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Peripheral Edema, Part 2: Management

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Goals. The goals of this two-part lesson series are to describe causes and symptoms of peripheral edema, and provide information on its management.

Objectives. At the conclusion of this lesson, successful participants should be able to:

1. list the common causes of peripheral edema;
2. identify appropriate pharmacologic and supportive treatment for peripheral edema;
3. explain the health benefits of elastic support hosiery; and
4. describe the proper use of elastic support hosiery to maximize benefit.

Introduction

This is the second in a two-part lesson series that discusses peripheral edema and its management. It includes a brief discussion of pharmacologic therapy and provides an in-depth review of adjunctive treatment including the use of elastic support hosiery. It concludes with information that can be used in counseling patients on peripheral edema and the use of support hosiery. Part 1 presented basic considerations about peripheral edema, including its causes and factors that aggravate it.

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Understanding the Common Causes

Table 1 lists examples of common causes of peripheral edema.

Prolonged Standing or Sitting. Prolonged standing and inactivity are common causes of peripheral edema. It can develop in an otherwise healthy individual who remains immobile for long periods.

Long Automobile Rides or Airplane Flights. Once a person settles into a cramped seat, fluid may soon begin to collect in the extravascular (i.e., interstitial) spaces in the legs. The amount may not be massive, but the process is nevertheless underway. This is why it is recommended that individuals, especially those who are prone toward developing peripheral edema, not remain inactive for a long period. It is common to see seasoned airline travelers flexing their leg muscles to help reduce fluid build-up in those tissues. In addition, they may get up often and walk around.

Menstrual Periods. Many, but not all, women report significant swelling in their legs during their menstrual period. Elastic hosiery or mild diuretics often benefit women during these periods.

Pregnancy. A number of factors associated with pregnancy may incite edema, both generalized and, more often, peripheral. Hormonal changes are a major consideration due to their effect on sodium and fluid retention. Pregnancy increases the total blood volume by about 20 percent. This extra volume, plus the weight of the fetus, imposes significant compression up the pelvic veins, which can decrease the venous return from the legs and cause peripheral edema.

Some women are restricted in their physical activity during pregnancy, or even confined to bed. This lack of activity may reduce the flow of venous blood since muscular contraction enhances blood flow.

Hypersensitivity Reactions. Hypersensitivity (i.e., allergic) reactions may damage the capillary wall. Fluid lost from the vasculature into the body's interstitial

Table 1
Common Causes of Peripheral Edema

- Prolonged standing or sitting
- Long airplane flights/automobile rides
- Menstrual periods
- Pregnancy
- Hypersensitivity reactions
- Venous insufficiency/varicose veins
- Lymphatic insufficiency
- Injury or trauma to ankle or foot
- Medical treatment/surgery
- Environmental factors
- Excessive dietary sodium
- Drugs

Table 2
Questions for Patients with Peripheral Edema

- Is the swelling confined to one side (unilateral) or is it present on both sides (bilateral)?
- Is pain present? If so, how much, and where does it hurt?
- Are there any changes to your skin, such as rash or sores?
- Is there a history of trauma to the legs?
- What is your recent travel activity?
- What kind of foods do you eat and how much do you eat each day? How much salt do you use?
- What other symptoms are present, even if they do not seem to be directly associated with your legs?
- Is there any change in your urinary volume?
- Do you feel back pain, or have a fever, chills, or sweats?
- Is there a possibility you are pregnant or have a gynecological problem?
- Has a doctor or other health care provider ever told you not to wear support hosiery? If yes, what was the reason?

spaces can produce edema that is usually nonpitting, localized, and accompanied by other signs of inflammation.

Lymphatic Insufficiency. The lymphatic system transports protein and large particulates from the tissue spaces back into the blood. In cases of intense lymphatic injury, the individual cannot maintain the required concentration gradient between blood and interstitial fluid. The outcome would be mass movement of fluid and protein from the vasculature into the interstitial spaces, with resultant edema.

Injury and Trauma. Injury or trauma to the lymphatic system, capillaries, or veins may destroy them. Fluid loss from the vasculature into the interstitial spaces, as noted above, may occur and peripheral edema follows.

Environmental Influences. Environmental factors may include thermal burns, sunburns, and insect bites. All of these may damage the capillaries or other structures.

Venous Insufficiency/Varicose Veins. One might contemplate the question: which came first, venous insufficiency (i.e., collection of fluid) or varicose veins? In a person with varicose veins, the veins are dilated and tortuous (twisted or crooked) with significant swelling. So the issue is, did the varicose veins cause edema, or did the individual's predisposition to edema actually cause the veins to dilate over time? The point is that individuals with varicose veins often have severe peripheral edema.

Medical Intervention/ Surgery. Medical intervention and/or surgery may damage a capillary bed or component of the lymphatic system. This may disrupt normal venous outflow and result in fluid retention.

Dietary Sodium. A diet rich in sodium adds to the ionic load of the blood. This increases the osmotic pressure, which attracts more fluid. As the fluid load increases, it raises the hydrostatic pressure of blood and, in turn, increases the amount of fluid that may move from the vasculature into the interstitial tissue spaces.

Drugs. Estrogens, progestins, and some antihypertensives are included as potential causative or aggravating factors in peripheral edema because they dilate the arterials and, therefore, lower blood pressure. That dilation may result in some movement of fluid outward. Certain antidepressants such as phenelzine are known inciters. Calcium channel blockers and corticosteroids that possess high mineralocorticoid activity are classic causes of peripheral edema. The NSAIDs as a group are listed because of their action to retain sodium.

Pharmacologic Treatment

Treatment for peripheral edema may include both pharmacologic and/or nonpharmacologic measures. Significant edema (generalized or severe peripheral edema, but not lymphedema) is treated with diuretics. Specific therapy will be included if needed to modify the underlying cause, such as digitalis in congestive heart failure. Otherwise, most uncomplicated cases are managed suitably by nonpharmacologic means, such as the use of elastic support hosiery.

Table 2 lists questions directed to patients with peripheral edema to determine the extent of his or her condition. The answers will help design a therapeutic profile tailored to treatment of the specific underlying cause(s) and direct specific treatment to alleviate symptoms.

Herbal Treatment

The first remedy to be used as an effective treatment for edema was an herb. Dr. William Withering's comments, more than 200 years ago, relating to use of the foxglove plant (*Digitalis purpura*) in the treatment of dropsy are classic to pharmacology. Many products containing herbal remedies were available without prescription into the early-1980s and touted to treat peripheral edema. They were often used without professional supervision.

Meanwhile, American consumers and many health care providers seem to have come full cycle in their thinking about the potential value of herbs for self-medication of peripheral edema. One remedy, butcher's broom (*Ruscus aculeatus*), is a member of the Liliaceae family native to Mediterranean Europe and Africa. It contains a combination of alkaloids, sparteine, traces of steroids, and coumarin. The herb is claimed to possess a wide range of pharmacologic actions, and herbalists have recommended it for centuries for treatment of various ailments. These include anti-inflammatory and vasoconstrictor effects. Peripheral edema is listed among the maladies for which butcher's broom has been used.

Supportive Treatment

While pharmacists do not initiate pharmacologic treatment plans for patients with edema, they can play a primary role in working with patients and physicians to determine appropriate and effective supportive treatment. In the absence of identifiable serious pathology, oftentimes properly fitted support hosiery is all that is needed to effectively control peripheral edema. Recommending supportive treatment begins by assuring that patients understand at least fundamentally how the factors listed in Table 1, and described above, contribute to peripheral edema.

Avoid Prolonged Standing or Inactivity. This is of extreme importance to any person with peripheral edema. Reasons have been stated previously.

Elevate Edematous Legs. When sitting for prolonged periods such as in front of the television, the legs may be elevated to bring them in alignment with the heart. This will reduce the hydrostatic pressure in the feet and distal legs and improve venous return. In severe cases, the individual may lie back and elevate the legs above the body.

Avoid Placing Hard Objects Under the Knees when Reclining. The venous system that returns blood from the feet is located on the backside of the legs, behind the knees. It doesn't take much pressure applied to that site, especially in thin individuals and those without well-developed leg muscles, to impede blood flow.

Avoid Constricting Clothing. Clothing that has tight elastic bands and/or fits snugly around the upper leg should be avoided. Constriction at these points can greatly reduce venous blood flow.

Avoid Tight-fitting or High-heeled Shoes. Tight-fitting shoes may restrict blood flow from the feet. High-heeled shoes change the natural angle of the feet and legs during walking and, thus, alter the natural physiology of the venous return from the feet. Blood flow may be hampered sufficiently to increase swelling in the feet.

Restrict Sodium/Salt Intake. Sodium increases the blood's osmotic pressure. This in turn increases its volume and hydrostatic pressure, thus favoring net movement of fluid from intravascular to extravascular sites.

Avoid Alcohol and Excessive Heat. Both are generalized vasodilators and can lead to excessive leakage of fluid from the vasculature.

Wear Support Hosiery. Support hosiery serves as a mechanical adjunct to the venous pump to aid in the movement of blood from the feet and legs back to the heart.

Graduated Compression Support Hosiery

Compression support hosiery provides support to the legs in the amount and at sites needed. The area most distal from the heart, where the hydrostatic pressure is greatest, receives the most pressure, with lessening pressure moving up the leg. This correlates with the hydrostatic pressure present at various levels along the length of the leg. Therefore, venous blood flow is aided, edema is reduced, and swelling is decreased. It may help one's understanding of the graduated compression feature by inserting a hand inside the stocking all the way to the toe, then pressing outward with the fingers. As the hand is withdrawn, one can feel the gradual lessening of elasticity all the way to the top, where it is least. That decreasing pressure from the ankle to the top of the hose represents how graduated compression support hosiery differs from other, less expensive support hosiery.

Fitting Support Hosiery. Support hosiery must be fitted correctly. There are many ready-to-wear products available to the consumer in pharmacies and elsewhere. Their manufacturers provide charts that aid in selection of the proper size. These grids are usually based on the individual's weight and height, or calf measurement and distance from the floor to the bend in the knee.

Support hosiery is available as open- or closed-toe styles, and below-knee or thigh-high styles. Some individuals prefer closed-toe hosiery because they feel the open-toe variety rolls at its edges to create a zone of discomfort. Others prefer the open-toe style because of fashion considerations or because it permits better aeration of the feet to keep them cooler. Either style, when fit properly, will meet the needs of most if not all persons with peripheral edema.

Hosiery that comes only to the knee is adequate when peripheral edema is confined to the lower leg. The thigh-high or pantyhose styles are necessary when the edema involves the entire leg or at least the upper portion. The choice will be based on specific needs, as well as personal preference.

Potential Candidates for Support Hosiery. Many individuals with peripheral edema are 40 years of age or older, representing a sizeable percentage of the population. Women of childbearing age are potential users. Other potential target groups, estimated to total 15 percent to 20 percent of the population, include individuals who have various venous disorders, lymphatic insufficiency, and any individual with impaired mobility (e.g., those who are wheelchair-bound or have severe arthritis in the legs).

Persons who spend considerable time on their feet, whether old or young, may benefit from support hosiery. This group includes pharmacists, restaurant servers, teachers, barbers and hair stylists, and flight attendants whose comfort will be improved by wearing support hosiery.

Support Hosiery Benefits People with Peripheral Edema

A study published in *J Occup Environ Med* (1997) evaluated two different treatment modalities in 114 meat factory workers whose

jobs required prolonged standing. All workers had a history of venous insufficiency, which included a wide variety of conditions including varicose veins. All reported a pre-study positive history of leg pain and peripheral edema. Study participants were placed into one of three groups. Over a three-month period, subjects in one group wore support hosiery each day while at work. Subjects in the second group stood on rubber mats during the work day. A third group served as controls and was left to work in an unaltered environment. Leg pain (subjective measurement) and leg volume (objective measurement) were recorded to determine swelling.

After the three months, the outcome favored the use of support hosiery. Forty-three percent of the workers who wore the stockings experienced decreased leg volume, versus 14 percent of the individuals who stood on a rubber mat. Before the trial began, 70 percent of individuals in the support hosiery group had complained of leg pain. By the end of the study, only 27 percent still reported leg pain. There was no significant difference in the number of complaints from the individuals who stood on rubber mats. The study concluded that support hosiery outperformed rubber floor mats for alleviating both subjective and objective complaints associated with peripheral edema.

Thirteen percent of the hosiery-wearing workers complained of ill-fitting stockings, indicating that the stockings felt too tight at the top. The study's authors indicated they believed that if the hosiery had been professionally fitted to each individual's needs, their ability to reduce leg pain and edema would have been even more significant in favor of the use of support hosiery over rubber floor mats.

Advising Patients on Support Hosiery

It is wise to advise patients to consult a physician if it appears there is a serious underlying problem. If so, the person should be encouraged to schedule a later afternoon appointment, rather than early morning. This will help the physician make a more accurate assessment, since symptoms will be most intense later in the day.

To minimize edema, support hosiery should be put on before getting out of bed. If the person must get out of bed before putting on support hosiery, he or she can lie down for another 15 minutes or so before putting on the hosiery. If swelling results in the toes in open-toe styles, or anywhere along the leg with either variety of stockings, the hosiery should be removed. Swelling may indicate that the hosiery has not been fitted properly and it is providing too much compression at its top edge upon the venous return. If the support hosiery is not effectively managing the edema, it is also possible that the chosen level of compression is too low.

Unless a physician recommends that support hosiery be worn during sleep, they need not be. While sleeping, the person is usually lying prone, and peripheral edema is minimized because the hydrostatic pressure is close to zero.

If hosiery irritates the skin or causes a rash, it may be the laundry soap used to wash them that is responsible. Patients can change to a different brand if this is suspected until a product is identified that is not irritating. They should rinse their hosiery thoroughly to remove all traces of soap. The support hose material, including lycra, is durable and will last a long time if treated according to manufacturers' care instructions. Hand-washing and air-drying the product will increase its length of service.

The hosiery should be observed carefully throughout the period of wearing for folds or wrinkles. Even a very slight buckling may act as a tourniquet to increase the pressure underneath sufficiently to occlude the venous return.

Patients should avoid using elastic bandages to wrap their legs in an attempt to substitute for properly fitted support hosiery. No matter how carefully the bandage is applied, the pressure will be uneven, perhaps even inadvertently greater near the top of the leg than near the toe. Also, elastic bandages may roll or wrinkle around their edges, especially on larger people. This may hamper venous blood flow for reasons explained previously.

Individuals with severe occlusive arterial pathology, such as Raynaud's disease and others with infections or allergies of the skin on their legs should not wear support hosiery without their physician's approval because the hosiery may decrease arterial blood flow into the tissues of the leg. The result may be increased leg pain upon walking or prevention of healing and/or exacerbation of skin rash and discomfort.

Summary

The incidence of peripheral edema is common among persons residing in the U.S. When advising patients on this condition, it is important to remember that most cases can be managed effectively with elastic support hosiery.