Efficacy of physical therapy methods and exercise after a breast cancer operation: a systematic review
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Authors' objectives
To evaluate the effects of: (1) different therapy methods on upper limb oedema of breast cancer patients; (2) early versus delayed introduction of shoulder exercise after breast cancer surgery; and (3) exercise therapy and aerobic exercise among breast cancer patients.

Searching
MEDLINE, EMBASE, and the Scandinavian database ArbSpriSwe were searched from 1980 to 1999 for English- and Scandinavian-language papers. Search terms such as 'breast cancer', 'breast neoplasm', 'physical therapy', 'physiotherapy', 'rehabilitation', 'exercise', 'lymphedema', 'late symptoms', 'quality of life' and 'physical activity', were included. Reference lists were handsearched.

Study selection
Study designs of evaluations included in the review
Prospective randomised, quasi-experimental, uncontrolled, or single-subject experimental (repeated measures) clinical studies were included.

Specific interventions included in the review
Post-operative therapy, therapy methods used with late symptoms, or therapeutic exercise or training were eligible.

The included lymphoedema therapy methods were ultrasound therapy, elastic sleeve, mechanical pressure therapy, electrically-stimulated lymphatic drainage, pneumatic compression, lymph massage by Foldi, bandaging, microwave heating, skin care, self-massage, mechanical massage vibrator, manual lymph drainage, massage with aromatherapy, low-level laser therapy, isometrics, and pneumatic massage with uniform or differentiated pressure. The included post-operative shoulder exercises were hand-squeezing, wall climbing, pendulum and pulley, arm use, spontaneous movements, and isometrics. The included exercise therapies involved head and neck, arm-shoulder, arm-leg, on-floor abdominal, back-leg, stretching, active assisted shoulder exercise, functional activities, and instruction in self-care. The included aerobic exercises were pedalling or walking, or were self-chosen. There were wide variations in the introduction, timing, intensity and duration of the interventions, and combinations of interventions were seen in all categories.

Participants included in the review
Female patients who had undergone breast cancer surgery were included. There was considerable heterogeneity among the populations in terms of age, severity of conditions, time elapsed since breast cancer operations, and prior or concurrent use of medication and therapies for oedema.

Outcomes assessed in the review
The outcomes assessed were oedema (measures such as volume or circumference difference, body-weight); shoulder mobility (e.g. goniometric range of motion and circumference measurement); and functional capacity (e.g. oxygen uptake, respiratory values, arm and shoulder function). Several studies also measured the subjective feelings of patients using a variety of tools.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
A quality assessment tool was developed for the review. The studies were scored in four main categories: study population (e.g. homogeneity, randomisation), intervention (e.g. adequate description, placebo control), measurement of effect (e.g. number of measures, blinding), and statistical validity (e.g. p-value marked). Two reviewers assessed the quality of each study independently. Any differences were resolved by consensus.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The quality assessment scores were presented in full, broken down by category and question, for all of the studies. Descriptive tables included fields for the interventions, study design, patients, outcome measures, and results.

Methods of synthesis
How were the studies combined?
The studies were grouped by intervention and described in the narrative. Five of the 16 studies (8 randomised trials and 8 quasi-experimental) were accepted for a pooled analysis.

How were differences between studies investigated?
Differences in design, populations and outcomes were discussed in the narrative. The authors do not report a method for investigating statistical heterogeneity between the studies, although a forest plot is given for visual inspection. Studies were accepted for the limited pooled analysis on the basis of common outcome measures and the inclusion of standard deviations.

Results of the review
Thirty-one studies involving 2,273 patients were accepted. There were 8 randomised trials, 8 quasi-experimental studies, 14 pre-experimental studies and one single-subject trial.

Lymphoedema (16 studies with 790 patients; range: 8 to 120).

Many therapies were used alone and in combination, and many studies showed that multi-modalities were effective. Ultrasound and mechanical pressure therapy showed no differences between them. Microwave heating caused marked reduction in oedema. Low-level laser therapy had a favourable effect on oedema, but produced hardening of the upper arm during and after treatment. A mechanical vibrator showed no improvement in oedema when added to lymphatic massage. Mechanical pressure therapy produced a marked reduction in oedema. Elastic sleeve therapy was effective in 4 studies. Arm elevation was ineffective when used alone.

Early versus delayed shoulder exercise (7 studies with 989 patients; range: 57 to 344). Significant differences in drainage and aspiration volume were found in one study. Five studies were accepted for a pooled analysis of drainage volume. These showed a combined effect size of +0.46 (95% confidence interval: 0.42, 0.50), which favoured delayed shoulder exercise. Exercise therapy (4 studies with 354 patients; range: 33 to 114). In the 3 controlled studies, the experimental groups showed significantly better shoulder range-of-motion results than the controls.

Aerobic exercise (4 studies with 140 patients; range: 14 to 65). The functional capacity of the experimental group improved in the randomised controlled trial. The walking tests results for this group were significantly better than those for controls in 3 non-randomised studies.

Authors' conclusions
Treatment bias in many studies prevented conclusions about the effectiveness of individual therapies for post-operative and late symptoms. Only 8 of the 31 studies were randomised controlled trials, and pooling was possible only for early versus delayed shoulder exercise.

CRD commentary
The authors asked clear questions, and used a reasonably comprehensive search strategy to locate the studies. The review appears to have been conducted according to a protocol, although some details of the evaluation and checking were not reported. The authors acknowledged that the synthesis (including the small pooled analysis) was limited by the extreme heterogeneity of the studies, as regards the study design, populations, outcomes measured and reporting. The conclusions seem to follow from the results presented.

**Implications of the review for practice and research**

Practice: Early shoulder exercise cannot be justified. Aerobic exercise prescriptions should be tailored to the patient's ability and stamina.

Research: Methodologically sound trials and economic evaluations of post-breast-cancer interventions commonly prescribed by physiotherapists, are needed.

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