

Alginate hydrocolloid impregnated zinc paste bandages-an alternative in the management of lymphoedema?

Franz-Josef Schingale,¹ Hugo Partsch²

¹Lymph-Opt, Clinic for Lymphology, Pommelsbrunn, Germany; ²Private practice, Vienna, Austria

Abstract

Several studies have shown an impressive reduction in swelling as a result of compression, and inelastic bandages have become widely accepted as a part of lymphatic decongestive therapy for managing lymphoedema.

Lymphoedema bandaging is indicated to reduce swelling, improve limb shape, skin and tissue-condition and to ameliorate symptoms such as discomfort. Compression therapy for lymphoedema is based mainly on the use of inelastic, short-stretch bandages with high compression, usually protecting the skin with polyurethane foam bandages. In this preliminary report it is shown that completely rigid material like zinc paste applied without padding provides a good level of efficacy.

Introduction

In the management of lymphoedema bandages with high stiffness are traditionally pre-

ferred. Theoretical reasons for this choice are: i) in contrast to venous diseases in which the hydrostatic problem in the upright position has to be tackled and which need compression mainly during daily activities, lymphatic pathology needs 24 h compression,¹⁻³ at least during the initial treatment phase. Therefore our compression pressure should be well tolerated in the lying position and at the same time strong in the upright position, prerequisites that are typically fulfilled by stiff materials; ii) the high massaging effect with movement will stimulate lymphatic drainage by opening initial lymphatics due to the intermittent increase of tissue pressure, by propulsion of tissue fluid into the initial lymphatics and by enhancing the spontaneous rhythmic contractions of lymph collectors.^{4,5}

This effect is certainly much stronger with stiff compression than with a yielding elastic device. Due to Pascal's law the energy created by muscle contractions will be transmitted into all directions in a closed container while it would partly be lost if the extremity is encircled by elastic material giving way to each muscle contraction (Figures 1 and 2).

Among the available compression materials zinc paste bandages are certainly the products providing minimal stretch and highest stiffness. Up to now reports concerning their use in lymphoedema patients are lacking.

In this preliminary report we would like to discuss the potential role of zinc paste bandages in the initial treatment phase of lymphoedema of the lower extremities. Based on a case series in which we concentrated on clinical aspects only, advantages and disadvantages of this alternative treatment will be considered.

Correspondence: Franz-Josef Schingale, Lymph-Opt Klinik, Happurgerstr. 15, 91224 Pommelsbrunn, Germany. Tel. +49.9154.911.200. E-mail: schingale@lympho-opt.de

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Materials and Methods

In 2009 the Alegro® (Alegro Medical Hamburg, Germany) alginate zinc bandage (AZB) was introduced for treating arm lymphoedema.⁶ It is a semi-rigid zinc bandage drenched with calcium alginate and hydrocolloid that becomes stiff and inelastic by time. Twenty patients (2 males and 18 females) with primary and secondary lymphoedema (stage II-



Figure 1. Typical tracing of the pressure exerted by a zinc paste bandage in the lying position and during walking on spot immediately after application in a patient with lymphoedema of the leg. Supine pressure is 55 mmHg, static stiffness index 10 mmHg.



Figure 2. Pressure curve after wearing a zinc paste bandage for 24 h in a patient with lymphoedema of the leg. Lying pressure drops down to 20 mmHg but rises to more than 40 mmHg by standing up. The static stiffness index is more than 20 mmHg. The high pressure amplitudes during walking exert a strong massaging effect.

III as to International Society of Lymphology classification) of the upper (n=3) and lower limbs (n=17) received such bandages. The range of age was 28-73 years.

AZB was used on patients with hard and indurate edema, where conventional multilayer low stretch bandaging had poor results, reducing the circumference of the limb by less than 2 cm in one week. No padding was added.

The bandage was applied directly to the skin on the lower leg and forearm. An overlying short stretch bandage without additional compression was applied as the most superficial layer, in order to protect clothes.

AZB material stuck directly to the skin, without any slippage and was kept in situ for 24-48 h. When the pressure dropped to less than 30 mmHg, the bandage was changed. In 16 cases this happened after 24 h. In 4 cases the edema was so hard, that pressure reduction due to a decrease of edema occurred only after 48 h.

Sub-bandage pressure was measured on the distal medial leg (B1 point) using Picopress® [(Microlab Elettronica Sas, Roncaglia di Ponte San Nicolò (PD), Italy)] transducers while volume and circumference of the limb before and after treatment was evaluated by an optoelectronic device (Perometer®, Pero-System Messgeraete GmbH, Wuppertal, Germany). The zinc paste bandage was only applied on the lower leg.

Results

The reduction of volume depended on the volume of the extremity. In two patients we started the treatment from the first day with zinc bandage, because they were suffering from elephantiasis in primary lymphoedema.⁷ The residual patients received the zinc bandages 1-3 weeks after initial treatment with conventional bandaging. An example is shown in Figure 3.

Table 1 summarizes the volume reduction obtained with AZB after one week.

Two examples illustrating our experience with zinc paste bandages in patients with severe lymphoedema are presented.

he first patient was a 38-year old woman with primary lymphoedema, papillomatosis cutis lymphostatica, lymphocysts and lymphorrhoea with inflammation of the skin (Figure 4A). The patient was bandaged with Alegro®-zinc on the lower leg and long stretch Rosidal D (Alegro Germany) for the thigh. After 11 days papillomatosis was reduced, lymphocysts, lymphorrhoea and inflammation had disappeared (Figure 4B).

The reduction of circumference was 30 cm in the lower leg and 15 cm in the thigh in only 11 days (Figure 5). The volume reduction of the whole leg was 12.810 mL.

The second patient, a 23-year old man suffering from primary lymphoedema of both legs was treated with AZB on the right lower limb and a conventional lymphological bandage (inelastic, multilayer and multi component bandage)⁸ on the left lower limb.

The results showed a reduction of 3.147 mL (40.1%) in 14 days (Figure 6A) with AZB and of 1.647 mL (31.3%) by usual bandaging⁸ (Figure 6B). The volume reduction in the first 3 days was much faster on the leg treated with AZB. In the patients primarily treated with conventional multicomponent lymph bandages a clear improvement was observed when switching to AZB, as demonstrated in the following example. A 65-year old patient suffering from secondary lymphoedema, showed a volume reduction of 618 mL in 19 days (33 mL per day) with conventional bandage. After switching to AZB a volume reduction of 275 mL in 3 days (92 mL per day) was recorded (Figure 3).

This finding is in contrast to the usual volume reduction, which is mostly more pronounced in the initial phase of compression treatment (Figure 6). Only after AZB employment a more pronounced tissue softening took place and the pressure under the bandage showed a dramatic drop (57 mmHg after bandaging and 32 mmHg after 24 h) This reduction was higher than with conventional bandages corresponding to a more pronounced volume reduction (Figure 3). With AZB inflammation and dermatitis disappeared after 3-5 days, lymphorrhoea stopped after the first bandage and

cysts were not visible any more after 7 days of compression.

Discussion

Zinc paste bandages with gelatin glue, as previously used, were semi-rigid, unyielding and became totally dry after one day. We used this material for treating venous diseases, but due to the dry material skin irritations occurred sometimes. Therefore we changed to bandages with cellulose glue, but their hardening was a limitation again. As any skin injury may lead to dermato-lymphangio-adenitis (cellulites, erysipelas, lymphangitis), clinicians used pure zinc-oxide bandages very seldom in lymphoedema. As Alegro® (Alegro Germany) alginate zinc bandage has a more durable moisture level, the present authors introduced AZB also in lymphoedema patients. So far one single study reported about efficacy of AZB *vs* conventional bandaging⁶ in lymphedema. More comparative data are needed to corroborate the results of our preliminary observational study which confirmed that the stiff material results in better and faster edema and fibrosis reduction than the traditional multilayer bandaging. In venous diseases different studies demonstrated that zinc oxide bandages are well tolerated and very effective.

Table 2 summarizes some general advan-

Table 1. Volume (mL) before and 1 week after AZB (Perometer®, Pero-System Messgeraete GmbH) treatment (mean±standard deviation) in 20 patients.

Limb (patience no.)	Before	After	Difference after one week
Left leg (n=7)	12,874 mL (±4187 mL)	11,949 mL (±3617 mL)	789 mL (±1224 mL)
Right leg (n=10)	13,067 mL (±976 mL)	11,955 mL (±3578 mL)	976 mL (±1872 mL)
Right arm (n=3)	3282 mL (±944 mL)	3090 mL (±929 mL)	192 mL (±127 mL)

Table 2. Advantages and disadvantages of zinc paste.

Advantages of zinc paste

Good tolerance, no skin irritations observed

Easy to apply, the patient can move better than with conventional lymphological bandage

Better and faster results

Skin care and anti-inflammatory properties

Increased stiffness, which better supports the muscle pump, which partly explains better edema reduction

Bandage slippage is of limited relevance, which helps in the maintenance phase and for the swift to medical compression stockings/sleeves

Disadvantages of zinc paste

Necessity to re-bandage every 24-48 h in the initial treatment phase, due to fast edema reduction

Single usage of this kind of bandage makes this treatment quite expensive (the usual lymphological bandages can be washed and re-used several times)

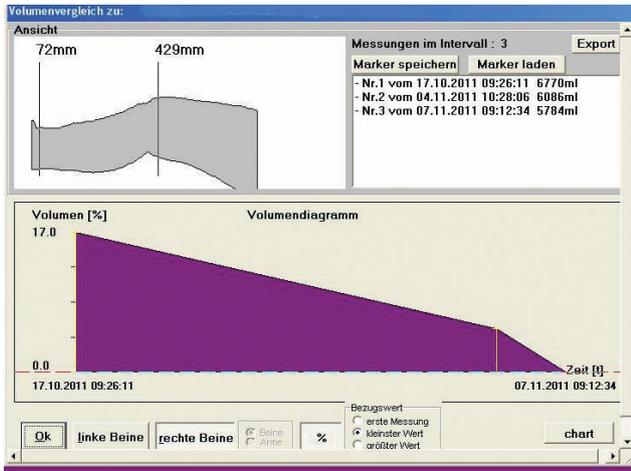


Figure 3. Slow volume reduction by conventional lymph bandages applied for 19 days, followed by a more intensive effect for the last 3 days when AZB (Perometer®, Pero-System Messgeraete GmbH) were applied.



Figure 5. Top: Longitudinal profile of leg circumferences (Perometer®, Pero-System Messgeraete GmbH) before (green line) and 11 days after compression therapy. Bottom: girth-reduction (40 cm on x-axis corresponds to the height of the knee level). A more pronounced reduction of circumference on the lower leg (AZB) than on the thigh (elastic bandage) is clearly visible.

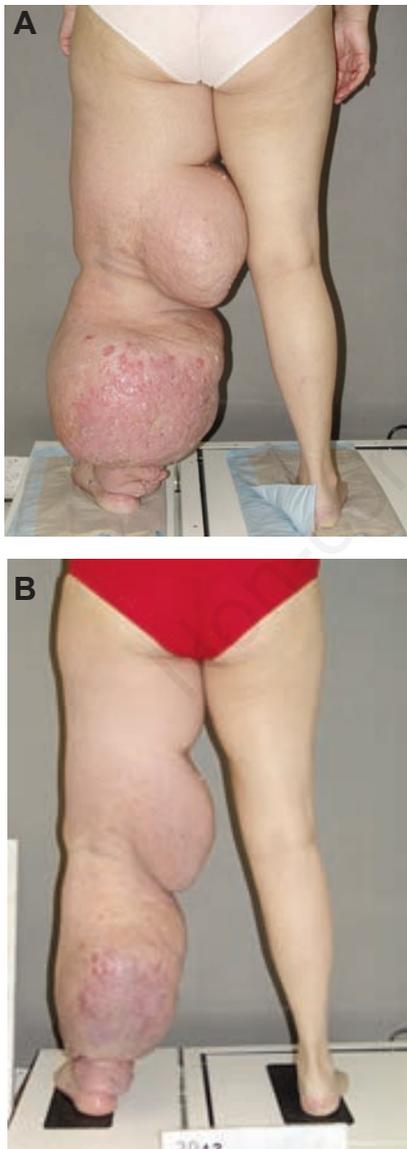


Figure 4. A) Before and B) eleven days after treatment.

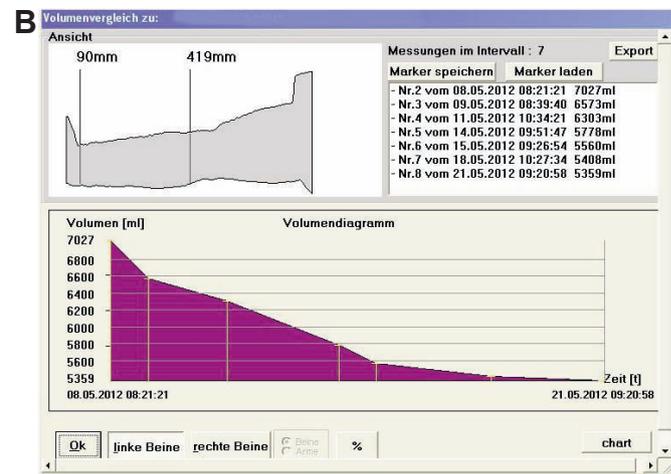
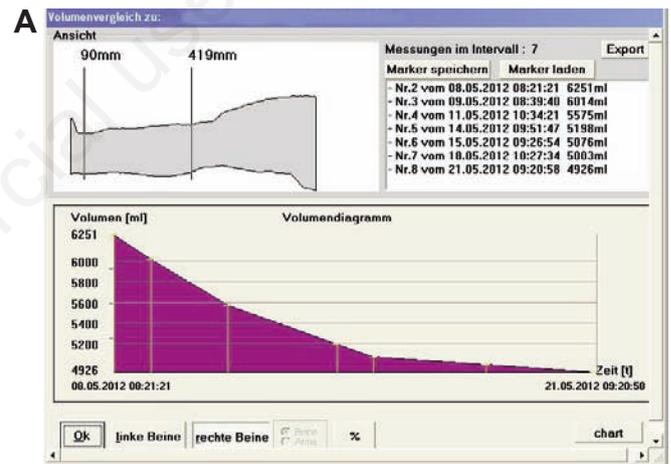


Figure 6. A) Volume reduction achieved by AZB (Perometer®, Pero-System Messgeraete GmbH) on the right lower limb; B) Volume reduction achieved by conventional lymph bandages (Perometer®, Pero-System Messgeraete GmbH) on the left lower limb.

tages and disadvantages of zinc paste, which have been highlighted in our clinical practice and in the pertinent literature.

Conclusions

Our preliminary results demonstrate that AZB (Pero-System Messgeraete GmbH) seem to be more effective than conventional multi-component lymph bandages (which include a lot of padding material) in reducing oedema in the initial treatment phase of patients with severe lymphoedema of the extremities. It is hypothesized that this is due to the very high stiffness of the alginate/zinc coated bandage, which is applied directly to the skin without padding.

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