenses.

Authors' Contributions

Study design: Mengxi Xiao; data collection and appraisal: Mengxi Xiao, Asahiko Higashitsuji, Tomoko Majima; data analysis: Mengxi Xiao, Tomoko Majima, Mariko Masujima; manuscript writing: Mengxi Xiao; critical revisions: Mariko Masujima; all authors revised and accepted the final draft.

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乳がん術後リンパ浮腫とともに生きる患者の体験：メタ統合

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要 旨

本研究の目的は、乳がん術後にリンパ浮腫を発症した患者のリンパ浮腫とともに生きる体験について質的な研究結果を統合し、明らかにすることである。

研究方法は、乳がん術後のリンパ浮腫患者の体験に関する質的な研究結果のシステマティックレビューとした。検索データベースは、PubMed、CINAHL (EBSCO host)、APA PsycINFO (EBSCO host)、Web of Science、医中誌 web とし、文献選定基準に即して乳がん術後リンパ浮腫患者の体験に関する質的な研究論文 8 件を選定し、Meta 統合を行った。

Meta 統合の結果、乳がん術後のリンパ浮腫患者の体験として、234 の具体的体験から 12 のカテゴリーを明示し、最終的に 3 つのコアカテゴリー『ニーズと社会的支援』、『日常生活の変化と挑戦』、『将来に向けた対応と適応』を明らかにした。

乳がん手術に続発するリンパ浮腫とともに生きる患者を中心としたケアと社会支援の在り方は、1) 乳がん術後リンパ浮腫の発症予防に関する説明を強化する、2) リンパ浮腫の発症に伴う感情の調整を支援する、3) リンパ浮腫が日常生活に及ぼす影響について、乳がん術後患者とその家族に応じた説明を丁寧に行う、4) リンパ浮腫に関する勉強会や患者が学べる場を提供することである。

キーワード：乳がん、リンパ浮腫、体験、メタ統合、システマティックレビュー