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# The Modern Management of Varicose Veins

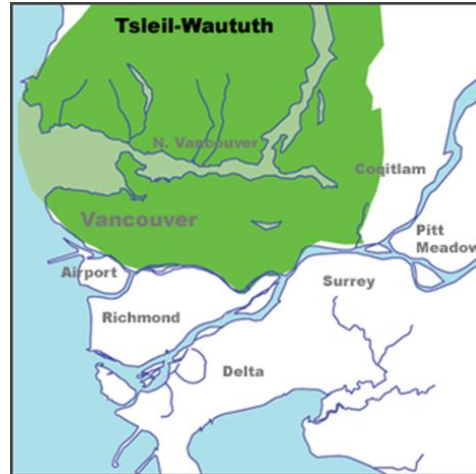
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We would like to acknowledge that we are gathered today on the traditional territories of the Musqueam, Squamish and Tsleil-Waututh peoples.





# Objectives

1. Describe the pathophysiology of chronic venous insufficiency and varicose veins
2. Describe the appropriate investigations for chronic venous insufficiency
3. Describe the nonoperative management of varicose veins and chronic venous insufficiency
4. Describe the interventional management of varicose veins



# Disclosures

- Received educational grant funding from Gore, Medtronic and Cook
- Provide private cosmetic vein management at Arbutus Laser Centre
- Provide injection sclerotherapy, radiofrequency ablation and cyanoacrylate glue vein treatment at Vancouver General Hospital



# Overview

- Historically the diagnosis and management of venous pathology has been very poor
  - Many vascular surgeons do not incorporate venous disease actively in their practices or do not completely understand the pathology
- BUT: treatment of varicose veins and superficial venous reflux is very straightforward and simple
  - *If a vascular surgeon can understand it, it can be understood by any multicellular eukaryotic organism*



# General Overview - Terminology

- Chronic venous insufficiency
  - Umbrella term referring to all forms of chronic venous pathology including but not limited to: varicose veins, spider veins, post-thrombotic syndrome, venous ulcers, stasis dermatitis, etc.
  - Extremely common - ~1/3 of all people will develop some form of chronic venous insufficiency within their lifetime with variable severity
  - Can be further sub classified into primary and secondary chronic venous insufficiency
    - Primary venous insufficiency (i.e. valve failure) is far more common (>95%)
    - Secondary venous insufficiency is usually the sequelae of DVT



# The Spectrum of Chronic Venous Disease

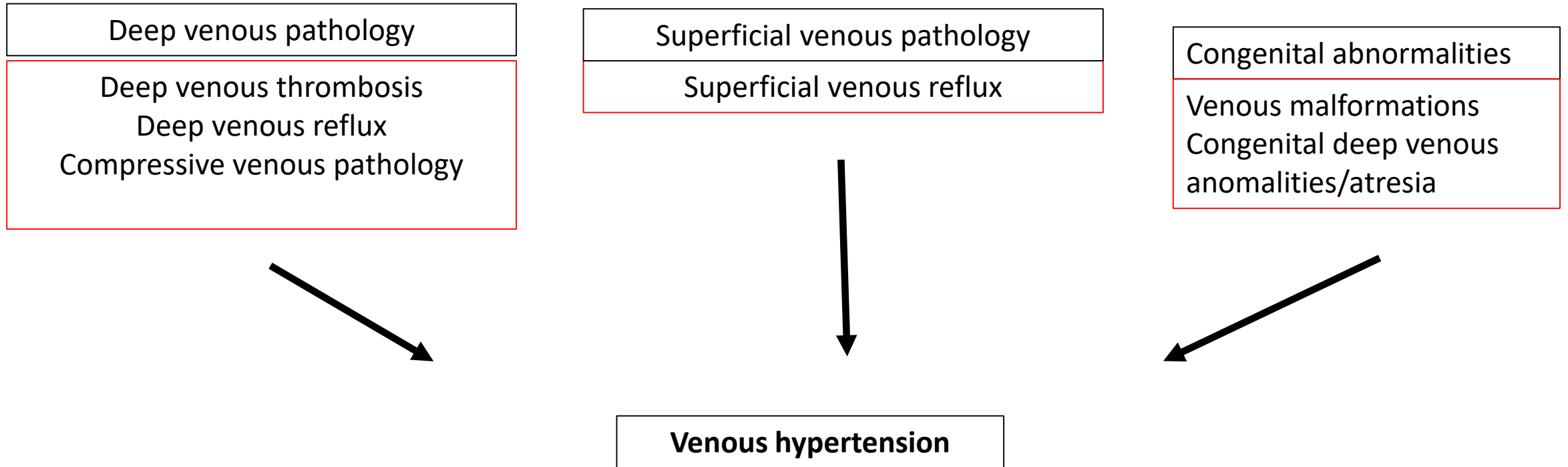


- **The underlying cause of all venous problems is elevated pressure in the venous system**
- All elevated venous pressure is from the obstruction of flow or venous flow going in the wrong way





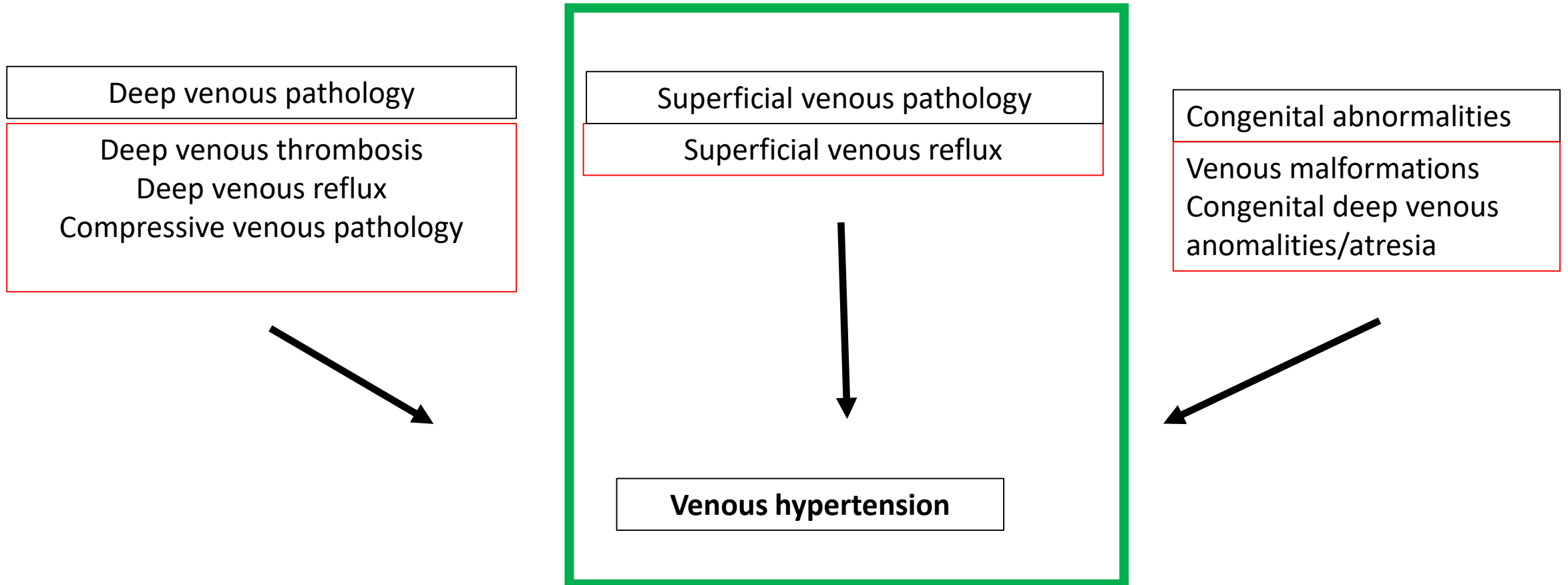
# Chronic Venous Insufficiency







# Chronic Venous Pathology





# Clinical Manifestations of Venous Hypertension

- Excessive venous stasis is not good for the leg
- Early stages results in distension of smaller veins (telangiectasias) and larger veins (varicose veins)
- More advanced stasis results in extravasation of blood constituents including RBCs, proteins into the interstitial space
  - Elevated venous pressure alters hydrostatic pressure and increases extravascular swelling
- This process is highly inflammatory
  - Results in skin changes, inflammation, scarring and ulceration



# Clinical Manifestations of Chronic Venous Insufficiency

## Clinical classification



Class 1:  
Telangiectasia.



Class 2:  
Varicose vein.



Class 3:  
Edema.



Class 4:  
Pigmentation /  
Eczema.



Class 5:  
Healed Ulcer.



Class 6:  
Venous Ulcer.





# General Overview

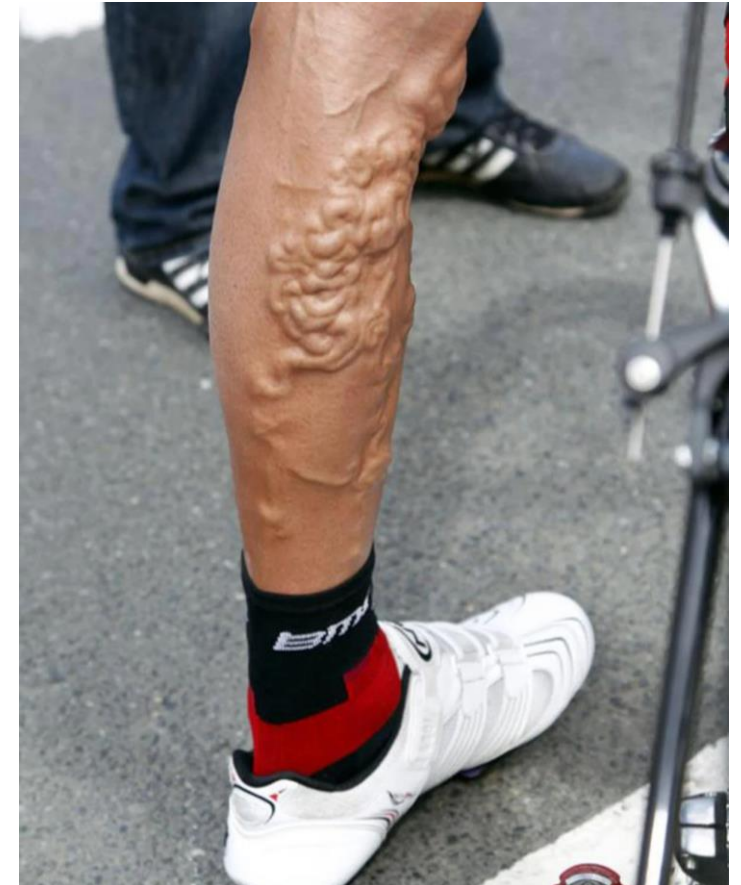
- Risk factors for primary venous insufficiency
  - Family history
    - Most important risk factor – highly genetic
  - Female sex
    - Mostly related to pregnancy
  - Obesity
  - Standing occupation



# Varicose Veins – What are they?

- Pathologically enlarged veins (>3mm) that typically appear serpiginous or tortuous
- They are a physical sign of chronic venous insufficiency but can be due to several causes
- The overwhelming majority (>95%) are related to vein valve failure
  - Most commonly the great or short saphenous veins

## What is wrong with this Tour de France cyclist's leg?!





# Spider Veins (e.g. Telangiectasias) – What are they?

- Pathologically enlarged superficial veins (<1 mm)
- They are a physical sign of chronic venous insufficiency but can be due to several causes
- The majority are related to vein valve failure in small veins





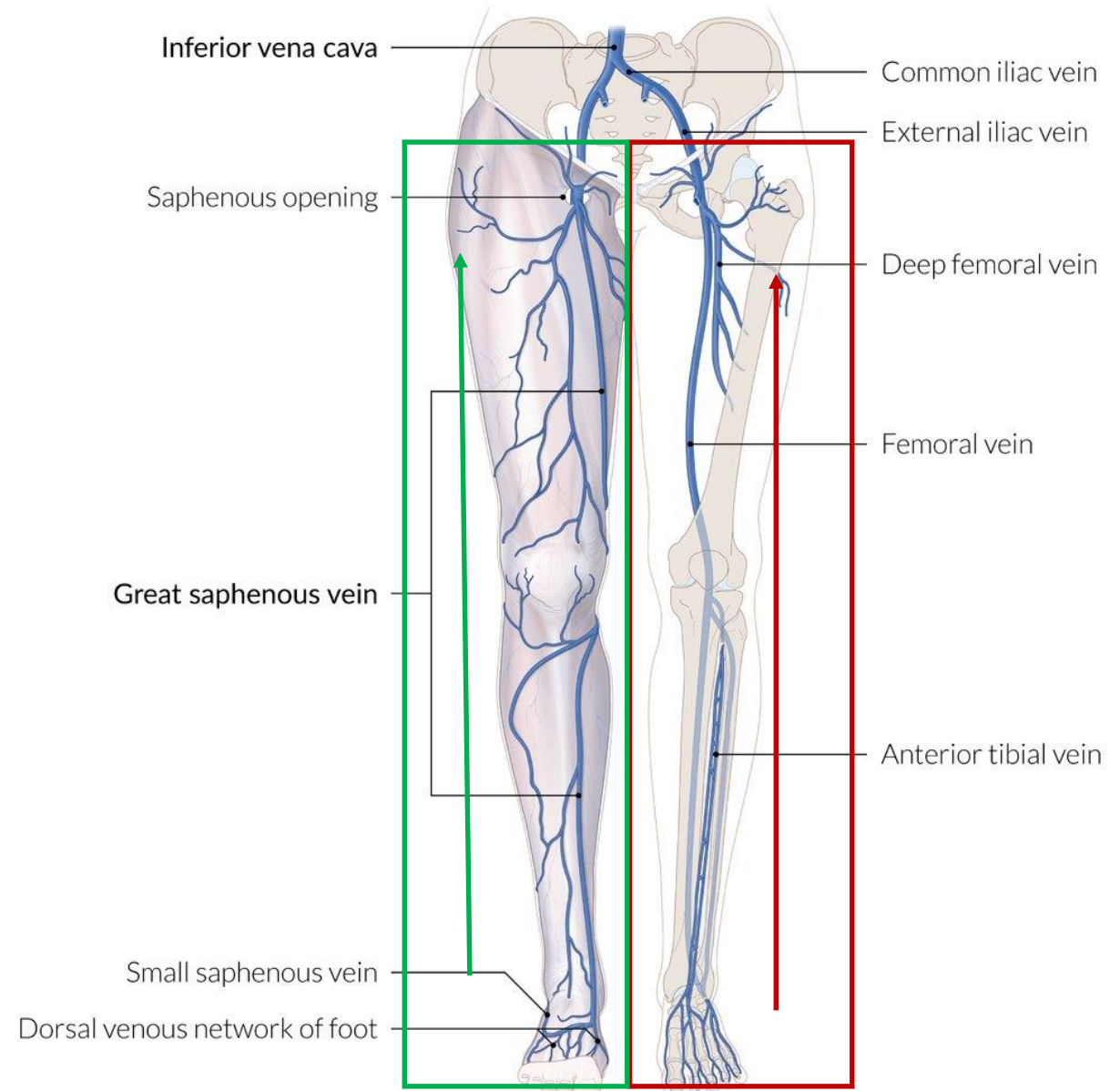
# Chronic venous insufficiency and venous reflux

- All causes of chronic venous insufficiency can cause all levels of clinical manifestations
  - E.g. Both deep venous thrombosis and superficial venous valve failure can cause venous ulceration, varicose veins and skin changes
- ***Overall, primary venous valve failure is the most common cause of all clinical manifestations of venous insufficiency***
- Superficial venous valve failure is more common than deep venous valve failure



# Anatomy Overview

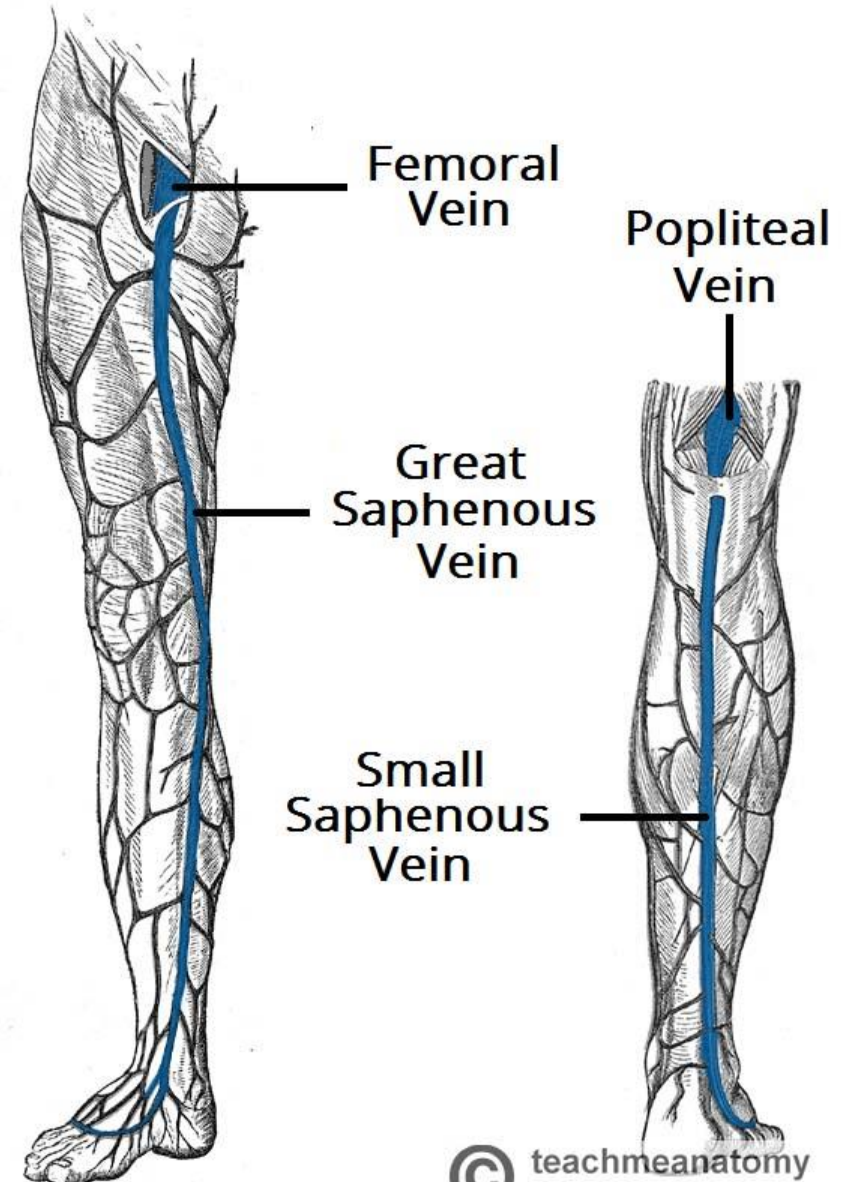
- 2 major venous systems
  - Deep venous system
  - Superficial venous system
- The venous system serves 1 major function
  - Return blood to the heart
- The deep venous system is responsible for most of the work
- The superficial system is entirely redundant





# Anatomy Overview

- There are only 2 important superficial veins
  1. Great saphenous vein
  2. Short saphenous vein
- All other superficial veins are tributaries of these 2 superficial veins
- The large majority of visible venous pathology is due to a failure of one (or potentially both) of these systems



# Anatomy Overview

- Veins are a low pressure, high volume system
- Valves are the primary mechanism that keeps blood flowing in one direction (up and towards the heart)
- Valve failure causes reflux
  - Blood pools or flows in the wrong direction



**BLOOD MOVES  
UP TOWARDS  
THE HEART**



**HEALTHY VALVE  
PREVENTS BLOOD  
BACKFLOW**

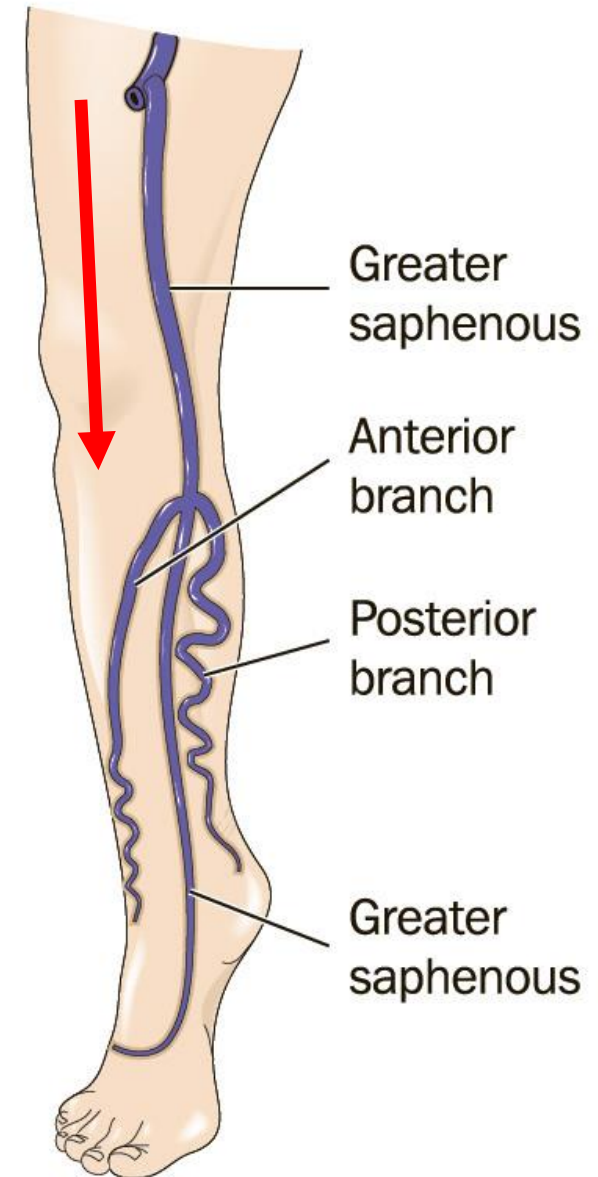


**DAMAGED VALVES  
ALLOW BACK FLOW**

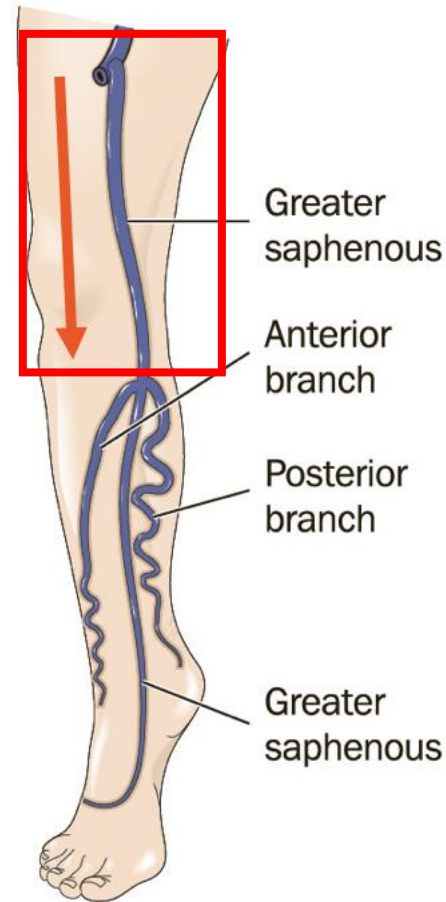


# Anatomy Overview

- Varicose veins most often result from valve failure in the superficial venous system
- When valves fail, blood does not efficiently leave the leg
- This increases pressure within the branches of the great/short saphenous, leading to distension, enlarged veins (e.g. varicose veins), and other clinical problems



# Superficial venous reflux and venous distension



- The most effective treatment option for primary venous insufficiency is **elimination of the underlying source of reflux**
- Treating only the varicose veins themselves will almost always lead to immediate recurrence

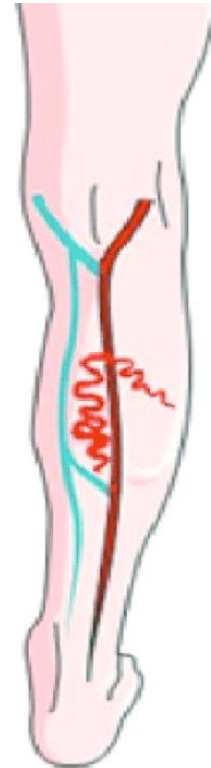


# Where the veins are is an important clue to their underlying cause

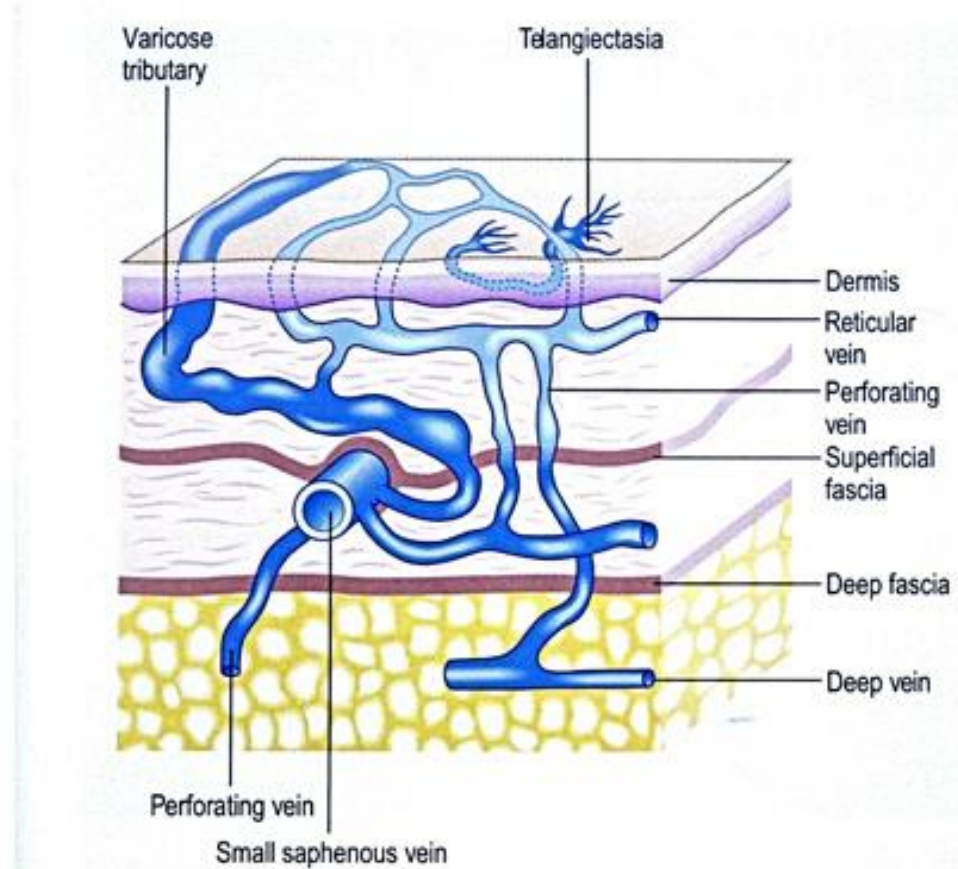
**Great saphenous vein dysfunction**



**Short saphenous vein dysfunction**



# Telangiectasias and spider veins



- Related to valve failure in veins very near the skin surface
- Can be related to deep venous problems, saphenous vein valve failure, isolated superficial vein valve failure
- Large majority are the result of valve failure in superficial small veins



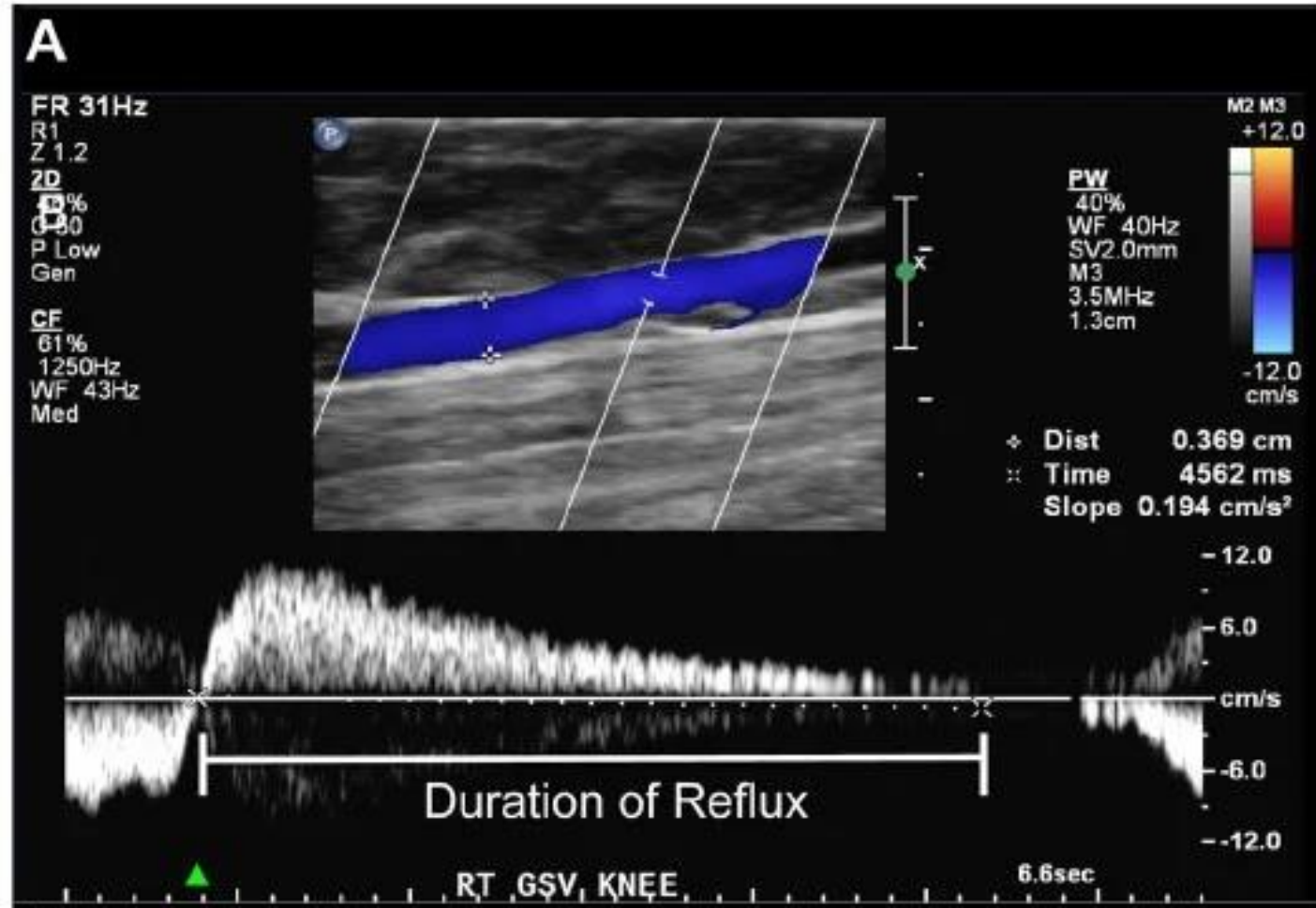
# Diagnosis of venous insufficiency

- Ultrasound is mandatory for the effective management of all forms of chronic venous insufficiency
- Advantages:
  - Simple
  - Cheap
  - Highly accurate
  - Directly guides management
- Disadvantages:
  - Operator dependent
  - **Availability**





# Diagnosis of venous insufficiency

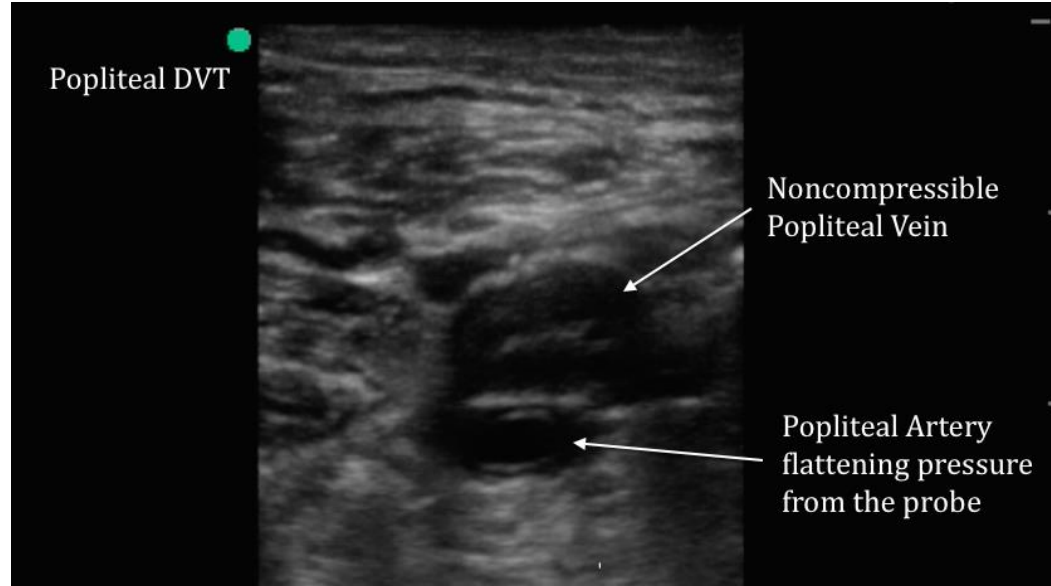






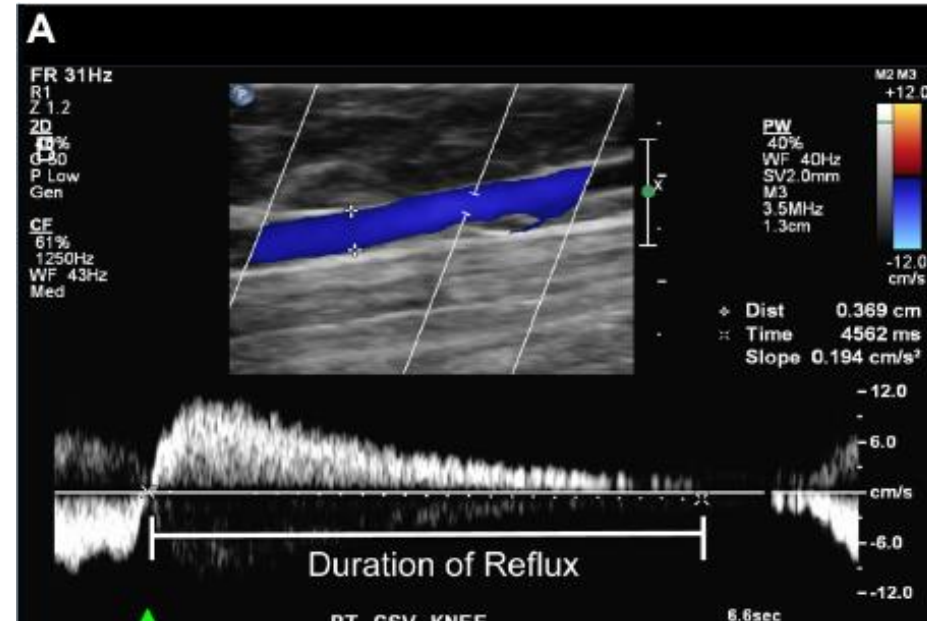
# Difference in venous studies

## Venous Duplex - DVT



- Relies on compression (DVT does not compress)
- Flow assessment limited to present or absent
- Performed with patient laying down

## Venous Duplex - Reflux



- Relies on assessment of direction of flow
- Performed with patient standing up
- Takes longer to perform



# Diagnosis of venous reflux

**EXAM TYPE:**

US RIGHT LEG AND VENOUS

**HISTORY:**

Assess reflux.

**FINDINGS:**

Grade 4 reflux was identified extending through the right saphenofemoral junction within the entire length of the greater saphenous vein associated with thigh and calf varicosities. The right common femoral, superficial femoral, popliteal and lesser saphenous veins were competent.



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# Management of venous reflux

- The ultrasound is the Rosetta Stone of determining the management of venous reflux
- Without ultrasound, it is nearly impossible to accurately identify the cause of the patient's venous pathology on clinical examination alone
- Appropriate definitive treatment in many cases depends on the underlying cause of the problem



# Management of venous reflux

- The basic underlying principle of the large majority of treatment for venous pathology is:
  - *The superficial venous system is redundant and superficial veins can be removed with no consequence*
- The deep venous system is necessary and cannot be easily removed without significant consequences
- The very large majority of visible venous pathology is related to the superficial system and therefore the treatment of these veins is removal



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# Arborist of the venous system





# Chronic venous insufficiency - Management

- Who should be offered treatment?
  1. Patients with skin changes, dermatitis or ulceration
  2. Patients with recurrent superficial thrombophlebitis
  3. Patients with bleeding
  4. Patients with significant postural symptoms
  5. Patients with cosmetic concerns (not covered by MSP)





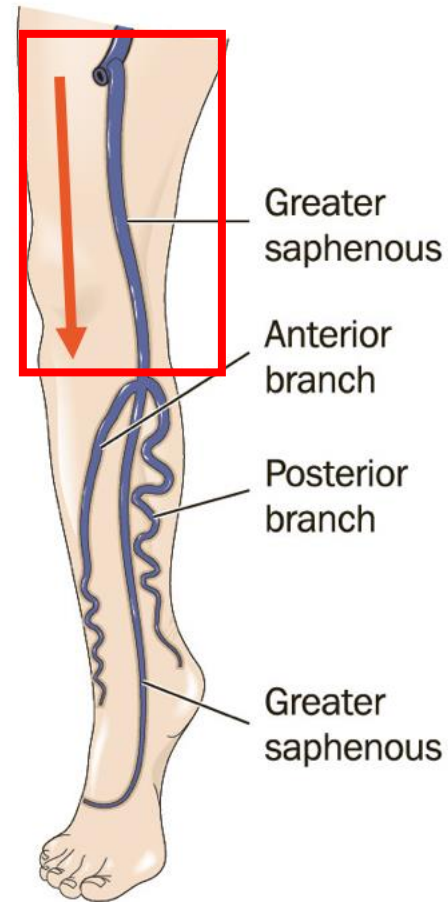
# A Word on Nonoperative Management

- Compression therapy most commonly employed strategy
- **Most overused and least valuable management strategy for varicose veins**
- Effective for:
  - Edema
  - Chronic skin changes
  - Symptoms with standing





# Compression Therapy



- Counteracts the local forces resulting in skin change and ulceration
- Does not prevent veins from degenerating
  - Varicose veins will worsen whether you wear them or not
- Does prevent skin changes and helps heal ulcers



# Nonoperative Management

Compression Level	8-15 mmHg	15-20 mmHg	20-30 mmHg	30-40 mmHg	40-50 mmHg
Medical Classification			Class I	Class II	Class III
Stocking Class	Light	Medium	Firm	X-Firm	XX-Firm
Compression Options	Uniform	Uniform or Graduated	Uniform or Graduated	Uniform or Graduated	Uniform
Fabric Options	Circular or Flat Knit	Circular or Flat Knit	Circular or Flat Knit	Flat Knit	Flat Knit



# Compression Therapy Guidelines

9.2	We recommend against compression therapy as the primary treatment of symptomatic varicose veins in patients who are candidates for saphenous vein ablation.	1	B
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## The care of patients with varicose veins and associated chronic venous diseases: Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum

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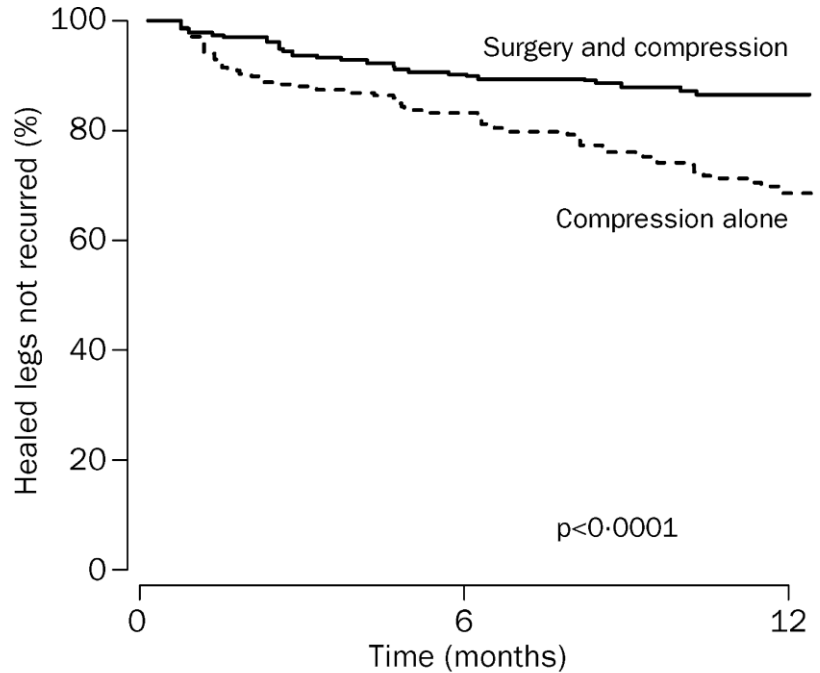


# Compression Therapy

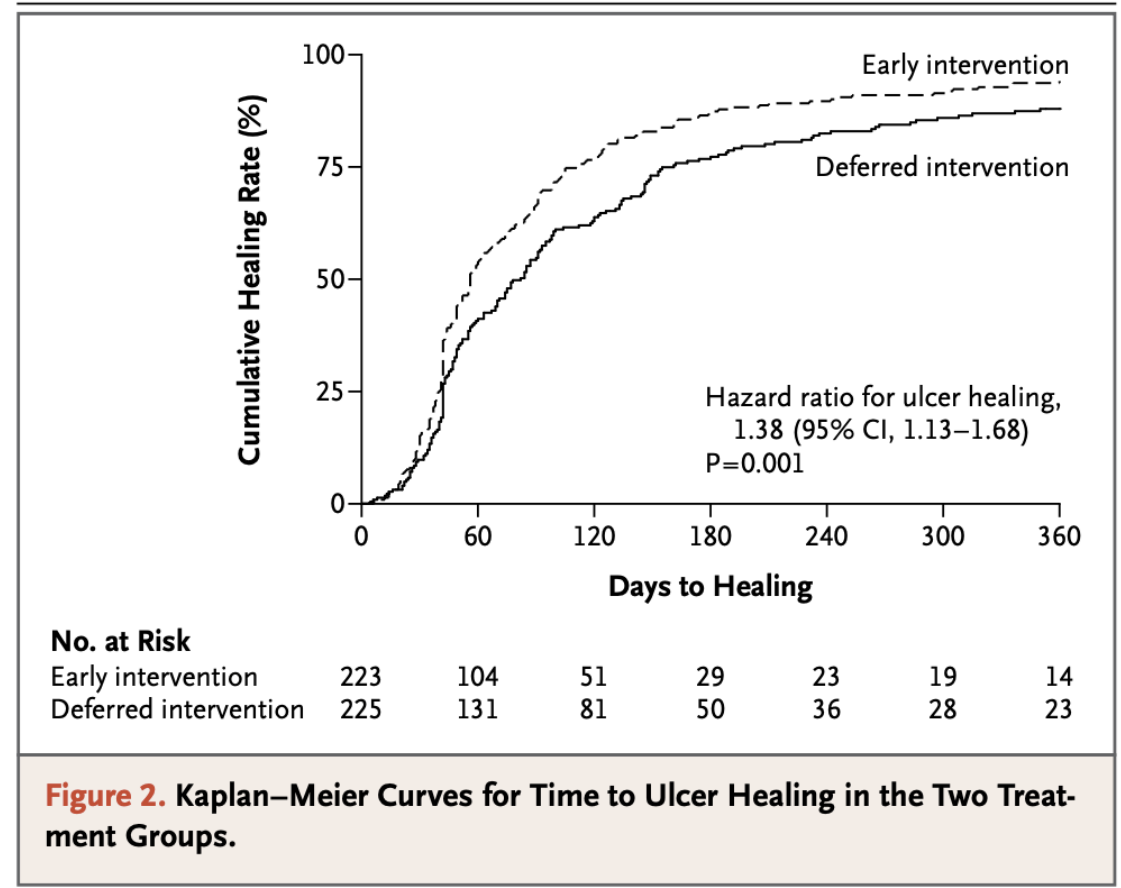
- There are several compelling reasons to use compression therapy sparingly in patients with uncomplicated superficial venous reflux:
  1. Compliance is universally poor
  2. They cost a lot of money
  3. It does not change prognosis or progression of varicose veins
  4. It is exceptionally difficult for many seniors to put the stockings on and take them off
  5. Effectiveness is mostly for patients without treatable superficial venous reflux who have chronic skin changes and/or ulceration
  6. Useful for patients with deep venous reflux because we do not have any other effective treatment for this currently



# Interventional vs. compression therapy for superficial venous reflux



Number at risk		
Surgery and compression	214	132
Compression alone	214	109



**Figure 2.** Kaplan–Meier Curves for Time to Ulcer Healing in the Two Treatment Groups.

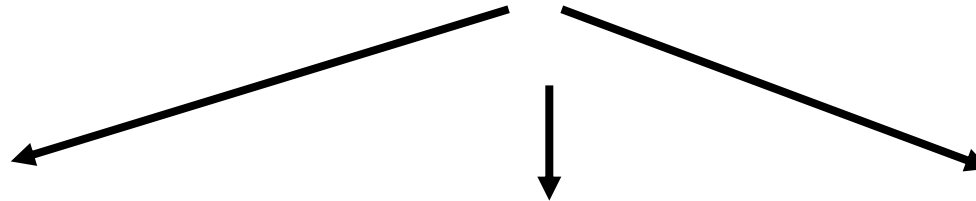


# Management of Superficial Venous Reflux

Varicose veins, spider veins, edema, stasis change



DUPLEX ULTRASOUND



Great saphenous vein or short saphenous reflux



Surgical ligation and stripping,  
radiofrequency ablation,  
cyanoacrylate glue embolization

Deep venous reflux  
without saphenous reflux



Nonoperative treatment

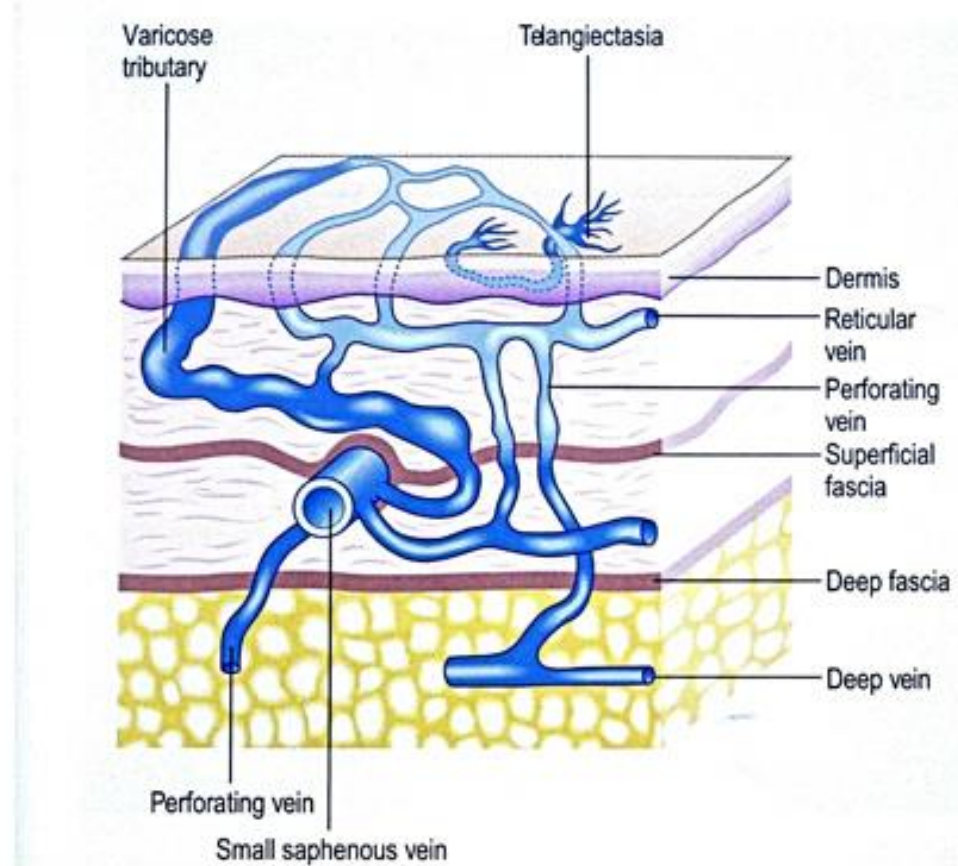
No significant saphenous reflux



Injection sclerotherapy for  
varicose veins and spider veins



# Treatment of varicose veins



- Find the underlying cause and treat it (if possible) to effectively eradicate the vein
- Avoid treating normal veins





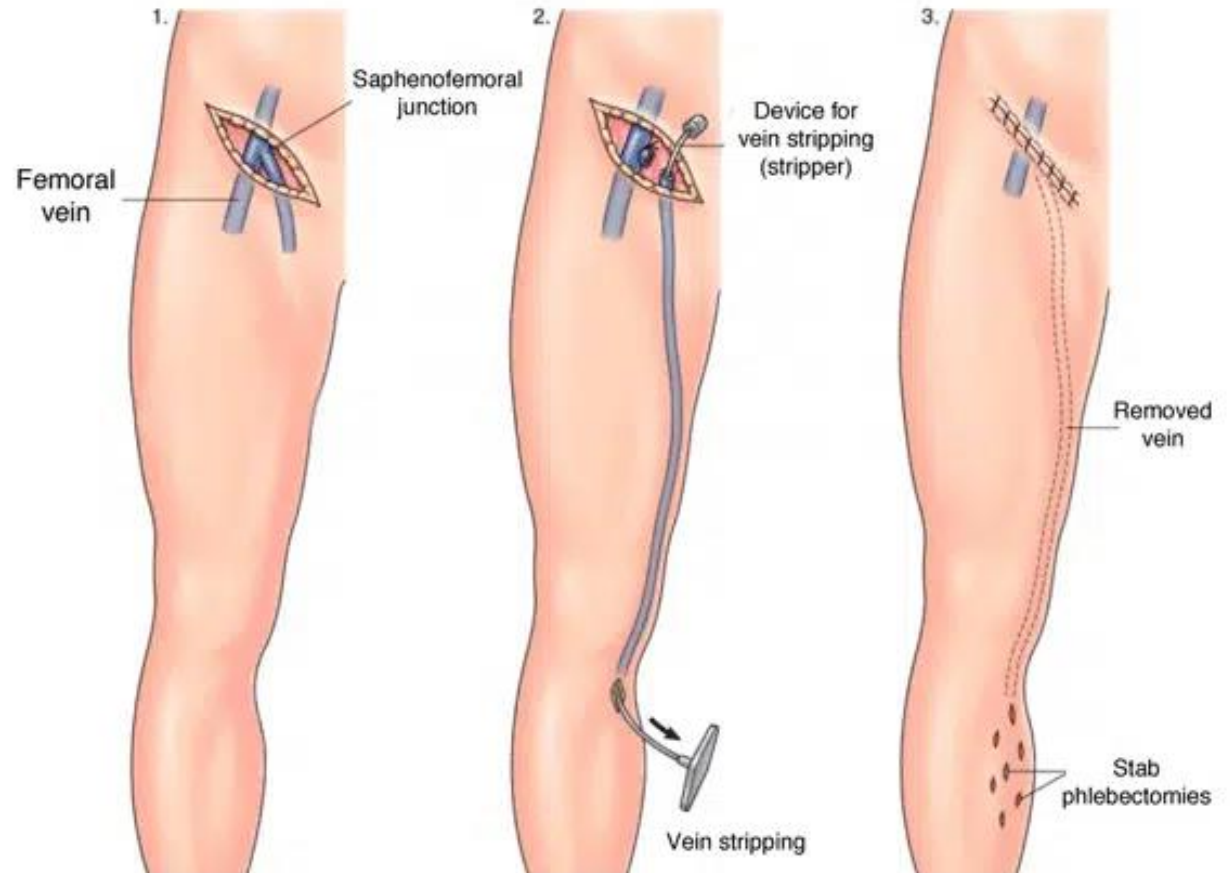
# Surgical and Interventional Treatment

- 3 major interventional options for saphenous vein reflux (great saphenous vein or short saphenous vein)
  - Surgical high ligation (usually with stripping of the vein)
  - Radiofrequency ablation (Venefit)
  - Cyanoacrylate glue (VenaSeal)

# Surgical high ligation and stripping

- **Standard surgical steps:**

- Ligate the saphenofemoral or saphenopopliteal junction
- Ligate the vein distally
- Avulse the vein by pulling through the saphenous canal
- Can be supplemented by separate incisions for excision of largest varicosities





# Surgical high ligation and stripping

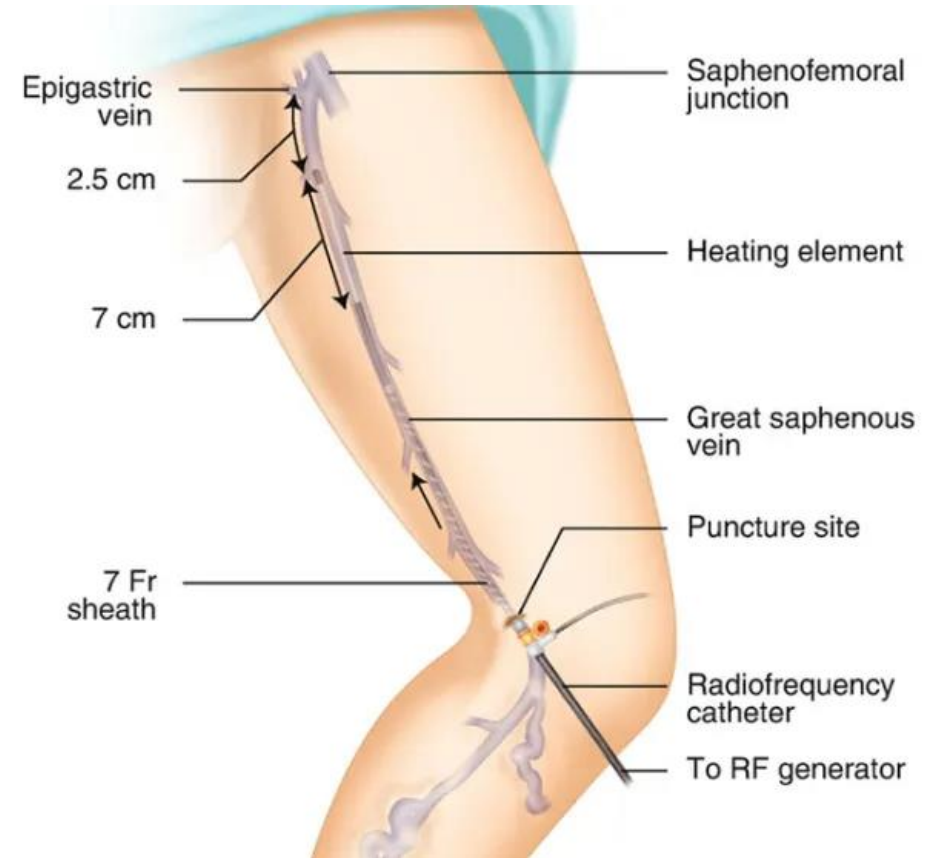
- Effective and well studied
- Can treat any size or configuration of veins
- Several important limitations:
  - Requires general anesthetic and operating room
  - Uncomfortable and requires time off work (1-2 weeks)
  - Leaves extensive bruising
  - Wait for surgery is universally long
  - Return to normal activity is usually delayed (3-4 weeks for high exertion activity)





# Radiofrequency Ablation (Venefit)

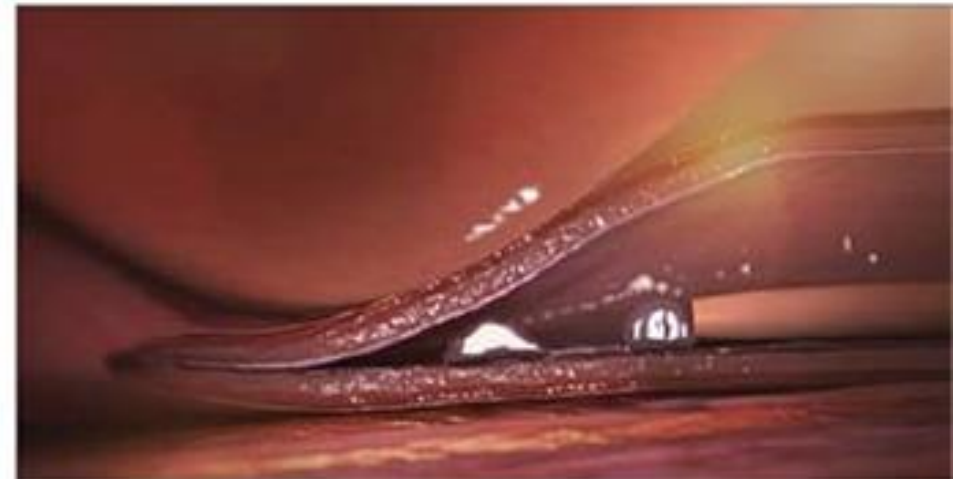
- “Endovenous treatment”
  - Uses heat energy to burn the vein from the inside (120 C)
  - Successor of endovenous laser therapy
  - Day procedure – no anesthetic except local (tumescent anesthesia)
  - Minimal recovery
    - Return to work within 1 to a few days
    - Return to regular exercise 48 hours
  - But – not covered by MSP
  - Most private facilities in BC ~3000 dollars per leg





# Cyanoacrylate Glue (VenaSeal)

- “Endovenous treatment”
  - Uses adhesive to glue the vein shut from the inside
  - *n-butyl-2 cyanoacrylate*
  - Extremely precise and versatile
  - Day procedure – no anesthetic except local
  - Effectively no recovery
    - Return to activity and work immediately
  - Not covered by MSP
  - Most private facilities in BC ~4000 dollars per leg





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## Is there a difference?

- Surgical high ligation and stripping vs. RFA vs. cyanoacrylate
  - At 6-12 months – no significant difference
    - All >95% effective at definitively removing the source of reflux
  - Within 30 days of procedure – yes significant difference
    - Recovery is far faster with endovenous procedures than surgery (for obvious reasons)
  - Recurrence?
    - No difference – large proportion of “recurrence” represents new sources of reflux unrelated to previous treatment



## Is there a difference?

- There are several very specific features with each procedure that can be advantageous
  - Surgical high ligation and stripping – flexibility of treatment
  - Radiofrequency ablation – no foreign material retained – complete obliteration of the treated venous segment
  - Cyanoacrylate glue – no risk of nerve injury (preferred for short saphenous) and extremely precise





# Injection Sclerotherapy

- Utilized for the treatment of spider veins and varicose veins with no significant associated saphenous reflux (or treated)
- ***Induces very localized thrombosis within the injected vein***, causing it to sclerose and ultimately fade away completely
- Multiple agents and formulations used
  - Sodium tetradecyl sulfate (STS) – varicose veins
  - Sclerodex (dextrose and saline) – spider veins
- Avoids incisions but causes pigmentation related to vein thrombosis that can take months (or in some rare cases years) to resolve
- For cosmesis can be expensive – typically 200-500 \$/ treatment



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# Injection Sclerotherapy





# Ethical Considerations

- Despite demonstrated cost savings and improved outcomes, endovenous treatments remain almost exclusively not covered by MSP
  - St. Paul's Hospital is a notable exception
  - Proposals for adoption have not been taken up
- Although in some cases cosmetic, many in fact are symptomatic and all have pathology
- Rewards the rich and punishes the poor – those who need the most (e.g. those that cannot take time off work) are those that are least able to access



# Prognosis

- It is important for all patients with varicose veins and superficial venous pathology to be aware that recurrence is very common
  - The same pathology that predisposes to varicose veins in the first place also predisposes to recurrence
- Several specific risk factors significantly increase the probability of recurrent varicosities:
  1. Underlying significant deep venous reflux
  2. Very strong family history
  3. Varicose veins at an early age
  4. Pregnancy



# Varicose veins and superficial venous pathology – current issues

- Wait times and accessing time-appropriate care
  - Due to the sheer volume of venous insufficiency in the general population this is an ongoing challenge
    - Most US laboratories are overwhelmed and wait times are long
    - Office-based Duplex has helped substantially
  - Care and referral pathways are individualized and disjointed
    - Individual surgeons work up varicose veins differently
    - The knowledge of varicose veins and chronic venous insufficiency is not uniform among surgeons or other specialists treated varicose veins
  - The best treatment options aren't available to public
    - This issue is being addressed

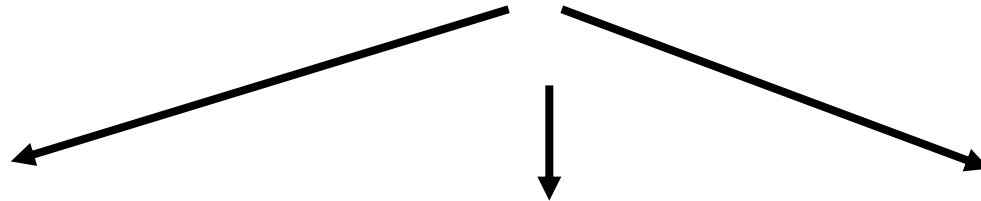


# In Summary:

Varicose veins, spider veins, edema, stasis change



DUPLEX ULTRASOUND



Great saphenous vein or short saphenous reflux



Surgical ligation and stripping, radiofrequency ablation, cyanoacrylate glue embolization

Deep venous reflux without saphenous reflux



Nonoperative treatment

No significant saphenous reflux (isolated varicose/spider veins)



Injection sclerotherapy for varicose veins and spider veins



# In Summary

- Extremely common pathology
- Most causes are related to superficial venous problems
- Duplex ultrasound is mandatory to appropriately treat
- Management depends very specifically on the specific underlying cause but usually involves removing some or all of the superficial veins involved
- Compression therapy useful for skin changes but not for standard uncomplicated varicose veins



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Questions?