

**Introduction**

Sequential cryocompression involves the use of a triple segment sleeve that inflates with cold liquid sequentially from distal to proximal around an injured joint or limb. This modality combines cold (to slow down or minimize acute inflammation reactions) and sequential compression (to reduce edema and post-traumatic swelling by increasing lymphatic drainage.)

**Cooling System**

A 15-gallon reservoir of water is maintained at the selected therapy temperature with an internal hermetic refrigeration system. This chilled water pressurizes the sleeve during treatment and comfortably lowers the tissue temperature. Five to seven gallons of chilled water surround the entire limb during treatment similar to cold-water immersion. The large amount of coolant provides vigorous cooling deep into tissue, muscle and joints. Antifreeze should never be added to the water. Coolant temperatures below the freezing point of water could freeze tissue and cause frostbite.

**Treatment Temperature from 40°F to 60°F**

Lowering tissue temperature diminishes local blood flow and helps constrict capillaries in the injured area. This also decreases clotting time to reduce hemorrhaging. Another important effect is decreasing the metabolic demands by slowing the chemical actions in cells surrounding the injured area. This reduces the build-up of waste products in the area and allows more tissue cells to survive the period of temporary hypoxia. The treatment temperature is selected by adjusting a control knob and the water temperature is displayed on an LED readout.

**Sequential Compression**

Pressurizing three sleeve segments sequentially within the appliance increases the distal to proximal gradient. First the distal compartment inflates, 30-seconds later the mid chamber inflates, 30-seconds later the proximal chamber inflates, after 90 seconds all three chambers relax for 30-seconds, and completes the 2-minute cycle. Up to ten cycles can be selected for a full 20-minute treatment.

**Treatment Pressures from 20 to 100mm Hg**

Individual electronic sensors control pressure in each of the three sleeve segments. This assures that absolute pressure is precisely applied to the injured limb. Treatment pressure is adjusted with a control knob calibrated in mm Hg. The actual compression pressure is displayed on three separate LED readouts.

**Gradient Settings**

The Gradient switch can be set for 10% and 20% pressure ratios. These settings automatically factor the ratio and reduce proportionally the compression pressures of the mid and proximal chambers. For example, with the pressure control knob set at 100 mm Hg and the gradient switch at 20%, the distal chamber pressure will control at 100 mm Hg, mid chamber at 80 mm Hg, and proximal at 60 mm Hg. Higher ratios can be helpful for treating distal injuries such as ankle sprains.

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## **Sleeve Support**

A rigid fiberglass boot surrounds the triple-segment sleeve to provide leverage for uniform compression. Without this rigid boot, liquid coolant would slosh around in the sleeve, causing inaccurate pressure control. The boot also hinges open for convenient application to the injured limb.

## **Boot Elevation**

Elevation of the injured limb above heart level limits pooling and encourages venous return. This elevation also decreases the hydrostatic pressure within blood vessels, helping decrease the amount of edema by decreasing the volume of fluid filtered out of the blood vessels and into the tissue space.

## **Setup**

Select the desired treatment temperature. (Temperatures below 55°F are generally recommended.) The unit will cool to the set temperature and shut off. It will then cycle on for ten minutes a few times a day to maintain the set temperature. Leave the Power switch on so the unit will be ready when needed. Refer to the manufacturer's Users' Guide for important safeguards, control functions, installation, operation, and maintenance.

## **Application**

Insert the injured limb into the sleeve, close the boot, and fasten the latches. With the Gradient switch off, set the pressure control knob to 40 mm Hg and press the Fill button. All three-sleeve chambers will fill to 40 mm Hg in approximately two minutes. Select the desired gradient setting (Off, 10%, or 20%) and increase the pressure to a setting most comfortable for the patient (60 to 100 mm Hg is recommended for lower extremities.) Press the Drain button and reduce chamber pressure to 40 mm Hg. Select the treatment time (2-20 minutes) and press the Start button to begin the sequential cycling. After the last cycle, the sleeve will drain automatically, followed with a beep announcing the treatment has been completed.

## **Over-pressure protection**

Three independent mechanical pressure switches provide secondary over-pressure protection should a malfunction occur in the primary electronic control system. Also a remote patient call switch deflates the sleeve and sounds an alarm.

## **Post-Surgical Treatments**

Sequential cryocompression has proven effective for reducing post-surgical swelling. Open wounds must be covered with sterile dressings to help prevent blood components from contacting the interior sleeve and other surfaces. See the manufacturer's Users' Guide for proper cleaning methods.

## **Contraindications**

Sequential cryocompression is a relatively safe, passive approach to reducing post-traumatic edema and there are few contraindications. Certainly all situations in which tissue movement is restricted, such as healing fractures and gross joint instability would contraindicate sequential cryocompression. Infection, thrombophlebitis, pulmonary edema, and congestive heart failure also contraindicate the use of sequential cryocompression.

## **Insurance Coverage**

Cryocompression is recognized as a vasopneumatic device (CPT Code #97016). Edema related ICD9 diagnosis codes are generally acceptable for insurance billing.

## **Location**

The sequential cryocompression unit usually becomes a favorite modality in sports medicine clinics and commands a dedicated treatment table. When treatment table space is limited, the unit can be wheeled to any convenient storage space. Do not store in a potentially corrosive atmosphere such as an enclosed pool area.