

June 2006

Learning Package
**Assessment and Management of
Venous Leg Ulcers**



 **RNAO** Registered Nurses' Association of Ontario
L'Association des infirmières et infirmiers
autorisés de l'Ontario
NURSING BEST PRACTICE GUIDELINES PROGRAM

Based on the Registered
Nurses' Association of Ontario
Best Practice Guideline:

*Assessment and Management
of Venous Leg Ulcers*

Acknowledgement

The Registered Nurses' Association of Ontario (RNAO) and the Nursing Best Practice Guidelines Program would like to acknowledge the following individuals and organizations for their contributions to the development of this *Learning Package: Assessment and Management of Venous Leg Ulcers*.

- ▶ **Saint Elizabeth Health Care, Markham**, for their role in implementing and evaluating the guideline *Assessment and Management of Venous Leg Ulcers* through the RNAO pilot site implementation initiative, and for providing leadership in the development of this resource as part of their implementation plan. This educational resource has been adapted for web dissemination by the RNAO.
- ▶ The guideline development panel for *Assessment and Management of Venous Leg Ulcers*. This best practice guideline is a foundation document for the content of this educational resource, which has been developed to support the educational needs of nurses in the implementation of *Assessment and Management of Venous Leg Ulcers*.

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Registered Nurses' Association of Ontario (2006). *Learning Package: Assessment and Management of Venous Leg Ulcers*. Toronto, Canada: Registered Nurses' Association of Ontario.

The RNAO Nursing Best Practice Guidelines Program is funded by the Government of Ontario.

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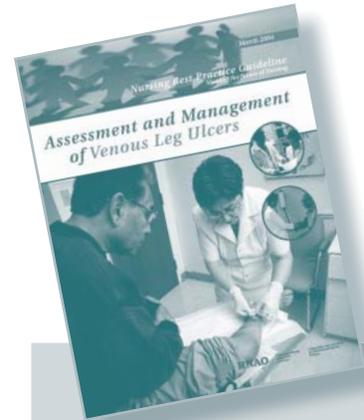
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The RNAO Best Practice Guideline *Assessment and Management of Venous Leg Ulcers* is available for free download from the RNAO website at www.rnao.org/bestpractices.

CASE STUDY

The Case Study will appear throughout this document to highlight the content information through practical, anecdotal application. You will follow the assessment and plan of care for Mr. A, a middle aged bartender requiring care for venous disease.

Section 1: Assessment of Venous Leg Ulcers

Overview

In this section you will review:

- ▶ The distribution of leg and foot ulcers
- ▶ The causes and common tests used to diagnose venous leg ulcers
- ▶ The defining characteristics of venous leg ulcers

Learning Objectives

After completing this section you will be able to:

- ▶ Identify the most common type of lower leg ulcer
- ▶ Describe the common causes for venous leg ulcers
- ▶ Identify and contrast characteristics of venous leg ulcers, arterial ulcers and diabetic foot ulcers
- ▶ Identify specific characteristics of a venous ulcer
- ▶ State ABPI results and impact on treatment options

Prevalence of Leg and Foot Ulcers

Over 90% of leg and foot ulcers are due to venous, arterial and foot complications associated with diabetes. See *Table 1* for the distribution percentages of these leg/foot ulcers. Many chronic wounds that occur on the legs or feet may also occur elsewhere on the body.

Wounds, including leg ulcers, have a significant negative impact on a client's quality of life. Many clients with a venous leg ulcer find that the skin changes associated with venous disease can have a negative impact on body image.

Table 1: Distribution of Leg / Foot Ulcers*

Distribution of Common Types of Leg/Foot Ulcers		
Area	Non-venous [%]	Venous
Calf	8	5
<u>Gaiter</u>	43	87
Foot	49	8
Total	100	100

* Adapted from London, N.J.M., & Donnelly, R. (2000). ABC of arterial and venous disease. *British Medical Journal*, 320, 1589 – 1591.

NOTE

Underlined words throughout this document can be found in the glossary.

CASE STUDY

Clinical History

The first step in assessing Mr. A's treatment needs is to review his clinical history. This will help to develop a knowledge base of his understanding of venous disease and how it relates to him.

Mr. A has a number of risk factors for venous disease. He has been diagnosed with deep vein thrombosis (DVT) and has had an ulcer on a lower extremity in the past. Mr. A is obese. He works as a bartender, standing for long periods of time. When at work, Mr. A does not have the opportunity to elevate his limbs. In his off-work hours, he engages in only a minimal amount of walking. While Mr. A has been directed to wear compression stockings, he has not been wearing them regularly.

Causes of Venous Leg Ulcers

The specific cause of venous ulcers is poor venous return. Poor venous return is due to damage of the valves in leg veins that facilitate the return of the blood to the heart. Any of the lower leg veins can be affected. Venous ulcers commonly occur in the gaiter area of the lower leg. The most frequent location is the medial malleolus.

Venous System

The venous system has unique one-way valves that allow blood to flow against gravity. The one-way valves prevent a back flow in the system. Damaged valves or distention preventing proper closure of the valves causes a pooling of blood in the lower leg venous system. With the pooling, there is an increase in the venous pressure. Thus the common use of the term, venous hypertension.

NOTE

The constriction of muscle action in the calf during ambulation compresses veins, moving the blood upward toward the heart.

Veins in the Lower Leg

In the legs, there are 2 components in the venous system.

1. Deep veins – femoral, popliteal and tibia veins
2. Superficial veins – greater and lesser saphenous veins

The deep and superficial veins are connected by perforator veins. The system is like a ladder with the rungs being equivalent to the perforator veins.

Leg Ulcers

It is essential to identify the cause of a wound and the potential for healing. If the cause is unknown, correcting the cause is not possible. The differences between various types of leg ulcers are outlined in *Table 2*, which contrasts the various characteristics of arterial, venous and diabetic foot ulcers.

There are numerous types of leg ulcers. When assessing a leg ulcer, it is useful to know some of the distinguishing features of various types of ulcers.

NOTE

There are numerous points about a wound assessment that need to be documented in detail. Each wound is different. Leg and foot ulcers can vary significantly.

Table 2: Characteristics of Leg Ulcer Wounds

	Venous	Arterial	Diabetic
Location	Gaiter area Often over <u>malleolus</u>	Can occur anywhere on the lower leg	Usually on the foot, but can be anywhere on the lower leg and hands.
Size	Usually large	Usually small	Small but can be larger once callus is removed.
Depth	Shallow	Deep, punched out appearance	Can go to bone
Border	Irregular, ragged	Sharp edges	Smooth edges
Wound Bed	Bright red	Pale	Pale, dry
Edema	Generalized	Minimal	Localized
Peri wound	<u>Lipodermatosclerosis</u> , <u>hemosiderin staining</u> , and/or dermatitis	Pale, cool, shiny, hairless	Callus
Ankle Brochial Pressure Index	0.8 to 1.0+	Below 0.6	Unreliable
Pulses	Readily palpable once edema is reduced	Reduced or absent	Can be bounding but this is misleading
Pain	Can be severe	Claudication and/or pain on elevation of limb most often noted at night in bed	Often absent due to sensory neuropathy
Compression	Often used	Never	Possibly but modified

CASE STUDY**Assessment**

After reviewing Mr. A's clinical history, the next step is to assess the venous leg ulcer.

Mr. A's wound measures 6.0 x 4.3 x 0.1 cm. It is located on the right medial malleolus. It is a shallow wound with an irregular margin and red granulation tissue in the base. Minimal (10%) slough can be seen, and there is moderate serous exudate. The wound produces no odour, the periwound skin is intact and there is no erythema or itching.

Skin Assessment for Venous Disease

The skin should be assessed frequently for edema and discolouration. This assessment will include lipodermatosclerosis and hemosiderin staining, explained below.

Wound Assessment and Monitoring

At each dressing change, document the following:

- ▶ Clinical signs of infection
- ▶ Increase in wound exudate which would indicate an early sign of infection
- ▶ Client's pain associated with wound and wound treatment plan
- ▶ Comprehensive wound assessment, noting:
 - wound base
 - edges
 - type and amount of exudate
 - odour
 - periwound status
- ▶ Weekly assessment should include:
 - wound measurements
 - effectiveness of wound management regime
 - nutritional status
- ▶ A change in wound status requires a full assessment including all indicators above.

Lipodermatosclerosis – ‘woody fibrosis’

As venous pressure increases, fluid moves into the interstitial spaces. If the problem is not corrected, the fluid in the interstitial spaces becomes firm over time. This is known as ‘woody fibrosis’ or lipodermatosclerosis. With lipodermatosclerosis, there may be an associated dermatitis with or without an associated itch.

Hemosiderin Staining

Red blood cells (RBC) that move into the interstitial spaces die after 3 months. The products of the degradation of the RBCs include the iron from the hemoglobin. When this iron becomes trapped in the tissues in increased amounts, the client will experience a brown staining on the lower leg, called hemosiderin staining.



Lipodermatosclerosis, also known as “woody fibrosis” because of the texture of the skin.



Hemosiderin staining in early stages of venous disease.



Venous ulcer with evidence of hemosiderin staining.

CASE STUDY**Skin Changes**

Reviewing the known skin changes with Mr. A assists him to understand how this condition is 'real' for him. Mr. A has several tropic skin changes associated with venous disease:

- ▶ bilateral edema
- ▶ dry thick scaling on the left lower leg
- ▶ evidence of a healed ulcer over the left medial malleolus
- ▶ no hemosiderin staining of the lower extremity
- ▶ no stasis dermatitis.

Leg Ulcer Causes and Tests

Although the majority of leg ulcers are due to venous disease, it is essential to identify specific causes for individual clients. If arterial disease is identified, a careful evaluation of the wound and its causes will guide the treatment plan of care. *Table 3* outlines distinguishing features (causes and common tests) of different leg ulcers.

Table 3: Distinguishing Features of Different Leg Ulcers

	Venous	Arterial	Diabetic
Cause	DVT, trauma, outflow obstruction, scar breakdown, family history, varicose veins, ligation of leg veins, multiple pregnancies	Arterial disease, trauma, cold injuries, diabetes, hypertension, vasospastic diseases, infection, smoking	Pressure related to inappropriate footwear, objects in shoes, calluses, bony prominences
Common tests to differentiate type of ulcer	<u>ABPI</u> , <u>tourniquet test</u> , <u>doppler ultrasonography</u> , <u>photoplethysmography</u> , air plethysmography, <u>duplex ultrasonography</u>	<u>ABPI</u> , <u>doppler ultrasonography</u> , <u>duplex ultrasonography</u> , leg and toe pressures, angiogram	<u>Toe pressures</u> , monofilament testing for neuropathy, pressure mapping, off-loading, blood sugar (HgA ₁ C)

Predisposing Factors for Venous Leg Ulcers

A variety of conditions predispose an individual to the development of venous leg ulcers. These include:

- ▶ Varicose veins
- ▶ Deep Vein Thrombosis (DVT)
- ▶ Multiple pregnancies
- ▶ Trauma
- ▶ Obesity
- ▶ Periods of long standing – job related situations

Common Tests to Differentiate Type of Ulcer

- ▶ *Air Plethysmography* – performed with an air-filled cuff around the calf and measuring calf dynamics with a transducer probe. Recorded pressure changes during various test maneuvers provide information about standing and walking pressures.
- ▶ *Ankle Brachial Pressure Index (ABPI)* – the use of the brachial systolic pressure and the ankle systolic pressure to gain an indication of arterial perfusion. The normal value is 1.0 (Resting Pressure Index).
- ▶ *Doppler Ultrasonography* – a noninvasive test used to verify the presence of pulses that are often difficult to palpate in an edematous limb. A hand-held Doppler is also used to auscultate venous reflux and obtain an ABPI. In the absence of arterial disease, and diabetes, an ABPI measuring greater than 0.8 indicates that high compression therapy can be applied safely.
- ▶ *Duplex Ultrasonography (with or without colour)* – a noninvasive test that is used for assessing venous disease. It provides imaging of blood flow through the veins and identifies areas of obstruction or reflux. It replaces the venogram test.
- ▶ *Photoplethysmography* – a noninvasive test using infrared light and a transducer probe. It provides measurements of venous reflux and filling times. Normal refill times are 35-45 seconds but with venous hypertension, it can take less than 20-25 seconds.
- ▶ *Tourniquet test* – a noninvasive technique that identifies the level of valvular incompetence in the superficial veins of the leg.

Measuring Ankle Brachial Pressure Index

In a healthy vascular system, the ankle brachial pressure index is 1.0 to 1.2, and has also been identified with the range of 0.8 to 1.2.

$$\text{ABPI} = \frac{\text{Ankle Systolic Pressure}}{\text{Brachial Systolic Pressure}}$$

Both the brachial and ankle systolic pressures are obtained using a portable Doppler.

Procedure for Obtaining Ankle Brachial Pressure Index

Preparation

Explain to the client the procedure and rationale for performing it. Explain the steps of the procedure and the actions the client is required to perform. Give the client permission to stop at any time.

Explain that the cuff inflation may cause discomfort, but as the air is let out of the cuff this discomfort will subside. Explain the importance of holding still as it will minimize the time required to complete the procedure.

Gather all necessary equipment: Doppler and ultrasound gel, and blood pressure cuff, using the appropriate size.

A quiet environment is important to clearly hear the pulses. Turn off the radio or television during the procedure. Close the door to the room to decrease external noise.

Ensure the client is comfortable in a lying position. For accurate results this position should be held for 15 minutes before taking pressures.

Use the highest brachial systolic pressure and the highest systolic pressure in each foot to calculate the ankle brachial pressure index (ABPI).

Procedure

- ▶ Apply the blood pressure cuff around the arm above the brachial pulse at the antecubital fossa.
- ▶ Palpate for the pulse, and apply a 'dab' of ultrasound gel.
- ▶ Best results are obtained when you hold the Doppler at a 45° angle on the surface of the gel. This maximizes the sound of the pulse.
- ▶ Using the Doppler, auscultate for the pulse.
- ▶ When the pulse is heard, pump the blood pressure cuff up until the sound vanishes, then slowly let the air out. Slowly deflate the cuff until the pulse signal reappears. The number at which the pulse first returns is the systolic pressure reading.
- ▶ Obtain the systolic pressure for each arm. The highest pressure will be used for calculating the ABPI in each foot.
- ▶ Confirm the presence of the dorsalis pedis and posterior tibialis pulses for each foot.
- ▶ Using the highest systolic pressure for the left foot, calculate the ABPI
- ▶ Using the highest systolic pressure for the right foot, calculate the ABPI.



Performing a Doppler assessment of a pedal pulse

Table 4: Interpreting Ankle Brachial Pressure Index

ABPI Reading	Possible cause of ulcer	Type of Compression	Examples of therapeutic bandaging
0.8 to 1.2	Venous disease	High: 30-40 mm Hg	Profore® Surepress® Fourpress® Based on client tolerance
0.6 to 0.8	Mixed venous and arterial	Moderate: 15 – 20 mm Hg	Coban® Tensor + Coban® Comprilan® + Coban®
Below 0.6	Arterial disease	Never	

Calculation

For the right foot, divide the highest systolic pressure obtained by the highest brachial pressure. Repeat for the left foot.

Example 1

The highest brachial systolic pressure you obtained is 150.

Right Foot

- ▶ In the right foot, the highest systolic pressure obtained is 100.
- ▶ The ABPI for the right foot is:

$$\frac{100}{150} = 0.66$$

Left Foot

- ▶ In the left foot, the highest systolic pressure obtained is 90.
- ▶ The ABPI for the left foot is:

$$\frac{90}{150} = 0.6$$

Interpretation: In this example, high compression is contraindicated.

Example 2

The highest brachial systolic pressure obtained is 120.

Right Foot

- ▶ In the right foot, the highest systolic pressure obtained is 120.
- ▶ The ABPI for the right foot is:

$$\frac{120}{120} = 1.0$$

Left Foot

- ▶ In the left foot the highest systolic pressure obtained is 90.
- ▶ The ABPI for the left foot is:

$$\frac{90}{120} = 0.75$$

Interpretation: In this example, high compression can appropriately be applied to the right lower leg but is contraindicated in the left lower leg. In the left leg, moderate compression would be suitable.

Summary

During the assessment of the client with a venous leg ulcer, it is essential to identify the cause of the wound and then to determine if the wound is healable. Many leg ulcers may have a mixed origin, that is, an ulcer may be a combination of venous and arterial disease.

Section 2: Clinical Plan of Care

Overview

In this module you will learn:

- ▶ Effective wound cleansing
- ▶ Adjunctive therapies for venous leg ulcers
- ▶ Essential elements of clinical education for wound healing and participation in wound care
- ▶ Roles and benefits of a multidisciplinary team

Learning Objectives

After completing this section you will be able to:

- ▶ Describe the process for cleansing venous leg ulcers
- ▶ Identify 5 adjunctive therapies which may contribute to wound healing and prevent ulcer reoccurrence
- ▶ Create detailed, written client instructions for skin care and use of compression stockings
- ▶ Describe the roles and contributions of 8 members of the multidisciplinary team

Treatment of Wound

- ▶ Wounds are cleansed with normal saline using a 35 mL syringe and 19 gauge angiocath for approximately 8 to 15 psi pressure. This helps remove slough and debris from the wound without detrimental effects to new granulation tissue.
- ▶ Wound bed may be gently swabbed with cotton tipped applicator to further debride fibrinous slough but it may be painful for the client. Aggressive scrubbing of wound base and margins can potentially disturb granulation tissue and epithelial migration.
- ▶ Following cleansing, periwound skin should be dried with gentle patting.
- ▶ A hydrofibre may be used to contain the exudate. It should be cut to fit the size of the wound to minimize maceration potential to the periwound skin. Two layers may be used to promote vertical wicking.
- ▶ A barrier ointment to protect periwound skin and eliminate maceration should be applied. Zinc ointment or petrolatums are appropriate choices.

CASE STUDY

Treatment

After reviewing Mr. A's clinical history and assessing the venous leg ulcer, determining tests to be performed and interpreting the results will guide the plan of care.

Mr. A has evidence of venous disease bilaterally and has an ABPI of 0.98 on his right leg and 1.00 on his left. He has no history of contributing factors for arterial disease (no smoking or diabetes). He would benefit from compression bandaging on both limbs to reduce the edema, facilitate venous return, maximize wound healing to the right leg and reduce the risk of ulcer recurrence to the left leg. A discussion of this plan with Mr. A, his family and his primary care provider is required.

Once compression is applied, Mr. A should be advised to check his toes frequently and if there is pain in his foot or leg, or a change in colour he is to call the nurse. He should also be told that he could loosen or remove the bandages if a problem developed.

Once all ulcers are healed, he should be measured and fit for graduated compression stockings.

Table 5: Treatments for Various Leg Ulcers

	Venous	Arterial	Diabetic
Treatment	Compression or resistance bandaging, ambulation, exercise, elevation	Control risk factors, avoid trauma, prevent infection, promote collateral circulation, avoid cold	Off-loading, proper foot wear, regular inspection of feet, glucose control.
Medications	Trental, analgesics, NSAID, ASA	Minitran Nitro patch	Oral glycemc agents, insulin

Adjunctive Therapy

- ▶ Physiotherapy is helpful to assess ankle joint mobility. A mobile ankle improves pump function and maximizes venous return.
- ▶ Intermittent Compression Therapy (IPC) may be considered as an adjunct to compression bandaging if it is determined that a client has limited mobility and/or there is insufficient calf muscle pump activity. Optimal effects to reduce limb edema are achieved prior to application of compression bandages.
- ▶ Obesity is an ongoing risk factor for venous hypertension and predisposes clients to ulcer recurrence.
- ▶ Electrical stimulation is one option that is beneficial to venous ulcer healing.
- ▶ Hyperbaric oxygen may be used for non-diabetic clients and clients with no history of atherosclerosis or diabetes.
- ▶ Ultrasound therapy may be used to reduce the size of the wound.

CASE STUDY

Adjunctive Therapy

In Mr. A's case, Intermittent Compression Therapy is not considered as Mr. A's mobility is not limited at this time.

As obesity is a risk factor for ulcer reoccurrence, providing Mr. A with a nutritional consult may help with weight reduction and maintenance of an optimal nutrition status for wound healing.

Client Education

There are essential elements for clients to understand about venous disease which can minimize recurrence of venous leg ulcers. Clients participate in their care more actively when they understand why certain treatments are necessary and the benefits of those treatments. Ultimately, clients wish to maximize their quality of life. The essential elements of the education plan are:

- ▶ To promote healing, provide the rationale for wearing compression bandaging at all times.
- ▶ Following healing, explain why compression stockings are worn for the rest of their lives, which is a major lifestyle change.
- ▶ To promote understanding that stockings are replaced every six months as the stretch in the elastic reduces over time and with washings. Cost for the stockings is discussed along with alternative options.
- ▶ Provide stocking fitting information, including locations where this can be completed. Written instructions are preferred, as the client will have them for future reference.
- ▶ Explain that compression bandages should be removed if they slip down the leg and reapplied to control edema.
- ▶ Provide rationale for frequent lubrication of lower legs to soften and remove scales.
- ▶ Explain that dietary factors should be adhered to in order to promote wound healing and reduce risk factors related to obesity.
- ▶ Provide written instructions and diagrams for foot exercises to increase understanding and reinforcement of the information.

Client Education on Skin Care

Skin care is a vital element to promote wound healing and prevent recurrence of venous leg ulcers. The following information is provided to clients as recommended practices:

- ▶ Shower before wrapping of compression bandages.
- ▶ Avoid harsh soaps or highly perfumed soaps.
- ▶ Soothe any local skin irritation with a moisturizing cream. Avoid creams with perfumes, aloe and lanolin, as these products increase the risk of dermatitis.
- ▶ Monitor skin for potential reactions, and if present, contact your care provider.
- ▶ Discuss long-term use of steroids with your care provider.

CASE STUDY**Client Education**

An essential component of Mr. A's plan of care is the implementation and documentation of a full teaching plan. As Mr. A's ulcer is a recurrence, it is stressed that he wear compression bandaging as his ABPI is 0.98. Reviewing client's understanding aids in identification of knowledge gaps.

- ▶ Mr. A needs to eliminate restrictive clothing such as socks, in order to be able to have effective and even compression.
- ▶ Each day, following the removal of the high compression bandaging to his right leg, Mr. A must wash his leg with warm water and a mild soap, thoroughly dry and moisturize it prior to reapplying the compression system.
- ▶ Mr. A should be instructed to modify his level of activity to reduce limb discomfort related to edema and to promote venous return. Increased activity promotes weight loss. Suggestions for Mr. A would include:
 - Elevation of legs above heart level while on break at work and periodically at home
 - Avoiding crossing his legs
 - Regular foot exercises, with foot flexion and extension, plus rotation of the ankles
 - Daily regular walking
 - Avoid sitting for long periods.

When wound healing is achieved, Mr. A should be encouraged to have periodic follow-up. This has been shown to reduce ulcer recurrence.

Multidisciplinary Team

To maximize a positive outcome, a team based approach is of value. Team members may include:

- ▶ *The client* – the most important member. The multidisciplinary team will hear and understand the client's wishes and guide the plan of care
- ▶ *Physician* – to monitor overall health status
- ▶ *Nurse* – to optimize wound care and compression bandaging
- ▶ *Enterostomal Therapist Nurse* – to assess, plan and implement treatment plan
- ▶ *Dietitian* – to optimize nutritional intake and help reduce weight when necessary

- ▶ *Physiotherapist* – to teach and monitor foot and lower leg exercises.
- ▶ *Compression stocking specialist* – to assist with permanent stockings fitting once healing has occurred. This person will also ensure the client can apply the stockings independently.
- ▶ *Infectious Disease Specialist* – to assess for and monitor identified infection.

Summary

The clinical plan of care for venous leg ulcers is a multifaceted approach which can include proper wound cleansing, compression bandaging, adjunctive therapy and client education, with involvement of a multidisciplinary team. For the client with venous disease, compression bandaging that suits the client's clinical status and comfort should be implemented. Client teaching is completed at every stage of the treatment plan with ongoing assessment of understanding of information being provided.

Section 3: Compression and Resistance Bandaging

Overview

In this module you will learn:

- ▶ Types of compression bandaging
- ▶ Types of resistance bandaging
- ▶ Clinical application for the various compression and resistance bandaging

Learning Objectives

After completing this section you will be able to:

- ▶ State the common forms of high compression
- ▶ Identify 3 different methods of moderate compression
- ▶ Identify 2 resistance systems
- ▶ State key considerations when applying compression or resistance bandaging

Basic Principles of Compression or Resistance Bandaging

Client teaching is the first step. Explain the proposed treatment and describe the expectations of the treatment plan. Continuous assessment of client knowledge of treatment plan promotes active participation.

Compression and resistance bandaging systems should only be applied when vascular status has been safely established. Compression is appropriate for mobile and non-mobile clients.

Assessment

Wound care beneath compression or resistance type bandaging is determined by the condition of the ulcer and surrounding skin. Usually the venous ulcer is managed to minimize infection and optimize moisture levels in the wound. Individualized care planning incorporating client and wound assessments will guide wound healing and positive outcomes.

Assess pain and client's method for pain management. Always consider what is most comfortable for the client.

Ensure ankle circumference is greater than 18 cm. Assess the leg and foot and whether the ankle and calf are proportionate to the leg. This may present as an 'hour glass shape'. If there is a disproportion, a pad application to thinner areas will ensure a smooth wrap and protect pressure areas and bony prominences.

Application

When applying compression or resistance bandaging, have client dorsiflex the foot at 90 degree. This minimizes the amount of wrap over the anterior ankle and avoids skin breakdown in that area.

Start wrapping at the base of toes, careful not to enclose the small toe and continue to 2 – 3 fingers below the popliteal crease. Ensure heel is fully enclosed. Use figure 8 method to wrap around the foot and ankle, covering the heel (heel lock) which secures the bandage in this area to prevent slippage. When the area below the knee is reached, cut off excess bandaging. Do not rewrap down the leg or wrap several layers around the area below the knee.

When a tensor is applied in a figure 8 versus a spiral fashion, the compression is increased by approximately 8 –12 mm Hg.

Leg wraps are applied in a spiral fashion, with 50% overlap, unless ordered otherwise.

PRACTICE ALERT

Never apply modified or high compression without a doctor's order. It should only be applied by trained health professionals.

PRACTICE ALERT

Only apply a compression wrap in a figure 8 method if ordered by the physician.

Package inserts and your local wound care specialist are resources for additional guidance.

Instruct clients to wear larger shoes for the duration of compression treatment. Wearing regular shoes may lead to complications such as excess pressure on foot and unraveling of bandaging leading to ineffective treatment.

Profore® systems and orthopedic wool are discarded after each use.

Comprilan® and Surepress® bandages can be reused up to 20 times, however it will be required to be washed with cool water and mild soap, rinsed and dried.

Compression Bandaging Systems

To compensate for poor venous return compression bandaging via elastic type wraps provides both a high working and resting pressure. Because there is high pressure at rest, this type of bandaging is suitable for non-ambulatory clients.

A few types of compression bandaging systems are noted in *Table 4*. Compression is usually considered as high or moderate compression.

Frequency of Treatment and Compression

The frequency of application for compression bandaging depends on the wound status and amount of exudate. Adjust treatment plans according to wound status and drainage. If there is no decrease in the size of a wound in 3 weeks, wound management needs to be reassessed as the treatment being used may not be promoting healing.

Comprilan® or Surepress® may each be left on up to 2 – 3 days if swelling is controlled and there is no slippage creating more pressure. Profore® may be changed 2 – 3 times a week, but after a couple of weeks of treatment, it can be left on for 7 days.

When daily changes are required, cost effectiveness will guide the type of bandage being used.

High Compression

High compression, 30 – 40 mm Hg can be obtained with the Profore®, Fourpress® and Surepress® systems.

Profore® regular and Fourpress®

These similar systems, each with 4 layers, are designed to apply 40 mm Hg compression when applied according to the manufacturer's recommendations. Each is available in non-latex material.

The 4 layers are:

1. *Orthopedic wool* – helps absorb and pads. An extra layer over the front of the lower leg can be used if bone is prominent. This layer is not reusable.

Apply in a spiral fashion, with 50% overlap.

2. *Cotton layer* – smoothes out bottom layer. If client is allergic to wool, you can switch layer 1 & 2 and put on in the reverse order.

Apply in a spiral fashion, with 50% overlap.

3. *Elastic layer*

When ordered, apply in a figure 8 from the base of the toes up to 2 – 3 fingers below popliteal space with 50% overlap. Follow the yellow line to guide you for the 50% overlap. Use only 50% stretch.

4. *Cohesive layer*

Apply in a spiral fashion, with 50% stretch (just engaging the elastic) and 50% overlap.

Surepress®

This is a 2 layer system designed to provide 40 mm Hg compression. To hold the outer layer in place you may use Tubifast or strips of adhesive.

The layers include:

1. *Orthopedic wool* – often ordered as Surepress® padding.
Apply in a spiral fashion with 50% overlap. This layer is not reusable.
2. *Elastic layer* – Washable up to 20 times, an elastic layer with small and large rectangles on one side of the bandage. It is designed for varying ankle circumferences. To achieve desired compression the appropriate rectangle is stretched to become a square.

Apply in a spiral fashion with 50% overlap.

If the ankle circumference is between 18 – 26 cm, use the small rectangles as a guide and stretch the bandage until the small rectangles become squares

If the ankle circumference is greater than 26 cm, use the large rectangles as a guide and stretch the bandage until the large rectangles become squares.

Be careful when applying this layer that you do not pull what has been previously applied, tighter. Hold the area already wrapped as you stretch the bandage.



An example of the 1st 3 layers of high compression bandage



Finished high compression bandage

Moderate Compression

Moderate compression, 15 – 25 mm Hg, can be achieved using a variety of combinations:

- ▶ Orthopedic wool and Coban®
- ▶ Orthopedic wool, tensors, and Coban®
- ▶ Orthopedic wool, Comprilan® and tensors
- ▶ Orthopedic wool, Comprilan® and Coban®
- ▶ Profore® lite

The physician will specify the required combination in addition to the layers and if they are to be applied in a figure 8 method. Try various combinations to determine the best treatment for each client.

When clients are sensitive to wool, ordinary roll bandage can be used. The majority of roll bandages available have a 'silky' texture, and therefore will require additional monitoring for slippage. If this occurs, the wrap may need to be applied more frequently.

Coban® is a single use product. Comprilan® and tensors can be washed in warm water and dried. Monitor tensors for full elasticity to ensure desired compression.

Resistance Bandaging Systems

Resistance or non-elastic systems provide high working pressure and low pressure at rest. Therefore, this system works best for mobile clients. Each layer is applied in a spiral fashion with 50% overlap, and 50% stretch unless otherwise ordered. The systems available include:

- ▶ Unna Boot®
- ▶ Duke Boot®
- ▶ Comprilan® with roll bandage or orthopedic wool

Unna Boot®

A simple system used before elastic bandaging was available. It is two layers, applied once or twice a week. Any opening in the wrap removes the resistance and creates an outlet for the venous pressure. The layers are:

1. *Ichthopaste* or *Viscopaste* – roll bandage with plaster mixture imbedded in gauze. Clients may react to one product and may need to switch to the other.

Apply in a spiral fashion from base of toes to 2 – 3 fingers below popliteal space. Do not pull tight while wrapping. Cut off excess when top level is reached. This is often applied directly over the wound.

PRACTICE ALERT

'Windows' should not be cut for wound care.

2. Roll bandage – can apply 1 or 2 layers

Apply in a spiral fashion with 50% overlap.

Duke Boot®

A Duke Boot® is an Unna Boot® with an additional layer of cohesive bandaging. There are numerous methods for this system, therefore the physician's order should be followed. In theory, because of the cohesive bandaging, this system does have some compression. Some of the combinations include:

- ▶ Unna Boot® plus Coban® in 50% stretch
- ▶ Unna Boot® plus 1 or 2 layers of orthopedic wool and Coban®

Some clients with venous disease may also have dermatitis that can present a challenge when selecting the best system to promote wound healing. Comprilan® is elastic free, therefore it may be substituted for the 2nd layer.



Duke Boot®

Summary

There are a variety of compression and resistance systems that can be used to effectively facilitate venous return and optimize healing of a venous leg ulcer. The key is to work with the care provider team to select the best treatment options, then individualize the management plan which provides the maximum comfort. The goal is to heal the ulcer, and help clients return to their normal lifestyle without jeopardizing quality of life.

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Product Monographs

- ▶ Leg Ulcer Protocols, Smith & Nephew Inc.
- ▶ Profore® Four Layer Bandage System, Product Information Package, Smith & Nephew.
- ▶ Comprilan® Short-stretch Bandage, Product Information Package, Beiersdorf – Jobst Company.
- ▶ SurePress® High Compression Bandage, Product Information Package, ConvaTec Organization of Leg Ulcers, ConvaTec

Internet Searches - terms used

- ▶ Compression bandages
- ▶ Diabetic ulcers
- ▶ Leg ulcers: venous and arterial
- ▶ Wound care

Glossary of Terms

Developed by the RNAO Guideline Development panel for *Assessment and Management of Venous Leg Ulcers*.

ABPI (Ankle Brachial Pressure Index): Use of the brachial systolic pressure and the ankle systolic pressure. It gives an indication of arterial perfusion. The normal value is 1.0 (Resting Pressure Index).

Compression bandaging: The deliberate application of pressure using elastic bandages.

Doppler ultrasonography (in leg ulcer assessment): The use of very high frequency sound in the detection and measurement of blood flow.

Duplex ultrasonography: The combination of B mode grey scale ultrasound scanning and colour Doppler flow which gives an image of the vessel and velocity of the blood within. This is currently considered the gold standard in venous and arterial assessment.

Edema: The presence of excessive amounts of fluid in the intercellular tissue spaces of the body.

Electrical Stimulation: The use of an electrical current to transfer energy to a wound. The type of electricity that is transferred is controlled by the electrical source.

Exudate: Fluid, cells or other substances that have slowly been exuded or discharged from other cells and blood vessels through small pores or breaks in the cell membranes.

Gaiter: The area 2.5 cm below the malleolus to the lower one third of the calf.

Graduated high compression bandaging: Pressure between 35-40 mm Hg at the ankle graduating to half at calf in the normally shaped limb, as per La Place's Law.

Hemosiderin staining: grayish brown hyperpigmentation caused by extravasation of red blood cells into the tissues, colour from the breakdown of red blood cells.

Hyperbaric Oxygen: Oxygen at greater than atmospheric pressure that can be applied either to the whole patient inside a pressurized chamber or to a localized area (such as arm or leg) inside a smaller chamber.

Infection: The presence of bacteria or other microorganisms in sufficient quantity to damage tissue or impair healing. Clinical experience has indicated that wounds can be classified as infected when the wound tissue contains 10⁵ or greater microorganisms over gram of tissue. Clinical signs of infection may not be present, especially in the immuno-compromised patient or the patient with a chronic wound.

Lipodermatosclerosis: “Woody fibrosis”, deposit of fibrin in the deep dermis and fat results in a woody induration of the gaiter area of the calf. May attribute to the “inverted champagne” appearance of the lower leg.

Low resting pressure: When the muscle is relaxed, superficial veins are able to fill.

Maceration: The breakdown of the epidermis (skin) as a result of prolonged exposure to moisture.

Malleolus: Ankle bone

Photoplethysmography: Photoplethysmography uses infra-red light to assess changes in the blood volume in the microcirculation. This provides information about the presence of deep or superficial venous disease and the effectiveness of the calf muscle pump.

Stasis dermatitis: Eczema of the legs with edema, pigmentation, and sometimes chronic inflammation. It is usually due to impaired return of blood from the legs. Compression stockings help the rash to resolve.

Toe Pressure: see photoplethysmography.

Varicose veins: A distended, engorged vein, usually as a result of incompetent valves or local trauma. The long saphenous vein is most commonly affected.

Venous Leg Ulcers: Wounds that usually occur on the lower leg in people with venous insufficiency disease (www.WoundCareDirect.com). Venous leg ulcers are also known by such terms as venous stasis ulcer and venous insufficiency. Ulcers result from chronic venous hypertension caused by the failure of the calf muscle pump.

Venous Ulcer: Partial to full thickness ulceration of the lower leg precipitated by venous hypertension and venous insufficiency.

Venous Hypertension: Back pressure on the venous system exerted either from central or pulmonary sources, or from extrinsic compression syndrome. Example: a mass, tumor or tight girdle.

Venous Insufficiency: An obstruction that blocks outflow, valvular incompetence, which permits retrograde flow, or muscle pump failure, resulting in incomplete emptying of the venous system in the lower leg.