



Postthrombotic Syndrome

Sara R. Vazquez, PharmD, BCPS, CACP; Susan R. Kahn, MD, MSc, FRCPC



Postthrombotic syndrome (PTS) is a problem that can develop in nearly half of all patients who experience a deep vein thrombosis (blood clot) in the leg.^{1,2} PTS symptoms include chronic leg pain, swelling, redness, and ulcers (sores). It can be expensive to treat and make it difficult for you to get around, and the pain and discomfort can make your life less enjoyable. The best thing to do is to prevent this problem whenever possible.

What is PTS?

The veins deep in our legs have tiny valves that control the direction of blood flow. A blood clot in a leg vein can cause inflammation and block blood flow, causing damage to these valves. When valves are damaged, they can become leaky, allowing fluid to pool around the ankle. A blood clot that does not fully heal can also block blood flow. This makes the leg painful, swollen, and sometimes red (the Figure).³ As PTS worsens, poor blood flow in the leg can cause leg ulcers, which can be difficult to treat.^{2,4}

How Do I Know if I Have PTS?

Some patients are more likely to get PTS than others. Here are things that make it more likely for someone to have PTS (Table 1)^{2,4,5-7}:

- Having a blood clot above the knee (proximal deep vein thrombosis)
- Having more than 1 blood clot in the same leg more than once
- Still having blood clot symptoms 1 month after being diagnosed with the blood clot
- Being very overweight
- Having trouble keeping your blood thinner levels where they should be during the first 3 months after starting blood thinner medication

The most common symptoms of PTS include the following (Table 1)²:

- Pain, aching, and swelling in the leg (which can be worse after walking or standing for a long time and better after resting or raising the leg)
- Leg heaviness
- Leg itching
- Leg tingling
- Leg cramping
- An ulcer (sore) on the leg

If you have any of these symptoms, you should see your physician. A physician can decide if you have PTS on the basis of these symptoms. No special testing is needed to find out if you have PTS.^{2,4}

Preventing PTS

The best way to prevent PTS is to prevent the blood clot from occurring in the first place. Some patients have a higher risk of getting blood clots, especially patients in the hospital who have had recent surgery or are confined to bed. Patients are often given compression boots, stockings, or medicine to prevent blood clots while in the hospital and even after discharge.⁸ If you are in the hospital and are not given any of these things, you should ask your doctor if you need blood clot prevention.

In a patient who has a blood clot in the leg, elastic compression stockings help keep fluid from pooling (collecting) in the ankle (edema).^{2,9,10} Elastic compression stockings are made of a special elastic. They are very tight at the ankle, and the tightness lessens as the stockings move up the leg. This tightness (compression) helps the leg

From the University of Utah Thrombosis Center, Salt Lake City, Utah (S.R.V.), and McGill University, Thrombosis Program, Division of Internal Medicine and Center for Clinical Epidemiology and Community Studies, Jewish General Hospital, Montreal, Quebec, Canada (S.R.K.).

Correspondence to Sara R. Vazquez, PharmD, BCPS, CACP, Clinical Pharmacist, University of Utah Thrombosis Center, 675 Arapleen Dr, Suite 100, Salt Lake City, UT 84108. E-mail sara.vazquez@hsc.utah.edu

(*Circulation*. 2010;121:e217-e219.)

© 2010 American Heart Association, Inc.

Circulation is available at <http://circ.ahajournals.org>

DOI: 10.1161/CIRCULATIONAHA.109.925651

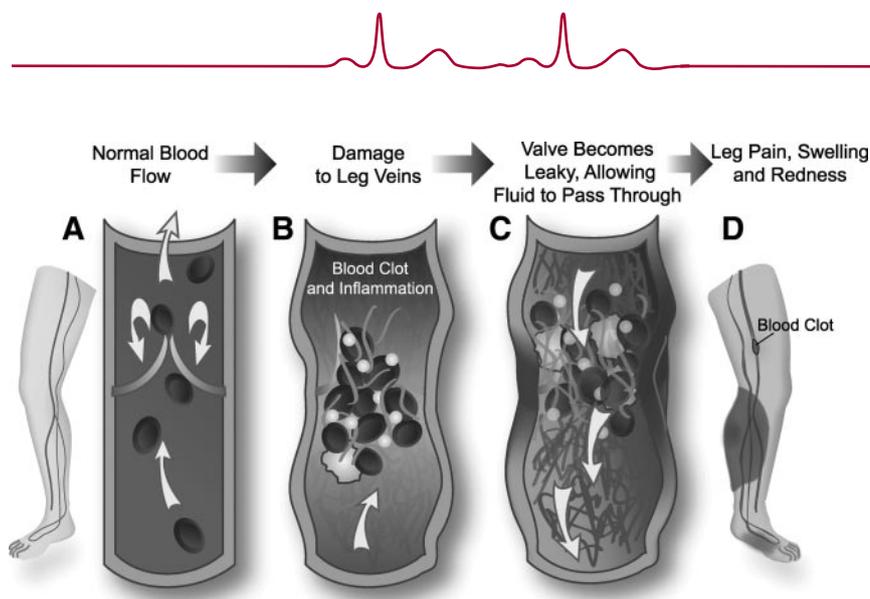


Figure. What is PTS? A, Valves in the leg veins help blood flow in the right direction. B, The blood clot and inflammation damage leg vein valves. C, The damaged valve becomes leaky and allows fluid to pool around the ankles. D, The leg becomes painful, red, and swollen. Modified from figure shown in Vazquez SR, Freeman A, VanWoerkom RC, Rondina, MT. Contemporary issues in the prevention and management of postthrombotic syndrome. *Ann Pharmacother.* 2009;43:1824–1835. Reproduced from Vazquez et al⁹ with permission from Harvey Whitney Books. Copyright © 2009 Harvey Whitney Books.

muscles squeeze the fluid back up in the proper direction, improving blood flow and decreasing leg pain.¹¹ You should start wearing these stockings as soon as possible after being diagnosed with a blood clot and should continue wearing them for at least 2 years.^{2,12}

Compression stockings come in different strengths (levels of tightness). These levels of tightness are measured in millimeters of mercury (mm Hg).

To obtain the right level of tightness to prevent PTS (30 to 40 mm Hg), you need a prescription from your doctor. You can get these stockings at some pharmacies or at most medical supply stores. The staff selling you the stockings should measure your leg so that you get the right size. The stocking should be worn during the day on the leg with the blood clot. It may be taken off at night (Table 2).

Treatment

Patients who get PTS are usually given stockings with a higher strength (30 to 40 mm Hg). If this is not effective at reducing swelling and other leg symptoms, a higher strength might be prescribed. Patients may also be given another type of device that puts pressure on the leg to improve blood flow.^{2,12} Patients who get leg ulcers because of PTS also need wound care, and a prescription medication called pentoxifylline may help heal the ulcer.^{2,12}

Additional Resources

Here are some Internet links that will give you more information about PTS and the use of compression stockings:

- Combs J. To hose or not to hose, that is the question: North American Thrombosis Forum. Available at: <http://natfonline.org/eThrombosis/?P=482>.
- Bussey, HI. ClotCare online resource. Available at: http://www.clotcare.com/clotcare/faq_postthromboticsyndrome.aspx.
- Routhier N, Kahn SR. Venous Disease Coalition: post-thrombotic syndrome. Available at: <http://www.venousdiseasecoalition.org/diseaseinfo/pts/>.
- National Alliance for Thrombosis and Thrombophilia. Postthrombotic syndrome (venous stress disorder): an

Table 1. What I Need to Know About PTS

Risk factors

- Having a blood clot above the knee (proximal DVT)
- Having >1 blood clot in the same leg more than once
- Still having blood clot symptoms 1 mo after being told you have the blood clot
- Being very overweight
- Having trouble keeping your blood thinner levels where they should be during the first 3 months after starting blood thinner medication

Signs and symptoms

- You have had a blood clot in the leg and have
 - Leg pain and swelling that is worse after long periods of walking or standing and is better after resting or raising the leg
 - Leg heaviness, itching, tingling, cramping
 - Leg ulcer (sore)

Prevention

- Prevent blood clots
- Wear elastic compression stockings with 30–40 mm Hg during the day on the leg with the blood clot

Treatment

- Wear compression stockings (usually 30–40 mm Hg)
- Wear another type of compression device
- Administer wound care for leg ulcers
- Take medicine (pentoxifylline) to help your ulcers heal

DVT indicates deep vein thrombosis.

Table 2. What I Need to Know About Compression Stockings

Your doctor will give you a prescription for the stocking with the correct tightness (30–40 mm Hg)

You need only a knee-length stocking (even if your blood clot is above the knee)

Take your prescription to a pharmacy or medical supply store that sells stockings; the staff there should measure your leg to make sure you get a stocking of the right size

Purchase the stockings in the morning when your leg is least swollen

Wear the stocking only on the leg with the blood clot

Take the stocking off at night

Get a new pair of stockings every 3–6 mo

If it is too uncomfortable to wear your stocking all day, wear it for a few hours at a time, and then slowly increase the number of hours you wear it

Put your stocking on first thing in the morning when your leg is least swollen

Do not allow wrinkles in the stocking

Do not cut the stocking

Do not fold or roll the stocking down

If you have trouble bending over to put on your stocking, use rubber dishwashing gloves (they give you a better grip to pull up the stocking) or a stocking aid (a metal device that holds the stocking open so that you can slide your foot into the stocking)

Wash and dry the stocking as directed on the label to prevent it from shrinking or being damaged

in-depth guide for patients and health care providers. Available at: http://www.stoptheclot.org/natt_publications/post_thrombotic_syndrome.pdf.

Acknowledgment

We are indebted to Kim Mahoney for manuscript and figure preparation.

Disclosures

Dr Kahn holds numerous peer-review funded grants; receives research support from Sigvaris; is on the speakers' bureau for Pfizer, Sanofi, and Leo Pharma; and is on the advisory board for Sanofi, Bayer,

and Boehringer-Ingelheim. Dr Vazquez reports no conflicts.

References

- Ashrani AA, Heit JA. Incidence and cost burden of post-thrombotic syndrome. *J Thromb Thrombolysis*. 2009;28:465–476.
- Kahn SR. How I treat postthrombotic syndrome. *Blood*. 2009;114:4624–4631.
- Vazquez SR, Freeman A, VanWoerkom RC, Rondina MT. Contemporary issues in the prevention and management of post-thrombotic syndrome. *Ann Pharmacother*. 2009;43:1824–1835.
- Kahn SR, Ginsberg JS. Relationship between deep venous thrombosis and the post-thrombotic syndrome. *Arch Intern Med*. 2004;164:17–26.
- Tick LW, Kramer MH, Rosendaal FR, Faber WR, Doggen CJ. Risk factors for post-thrombotic syndrome in patients with a first deep venous thrombosis. *J Thromb Haemost*. 2008;6:2075–2081.
- van Dongen CJ, Prandoni P, Frulla M, Marchiori A, Prins MH, Hutten BA. Relation between quality of anticoagulant treatment and the development of the postthrombotic syndrome. *J Thromb Haemost*. 2005;3:939–942.
- Kahn SR, Shrier I, Julian JA, Ducruet T, Arsenaault L, Miron MJ, Roussin A, Desmarais S, Joyal F, Kassis J, Solymoss S, Desjardins L, Lamping DL, Johri M, Ginsberg JS. Determinants and time course of the postthrombotic syndrome after acute deep venous thrombosis. *Ann Intern Med*. 2008;149:698–707.
- Geerts WH, Bergqvist D, Pineo GF, Heit JA, Samama CM, Lassen MR, Colwell CW. Prevention of venous thromboembolism: American College of Chest Physicians evidence-based clinical practice guidelines (8th edition). *Chest*. 2008;133:381S–453S.
- Prandoni P, Lensing AW, Prins MH, Frulla M, Marchiori A, Bernardi E, Tormene D, Mosena L, Pagnan A, Girolami A. Below-knee elastic compression stockings to prevent the post-thrombotic syndrome: a randomized, controlled trial. *Ann Intern Med*. 2004;141:249–256.
- Brandjes DP, Buller HR, Heijboer H, Huisman MV, de Rijk M, Jagt H, ten Cate JW. Randomised trial of effect of compression stockings in patients with symptomatic proximal-vein thrombosis. *Lancet*. 1997;349:759–762.
- Pierson S, Pierson D, Swallow R, Johnson G Jr. Efficacy of graded elastic compression in the lower leg. *JAMA*. 1983;249:242–243.
- Kearon C, Kahn SR, Agnelli G, Goldhaber S, Raskob GE, Comerota AJ. Antithrombotic therapy for venous thromboembolic disease: American College of Chest Physicians evidence-based clinical practice guidelines (8th edition). *Chest*. 2008;133:454S–545S.

Postthrombotic Syndrome
Sara R. Vazquez and Susan R. Kahn

Circulation. 2010;121:e217-e219

doi: 10.1161/CIRCULATIONAHA.109.925651

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Copyright © 2010 American Heart Association, Inc. All rights reserved.

Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the
World Wide Web at:

<http://circ.ahajournals.org/content/121/8/e217>

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Circulation* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the [Permissions and Rights Question and Answer](#) document.

Reprints: Information about reprints can be found online at:
<http://www.lww.com/reprints>

Subscriptions: Information about subscribing to *Circulation* is online at:
<http://circ.ahajournals.org/subscriptions/>