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LYMPHOEDEMA POST-MASTECTOMY: IS ELEVATION ALONE AN EFFECTIVE TREATMENT?

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ABSTRACT. In an attempt to obtain information about the efficacy of arm elevation on the reduction of lymphoedema following mastectomy, a study on 33 patients was carried out in which both the control, contralateral and lymphoedematous arms were elevated for periods of 1 and 5 h. There were statistically significant ($p < 0.05$) reductions in the volumes of the control and lymphoedematous arms after 1 and 5 h of elevation. After 1 h of elevation, significantly more fluid was removed from the control arm (2.7%) than the lymphoedematous one (1.3%). At 5 h there was no significant difference in the volume of fluid removed from the control arm (3.3%) compared with the lymphoedematous one (3.1%).

Key words: lymphoedema, elevation, lympho-stimulatory, post-mastectomy rehabilitation.

There are three forms of lymph vascular insufficiency. These have been well described by Földi (6, 7). The form of lymphatic insufficiency that we are dealing with in this study is a mechanical one whereby the lymphatic transport capacity of the arm has been reduced as a result of a removal of a number of axillary lymphatic vessels and their corresponding nodes.

A large anatomical variation in the location and number of lymph nodes and lymph vessels draining the arm have been reported by anatomists (11).

There have been a number of reports dealing with elevation as a treatment for lymphoedema. Stillwell (16) suggested an arm support board, while Foley (5) used an arm stand. Wright, cited in Clodius (4), stated that the arm should not be elevated in lateral abduction since the axillary vein (or artery) could be obstructed. Elevation periods of less than 1 h do not produce any measurable reduction in the arm (13). Mortimer (13) does not advocate elevation unless it is complemented by subsequent external support. Swedborg (18) used elevation in combination with exercises, massage and external support. All therapies for the lymphoedematous arm should and must be directed towards the re-establishment of normal lymphatic transport capacity (9). Elevation alone cannot be expected to achieve this.

The aim of this study was to obtain information about the efficacy of 1 and 5 h of elevation alone on the reduction of the volume of the lymphoedematous arm.

METHODS

Patient details

The patients included in this study were those who attended the Red Cross Hospital, Stockholm for medical rehabilitation consultation or treatment for post-mastectomy lymphoedema. For the study 33 patients were selected in which: The mastectomy was of a modified-radical type; the lymphoedema was unilateral, since all comparisons have to be made with the contra-lateral arm as the control arm; the volume of the lymphoedematous arm was at least 110% of the volume of the control arm; the patient must have indicated or complained about pain, heaviness, tension, bursting pains or of the swelling or unaesthetic appearance of the arm.

Exclution criteria applied were: Indication of metastases; existing infection, infection during the 3 preceding months or physiotherapy in the 3 preceding months involving the lymphoedematous arm; functional impairment, swelling, skin disorders or other problems in the contralateral control arm.

The mean age of the patients entered into the study was 71 years ranging from 43 to 87 years. Eighteen had a right-sided mastectomy and 15 a left-sided one. The mean swelling volume of the lymphoedematous arm was 128% with a range between 110 and 160%. Twenty-four patients had received radiotherapy, 4 cytostatic drugs and 3 hormone treatment.

The mean duration of lymphoedema was 2.7 years with a median time of 4 years.

Measurement technique

Each patient was admitted to the hospital for a total period of 5 h, beginning at 9.00 a.m. All patients had both arm volumes measured by plethysmography, described elsewhere by Swedborg (17, 18). The contralateral arm was always used as the control. Following the initial measurements with the patient lying supine in bed, both arms were supported and fixed at a comfortable elevation of 80° and at an abduction of 25° (Fig. 1). Further plethysmographic measurements were

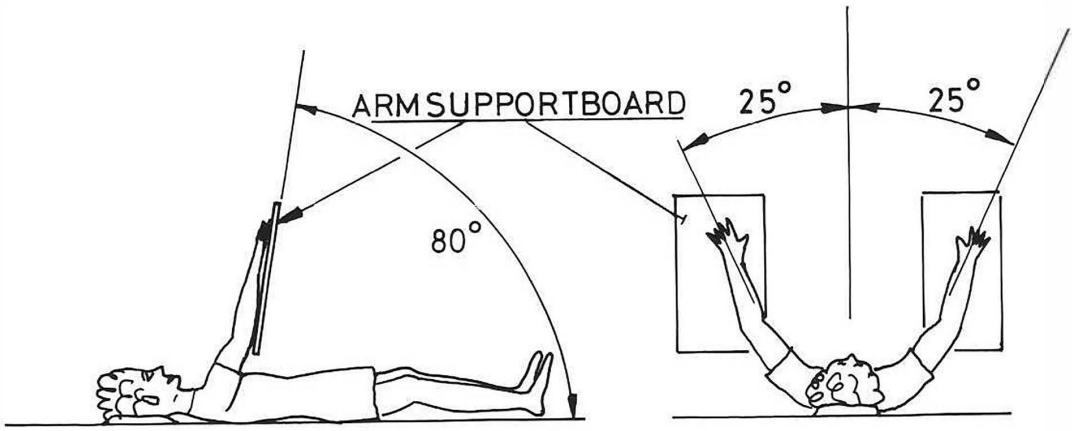

Fig. 1. Position of elevation.

made at 1 and 5 h. Paired Student's *t*-tests were performed on the results of the volume measurements to ascertain the significance of changes of the arms from 0 or no change and to compare the volume reductions of the control and lymphoedematous arms after 1 and 5 h of elevation.

RESULTS

Elevation of the lymphoedematous arm (Fig. 2) for a period of 1 h resulted in an average reduction in lymphoedematous arm volume of $1.3 \pm 0.04\%$ ($p < 0.05$) compared to the initial value. Elevation for 5 h gave an average reduction in lymphoedematous arm volume of $3.1 \pm 0.07\%$ ($p < 0.05$) compared to the initial value. The range of the change in arm volume was from a maximum of 7.8% decrease to a 3.8% increase. Elevation of the control arm for a period of 1 h resulted in an average reduction in arm volume of $2.7 \pm 0.04\%$ ($p < 0.05$) compared to the initial value.

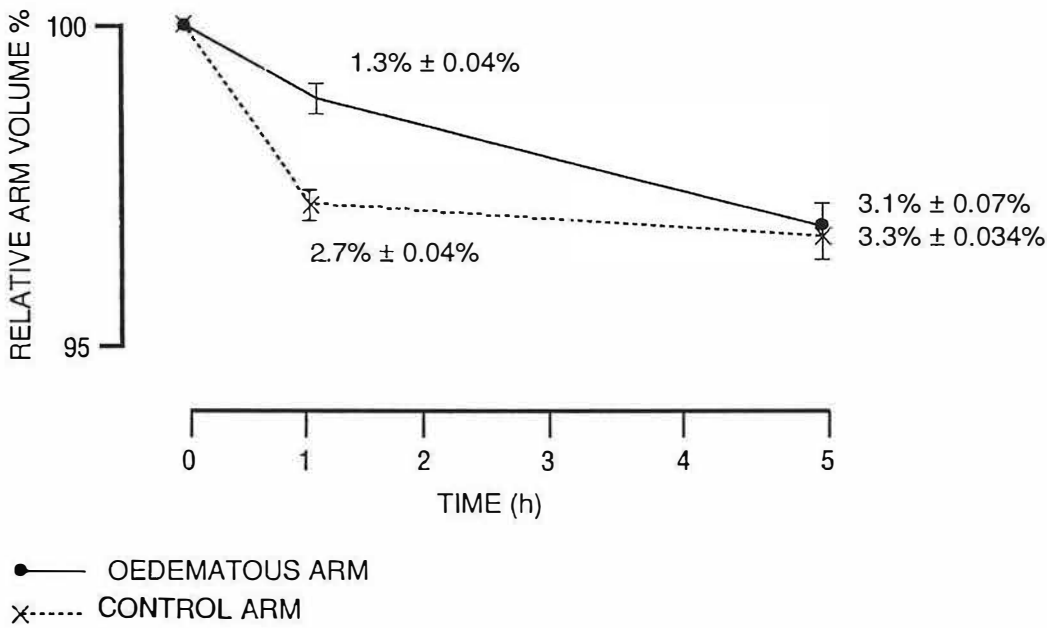

Fig. 2. Mean percentage reductions (±standard errors) in the volume of the lymphoedematous and control arms after 1 and 5 hours of elevation.

The volume reduction in the control arm was also significantly greater ($p < 0.05$) than that of the lymphoedematous arm after 1 h of elevation. After 5 h of elevation the average reduction of the control arm was $3.3 \pm 0.034\%$ ($p < 0.05$) compared to the initial value. After 5 h of elevation the volume reduction of the control arm was not significantly different from the volume reduction of the lymphoedematous arm.

DISCUSSION

The results from this study show that the reduction in the volume of the lymphoedematous arm is significantly less than the reduction of the control arm at 1 h and not significantly different from that of the control arm at 5 h.

The volume of fluid removed from the arms is made up of three components: (*i*) the venous blood, which in both arms is removed rapidly within the first minutes, (*ii*) the free fluid of the interstitial spaces which also will easily be removed from the tissues via the lymphatics, and (*iii*) the fluid held in the interstitial spaces by virtue of abnormally accumulated proteins, which will be osmotically held (2).

An important question is what the elevation can do to reduce the lymphoedema?

Elevation decreases the hydrostatic pressure gradient from the blood vascular system to the tissues. This reduces the outflow of proteins and fluids from the vascular system. Also since the hydrostatic pressure gradient increases along the lymph trunks flow direction, the effect of elevation may also encourage an increased lymph flow. This may occur if there is functional and/or anatomical insufficiency of the lymph vessels. There are two mechanisms of lymphatic pumping. These are governed by extrinsic and intrinsic factors, described by Benoit et al. (1), McHale (12), and Johnston (10). If the elevation is passive, as in our study, one cannot expect any beneficial effects on the extrinsic mechanisms such as skeletal muscle activity. The elevation may have a minimal effect on the intrinsic pump since it would reduced feeding of the collecting lymphatics from the initial lymphatics (12). However, there are still the reverse hydrostatic pressure gradients which may contribute to the lymphatic filling. Logically, elevation would seem to be more effective than continuous pressure over areas of collecting lymphatics which may cause their collapse and totally restrict their function (2). An example of this would be bandaging which has been applied at pressures in excess of 60 mmHg (2).

Why then does elevation alone not prove to be a very effective treatment of lymphoedema?

One possibility is that the oedemas studied were not true "phase I" even though they pitted. Secondly, and perhaps more likely, there must be some attempt to stimulate the lymphatic system, not only to help it drain but also to help it fill and to help it increase the lymphatic transport capacity (14).

To achieve this we need to apply lympho-stimulatory techniques such as complex decongestive therapy (3, 9) and others techniques (15, 18–21).

Conclusion

The effect of 1 and 5 h of elevation alone on the reduction of the volume of the lymphoedematous arm is limited to 1–3%.

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