

# Active Prevention of Pressure Sores through IsoTone Cyclic Resistance Exercise and Self-Massage

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## 1. Background

### 1.1 Pathophysiology and Limitations of Passive Prevention

Pressure sores (decubitus ulcers) develop when prolonged compression blocks blood and lymph flow to the skin and underlying tissues. The resulting oxygen deprivation leads to progressive tissue breakdown, particularly over bony areas such as the sacrum, hips, and heels.

Conventional prevention methods—regular repositioning, pressure-relieving surfaces, and topical care—are **passive measures**. They reduce mechanical stress but do not actively restore circulation or metabolic recovery in compressed tissues. This gap highlights the need for **an active physiological approach** that can safely stimulate blood and oxygen flow even in individuals unable to stand or walk.

### 1.2 The IsoTone Concept and Its Suitability for Circulatory Activation

IsoTone is a compact, hand-held resistance instrument engineered to provide **simultaneous, bidirectional muscle engagement** through cyclic compression and expansion. Its mechanical design automatically adjusts resistance in real time, responding proportionally to the user's effort without external settings or electronics.

This dual-phase operation allows **two complementary muscle groups** to contract and extend in perfect counter-sync, creating a continuous sequence of vascular pumping and muscular oxygen exchange. Unlike static exercise tools or passive therapy devices, IsoTone keeps the user **aerobically active even when movement is limited to the upper body**, generating both local and systemic circulatory benefits.

For bedridden or chair-ridden individuals, IsoTone is particularly appropriate because it:

- **Delivers safe resistance** without requiring posture changes or leg use.
- **Stimulates blood and lymph flow** through rapid, low-impact muscular action.
- **Engages users of all ages and fitness levels**, including those with minimal mobility.
- **Combines exercise and massage** in one lightweight, easily sanitized device.

By enabling rhythmic muscular activation under total user control, IsoTone converts limited physical motion into a **sustained circulatory exercise**, effectively bridging the gap between passive care and active prevention of pressure sores.

## 2. Physiological Basis

### 2.1. Circulatory Activation by Cyclic Resistance

Healthy tissue depends on uninterrupted microcirculation—the continuous exchange of oxygen, nutrients, and metabolic products between blood vessels and surrounding cells. In immobilized individuals, this exchange becomes impaired as local blood flow slows or stops under sustained pressure.

IsoTone restores this circulation by providing **rhythmic mechanical activation** of the body's intrinsic vascular pumps. Each IsoTone cycle—automatic compression and expansion—creates alternating pressure

and relaxation waves that propel venous blood, lymph, and interstitial fluids, re-establishing the natural balance lost during immobility.

What makes IsoTone distinct is its **counter-synchronous muscle engagement**:

- During the **squeezing phase**, one set of muscles contracts while its complementary group extends, producing coordinated internal pressure that drives blood toward the heart.
- In the **expansion phase**, the roles reverse—those that had extended now contract while the others release—maintaining a seamless alternation of effort.

Because contraction and extension occur simultaneously in opposing groups, the user remains **aerobically engaged without interruption**, generating a continuous, efficient circulation pump that enhances oxygen delivery and waste removal throughout the body, all without posture change or external assistance.

## 2.2. Whole-Body Circulatory Effect

Although IsoTone exercises often focus on the upper body, their impact extends throughout the entire circulatory system. The body functions as an integrated network—when one region becomes active, the resulting increase in venous return, cardiac output, and vascular tone benefits all tissues.

As muscles rhythmically compress and expand against IsoTone’s adaptive resistance, they stimulate heart activity, encourage vasodilation, and accelerate lymphatic return. These coordinated effects improve perfusion and oxygen delivery even in areas distant from the working muscles, such as the hips, back, and heels—regions most prone to pressure injury during immobility.

Through this interconnected response, **localized IsoTone engagement produces systemic circulatory renewal**, maintaining healthy microvascular function and supporting the recovery of tissues that otherwise remain stagnant under prolonged pressure.

## 3. IsoTone – A Dual-Function Therapeutic Device

IsoTone is a compact, hand-held instrument engineered to adapt automatically to the user’s effort, providing smooth, bidirectional resistance that adjusts instantly to any level of applied force. This self-regulating mechanism allows safe and effective exercise for individuals across all strength levels, from frail or recovering patients to active adults. Because resistance is present in both directions of motion, every movement becomes productive—there is no idle phase.

IsoTone serves two complementary purposes that together form a complete therapeutic system:

### 1. **Cyclic Resistance Training – Enhancing Deep Circulation**

Each compression–expansion cycle engages opposing muscle groups in counter-synchronous action, producing alternating internal pressure waves that drive venous blood and lymph toward the heart. This rhythmic activation strengthens the natural vascular pump and sustains oxygen delivery throughout the body.

### 2. **Self-Massage – Stimulating Surface Capillary and Lymph Flow**

Used gently over the skin, IsoTone delivers localized mechanical stimulation that promotes superficial circulation, relieves tissue stiffness, and assists lymphatic drainage. When applied immediately after exercise, this massage complements the deeper circulatory effects by enhancing skin perfusion and preventing stagnation near pressure-prone areas.

Together, these two functions enable IsoTone to act simultaneously as a **micro-aerobic exerciser and a therapeutic massage tool**, combining active and passive benefits within one simple, portable device.

## 4. Preventive Objective

The primary objective of this program is to **prevent or delay the onset of pressure sores** by maintaining continuous and balanced blood circulation in tissues exposed to prolonged pressure. Through cyclic IsoTone engagement and complementary light self-massage, the user activates a natural physiological pump that sustains oxygen delivery, nutrient exchange, and waste removal within skin and subcutaneous layers.

Unlike passive prevention methods that rely solely on external support surfaces or repositioning schedules, IsoTone introduces an **active circulatory component** that the individual or caregiver can perform safely in any posture – seated, reclined, or partially immobilized. Each short session reawakens dormant vascular pathways, reestablishes capillary flow, and prevents local ischemia from developing into early-stage skin damage.

This method is appropriate for **individuals of all ages and physical conditions**, from post-operative or rehabilitation patients to older adults confined to bed or wheelchair. Even a few minutes of rhythmic IsoTone activity several times per day can significantly improve tissue vitality, reduce swelling, and enhance comfort and well-being.

In clinical and home-care settings alike, IsoTone serves as a **portable, low-risk intervention** that bridges the gap between passive management and active physiological maintenance—empowering patients to participate directly in their own prevention and recovery process.

## 5. IsoTone Circulatory Activation Program

The IsoTone Circulatory Activation Program translates the physiological principles described above into a practical daily routine. It provides a structured sequence of short, safe, and effective movements that can be performed in bed, in a chair, or while standing with support. The objective is to transform even limited mobility into continuous micro-aerobic stimulation that sustains blood and lymph flow, prevents stagnation, and maintains healthy tissue oxygenation. The program consists of warm-up breathing, core IsoTone cycles, and a concluding self-massage sequence.

### General Guidelines

- Perform **2–3 sessions daily**, 5–8 minutes each.
- Sit or recline comfortably with back supported.
- Breathe naturally in sync with IsoTone operation: inhale while compressing and exhale while expanding. Avoid holding the breath.
- Perform each **compression–expansion cycle as fast and strong as comfortable – the faster, the better**, without pain or strain.

### 5.1. Warm-Up

#### IsoTone Breathing Flow

Hold IsoTone at chest level.

- Inhale while squeezing.
- Exhale while expanding.

Repeat continuously for about a minute, gradually increasing speed and power.

*Purpose:* Opens chest circulation, synchronizes breathing and movement.

### 5.2. Core IsoTone Exercises

The following IsoTone exercises are designed to deliver maximum circulatory benefit through cyclic squeezing–expansion movements that engage complementary muscle groups in continuous counter-sync. Each action stimulates internal pressure and relaxation waves that push blood and lymph through

the vascular system, maintaining an uninterrupted aerobic rhythm. When performed rapidly—each compression and expansion as fast and strong as comfortable—these movements become a highly efficient full-body circulatory engine, even when only the upper body is active. Each exercise can be done while sitting or reclining, making them suitable for virtually all levels of mobility.

| # | Exercise                | Description                                                                                 | Circulatory Effect                                                                                                                            |
|---|-------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Horizontal Press</b> | With elbows out, perform rapid squeeze—expand cycles at shoulder height.                    | Strongly activates pectoral and arm muscle pumps; improves blood return to the heart and warms upper-chest tissues.                           |
| 2 | <b>Elbow Squeeze</b>    | Squeeze and expand IsoTone with bent arms held near the torso.                              | Stimulates shoulder and upper-thoracic capillary beds; supports respiratory circulation and upper-back oxygenation.                           |
| 3 | <b>Low Cross</b>        | Cross hands at waist level and perform fast horizontal squeeze—expand cycles.               | Enhances thoracic and abdominal venous flow; promotes oxygen delivery to trunk organs.                                                        |
| 4 | <b>Raised Press</b>     | Lift IsoTone overhead and execute quick squeeze—expand cycles while keeping arms extended.  | Elevates cardiac and pulmonary circulation; increases arterial oxygen exchange and lymphatic drainage from arms and shoulders.                |
| 5 | <b>Low Press</b>        | Hold IsoTone down in front with straight arms and perform continuous squeeze—expand cycles. | Engages spinal and core stabilizers; boosts blood flow along the back and through the lower-torso muscles, aiding posture and skin perfusion. |

Each movement should feel energetic, controlled, and safe. Users naturally adjust intensity to their comfort and condition.

### 5.3. IsoTone Self-Massage Sequence

After exercises, use IsoTone handles or attachments for **light rolling and tapping** movements:

1. **Forearms:** Roll IsoTone gently from wrist to elbow several times each arm.
2. **Shoulders and Chest:** Apply light circular pressure to relax muscles.
3. **Thighs and Calves (if accessible):** Roll or tap lightly to stimulate blood and lymph flow.
4. **Neck and Upper Back (if assisted):** Gentle downward gliding motions.

A pleasant warmth in the skin signals improved circulation.

## 6. Mechanisms of Benefit

The benefits of IsoTone stem from the integration of mechanical resistance, neuromuscular activation, and rhythmic vascular pumping. Together, these mechanisms reproduce many of the internal effects of walking or light aerobic exercise without the need for large-scale movement. Understanding these mechanisms helps explain why regular IsoTone use supports both deep and surface circulation, accelerates recovery, and improves thermoregulation in individuals with restricted mobility.

| Mechanism                      | Effect                                        |
|--------------------------------|-----------------------------------------------|
| Rapid cyclic squeeze—expansion | Creates strong vascular and lymphatic pumping |
| Resistance in both directions  | Doubles stimulation per cycle                 |
| Automatic load adjustment      | Safe for any user condition                   |

| Mechanism                      | Effect                                     |
|--------------------------------|--------------------------------------------|
| Muscular heat generation       | Improves tissue temperature and elasticity |
| Exercise + massage combination | Deep and surface perfusion synergy         |

## 7. Implementation

For IsoTone to deliver consistent preventive value, it must be integrated into everyday care routines. This section outlines how caregivers, rehabilitation specialists, and individual users can safely incorporate IsoTone sessions into hospital, rehabilitation, or home environments. The goal is to make circulatory stimulation a natural component of patient management—simple, repeatable, and sustainable over time.

- Use in hospitals, rehabilitation centers, senior residences, and home care.
- Integrate into daily nursing or therapy routines.
- Can be self-performed or caregiver-assisted.
- Combine with hydration, nutrition, and routine repositioning.
- Avoid direct use on open sores or irritated skin.

## 8. Evaluation Metrics

Measuring outcomes ensures that IsoTone use remains both effective and individualized. The following metrics provide practical ways to monitor improvement in circulation and tissue vitality, from observable skin changes to subjective comfort indicators. Tracking these responses over several weeks allows caregivers and clinicians to document measurable progress and adjust exercise intensity as needed.

- Change in peripheral skin temperature
- Visual skin tone and elasticity
- Patient comfort and reported warmth
- Reduced incidence of redness or early ulcer formation

Expected outcomes after several weeks: increased vitality, reduced stiffness, warmer extremities, and overall improvement in tissue health.

## 9. Conclusions

IsoTone's **fast, cyclic dual-phase resistance** provides an active, simple, and safe means to maintain blood flow and prevent the earliest stages of tissue ischemia. Even partial-body movement, primarily upper body, generates **systemic circulation enhancement** and supports full-body tissue health.

Combined with IsoTone's light self-massage, this method establishes a **comprehensive, portable prevention system** for immobile individuals.

**Active Circulation – Health in Every Motion**