For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage:
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
Involves **intraocular bleeding/hemorrhage**: All of them

Where is the hemorrhage found in:

-- Purtscher’s?
-- Valsalva?
-- Terson’s?
Involves intraocular bleeding/hemorrhage: All of them

Where is the hemorrhage found in:
--Purtscher’s? Intraretinal
--Valsalva?
--Terson’s?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Purtscher retinopathy: Intraretinal hemorrhage
Involves intraocular bleeding/hemorrhage: All of them

Where is the hemorrhage found in:
-- Purtscher’s? Intraretinal
-- Valsalva?
-- Terson’s?

What section of the retina is most commonly involved in Purtscher’s?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them

Where is the hemorrhage found in:
--Purtscher’s? **Intraretinal**
--Valsalva?
--Terson?

What section of the retina is most commonly involved in Purtscher’s?
The peripapillary area
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves *intraocular bleeding/hemorrhage*: All of them

Where is the hemorrhage found in:
-- *Purtscher’s*? Intraretinal
-- *Valsalva*?
-- *Terson’s*?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves **intraocular bleeding/hemorrhage**: All of them

*Where is the hemorrhage found in:*
--Purtscher’s? Intraretinal
--Valsalva? Sub-ILM
--Terson’s?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Valsalva retinopathy: Sub-ILM hemorrhage
For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them

Where is the hemorrhage found in:
- Purtscher's? Intraretinal
- Valsalva? Sub-ILM
- Terson's?
Involves intraocular bleeding/hemorrhage: All of them

Where is the hemorrhage found in:
--Purtscher’s? Intraretinal
--Valsalva? Sub-ILM
--Terson’s? Sub-ILM, sub-hyaloid, or intra-vitreal
For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Terson syndrome: Sub-ILM, sub-hyaloid, intra-vitreal
Involves intraocular bleeding/hemorrhage: All of them

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

As we shall see, this is the first of many ways in which Purtscher’s differs from Valsalva and Terson’s retinopathies!

Where is the hemorrhage found in:

- Purtscher’s? **Intraretinal**
- Valsalva? **Sub-ILM**
- Terson’s? **Sub-ILM, sub-hyaloid, or intra-vitreal**
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head:
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- Secondary to compression injury of chest, head: Purtscher

What is the pathologic process underlying Purtscher’s?
Q/A

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher

What is the pathologic process underlying Purtscher’s?

activation $\rightarrow$ aggregation $\rightarrow$

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: **Purtscher**

What is the pathologic process underlying Purtscher’s?

Complement activation → granulocyte aggregation → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

What is the pathologic process underlying Purtscher’s?

Complement activation → granulocyte aggregation → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles

What is the cause of the occlusion?
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

What is the pathologic process underlying Purtscher’s?
Complement activation → granulocyte aggregation → leukoembolization → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles

What is the cause of the occlusion? Leukoembolization
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher

What is the pathologic process underlying Purtscher’s?

- Complement activation → granulocyte aggregation → leukoembolization → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?

- Occlusion of small retinal arterioles

What is the cause of the occlusion? Leukoembolization

Aggregates of what sort of immune cells form the emboli?
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

What is the pathologic process underlying Purtscher’s?
Complement activation → granulocyte aggregation → leukoembolization → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles

What is the cause of the occlusion? Leukoembolization

Aggregates of what sort of immune cells form the emboli? Granulocytes
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher

And lastly: Activation of which aspect of the immune system begins the cascade?

What is the pathologic process underlying Purtscher’s?
- Complement activation
  → granulocyte aggregation
  → leukoembolization
  → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
- Occlusion of small retinal arterioles

What is the cause of the occlusion? Leukoembolization

Aggregates of what sort of immune cells form the emboli? Granulocytes
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: **Purtscher**

And lastly: Activation of which aspect of the immune system begins the cascade?
The complement system

What is the pathologic process underlying Purtscher’s?
Complement activation $\rightarrow$ granulocyte aggregation $\rightarrow$
leukoembolization $\rightarrow$ occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles

What is the cause of the occlusion? **Leukoembolization**

Aggregates of what sort of immune cells form the emboli?
**Granulocytes**
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: *Purtscher*

For each statement, assign the proper condition(s):
*Valsalva retinopathy; Terson syndrome; Purtscher retinopathy*

And lastly: Activation of which aspect of the immune system begins the cascade?
The complement system

Now read it in order to cinch the process in your memory!

What is the pathologic process underlying Purtscher’s?
Complement activation → granulocyte aggregation → leukoembolization → occlusion of small retinal arterioles

Let’s tackle this topic in reverse. What is the direct, proximal cause of retinal hemorrhages in Purtscher’s?
Occlusion of small retinal arterioles

What is the cause of the occlusion?
Leukoembolization

Aggregates of what sort of immune cells form the emboli?
Granulocytes
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected:
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected**: Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’ What is the eponymous name for these areas? ‘Purtscher flecken’
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’ What is the eponymous name for these areas? ‘Purtscher flecken’
‘Areas of retinal whitening’--isn’t this the same thing as CWS?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
**Cotton-wool spots** occur when branches of the pre-capillary network are occluded.
Q/A

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’

What is the eponymous name for these areas?

‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?

Yes and no…

**Cotton-wool spots** occur when branches of the pre-capillary arteriolar network are occluded.
For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’ What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer.

three words
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
**Cotton-wool spots** occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer.
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
Cotton-wool spots occur when branches of the pre-capillary arteriolar network
are occluded. These vessels are located in the superficial (ie, inner) portion of
the retina; thus, the layer of the retina most affected by their occlusion is the
nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the
nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the
affected nerve fibers white, resulting in a CWS.
A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white, resulting in a CWS.
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: **Purtscher**

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’ What is the eponymous name for these areas? ‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS? Yes and no… Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white, resulting in a CWS.

In contrast, **Purtscher flecken** develop when occlusion occurs at the level of retinal circulation.
A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white, resulting in a CWS.
In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation.
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- **Cotton-wool spots common, expected:** Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…

**Cotton-wool spots** occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white, resulting in a CWS.

In contrast, **Purtscher flecken** develop when occlusion occurs at the **capillary** level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher
Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?
‘Purtscher flecken’

‘Areas of retinal whitening’--isn’t this the same thing as CWS?
Yes and no…
Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded in the retina; these vessels are located in the superficial (ie, inner) portion of the retina nerve fiber layer, so their occlusion affects the retina nerve fiber layer resulting in a CWS.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.

Let’s take a brief derail to drill down on this idea (I promise an on-topic payoff at the end)
How many blood supplies does the retina receive?
Blood supply

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

How many blood supplies does the retina receive? Two
What are the sources of the retina’s two blood supplies?
What are the sources of the retina’s two blood supplies?

Blood supply: Central retinal artery

Blood supply: Choriocapillaris

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy
What are the layers of the retina?

- Internal limiting membrane
- Nerve fiber layer
- Ganglion cell layer
- Inner plexiform layer
- Inner nuclear layer
- Outer plexiform layer (Henle's layer)
- Outer nuclear layer
- External limiting membrane
- Rod/cone inner and outer segments

Blood supply:
- Central retinal artery
- Choriocapillaris

For each statement, assign the proper condition(s):
- Valsalva retinopathy
- Terson syndrome
- Purtscher retinopathy
Retinal Layers
- Internal limiting membrane
- Nerve fiber layer
- Ganglion cell layer
- Inner plexiform layer
- Inner nuclear layer
- Outer plexiform layer (Henle’s layer)
- Outer nuclear layer
- External limiting membrane
- Rod/cone inner and outer segments

RPE

Bruch’s membrane

For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy
Retinal Layers
- Internal limiting membrane
- Nerve fiber layer
- Ganglion cell layer
- Inner plexiform layer
- Inner nuclear layer
- Outer plexiform layer (Henle’s layer)
- Outer nuclear layer
- External limiting membrane
- Rod/cone inner and outer segments

RPE

Bruch’s membrane

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy
A

- **Retinal Layers**
  - Internal limiting membrane
  - Nerve fiber layer
  - Ganglion cell layer
  - Inner plexiform layer
  - Inner nuclear layer
  - Outer plexiform layer (Henle’s layer)
  - Outer nuclear layer
  - External limiting membrane
  - Rod/cone inner and outer segments

- **RPE**
- **Bruch’s membrane**
- Involves intraocular bleeding/hemorrhage: All of them
- Secondary to compression injury of chest, head: Purtscher

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
  What is the eponymous name for these areas?
  ‘Purtscher flecken’
  ‘Areas of retinal whitening’—isn’t this the same thing as CWS?
  Yes and no…
  Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white—ie, a CWS.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.

**The payoff:**
This slide reminded us that the retinal vasculature does **not** supply the deep portion of the retina.

**Retinal Layers**
- Internal limiting membrane
- Nerve fiber layer
- Ganglion cell layer
- Inner plexiform layer
- Inner nuclear layer
- Outer plexiform layer (Henle’s layer)
- Outer nuclear layer
- External limiting membrane
- Rod/cone inner and outer segments
- RPE
- Bruch’s membrane

Blood supply: Central retinal artery

Which layers are supplied by each blood supply?

Blood supply: Choriocapillaris
For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher

The payoff:

This slide reminded us that the retinal vasculature does not supply the deep portion of the retina. The point being that, when we say Purtscher flecken are related to ‘vessels located deeper in the retina,’ you must bear in mind that deeper is a relative term, and that the involved retina is actually somewhat centrally positioned.

nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white—ie, a CWS.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation, and thus their occlusion doesn’t affect the retina nerve fiber layer--so no CWS.

These vessels are located deeper in the retina.
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher
Cotton-wool spots common, expected: **Purtscher**

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?

- **Purtscher flecken**

‘Areas of retinal whitening’—isn’t this the same thing as CWS?
Yes and no…

- **Cotton-wool spots**

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher
Cotton-wool spots common, expected: Purtscher

For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?

'Purtscher flecken'

'Areas of retinal whitening'

Yes and no...

Cotton-wool spots

How can Purtscher flecken and CWS be differentiated at DFE?
CWS have indistinct borders (like puffs of cotton wool—get it?), and obscure vessels running through them.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer--so no CWS.
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Cotton-wool spots
Involves intraocular bleeding/hemorrhage: All of them
2ndry to compression injury of chest, head: Purtscher
Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher’s is ‘polygonal-shaped areas of retinal whitening.’
What is the eponymous name for these areas?

‘Purtscher flecken’

‘Areas of retinal whitening’
Yes and no…

Cotton-wool spots

How can Purtscher flecken and CWS be differentiated at DFE?
CWS have indistinct borders (like puffs of cotton wool—get it?), and obscure vessels running through them. In contrast, Purtscher flecken are more sharply demarcated and do not obscure adjacent vessels—in fact, a ‘clear zone’ appears between vessels and the surrounding flecken.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Purtscher flecken
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

Purtscher flecken and cotton-wool spots
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher's is 'polygonal-shaped areas of retinal whitening.'

What is the eponymous name for these areas?

‘Purtscher flecken’

‘Areas of retinal whitening’—isn’t this the same thing as CWS?

Yes and no…

Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white—ie, a CWS.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer—so no CWS.

Flecken, flecken…where have I heard that before?

You’re probably thinking of glaukomflecken

That’s it! Clinically speaking, what are glaukomflecken?

Small white patches (‘flecks’) beneath the anterior capsule of the lens

With what clinical event are they associated?

Acute angle-closure glaucoma with severe IOP elevation

How do they form, ie, what is the pathophysiology?

The high IOP damages lens epithelial cells just beneath the capsule, and the damaged cells subsequently necrose
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher

A classic finding in Purtscher's is 'polygonal-shaped areas of retinal whitening.'

What is the eponymous name for these areas?
'Cotton-wool spots'

'Areas of retinal whitening'—isn't this the same thing as CWS?
Yes and no…

Cotton-wool spots occur when branches of the pre-capillary arteriolar network are occluded. These vessels are located in the superficial (ie, inner) portion of the retina; thus, the layer of the retina most affected by their occlusion is the nerve fiber layer. Obstruction of the RNFL causes axoplasmic stasis in the nerve fibers served by the obstructed vessel. Axoplasmic stasis renders the affected nerve fibers white—ie, a CWS.

In contrast, Purtscher flecken develop when occlusion occurs at the capillary level of retinal circulation. These vessels are located deeper in the retina, and thus their occlusion doesn’t affect the retina nerve fiber layer--so...

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(*Not referring here to Dr Glaukomflecken)
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Areas of retinal whitening are common. Yes and no...

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Wada ya mean, none? Everyone knows these cause Purtscher's. What's the dealio?
For each statement, assign the proper condition(s):
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Wadda ya mean, none? Everyone knows these cause Purtscher's. What's the dealio? It’s true that these conditions can cause a retinopathy identical in appearance to Purtscher’s. That said, Dr Purtscher’s original description was in the context of thoracic or head trauma. Thus, technically speaking, the term Purtscher retinopathy is reserved for only situations in which the retinopathy results from thoracic/head trauma.
For each statement, assign the proper condition(s):

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OK then, what is the name for the Purtscher’s-like retinopathy due to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture, etc?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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- 2ndry to compression injury of chest, head: Purtscher
- Cotton-wool spots common, expected: Purtscher
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- 2ndry to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture: None (but…)

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_OK then, what is the name for the Purtscher’s-like retinopathy due to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture, etc?_ It’s called ‘Purtscher’s-like retinopathy’
For each statement, assign the proper condition(s):
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- 2ndry to abrupt intracranial hemorrhage:
- Involves intraocular bleeding/hemorrhage: All of them
- 2ndry to compression injury of chest, head: Purtscher
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- 2ndry to coughing, vomiting, straining at stool: Valsalva
- 2ndry to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture: None (*but…*)
- 2ndry to abrupt intracranial hemorrhage: Terson
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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- 2ndry to abrupt intracranial hemorrhage: Terson

Does Terson’s follow a subarachnoid hemorrhage, a subdural hemorrhage, or either/both?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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- 2ndry to coughing, vomiting, straining at stool: Valsalva
- 2ndry to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture: None (but…)
- 2ndry to abrupt *intracranial hemorrhage*: Terson

Does Terson’s follow a subarachnoid hemorrhage, a subdural hemorrhage, or either/both?  
Either/both

Does Terson’s represent the direct extension of an intracranial bleed into the eye via dural compartments?
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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*Does Terson’s follow a subarachnoid hemorrhage, a subdural hemorrhage, or either/both?*
Either/both

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No

*OK, then what is the cause?*
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**Does Terson’s follow a subarachnoid hemorrhage, a subdural hemorrhage, or either/both?**
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No

**OK, then what is the cause?**
We’ll get to that shortly
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- Vision loss often permanent:
Involves intraocular bleeding/hemorrhage: All of them
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What is the visual prognosis in Terson or Valsalva retinopathy?
For each statement, assign the proper condition(s):
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What is the visual prognosis in Terson or Valsalva retinopathy? Great!
For both, vision is expected to return to baseline
For each statement, assign the proper condition(s):
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Great!

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- 2ndry to an acute increase in intraocular venous pressure:

Note: Not IOP!
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2ndry to an acute increase in intraocular **venous** pressure: Valsalva; Terson

Note that Valsalva retinopathy and Terson’s share a common final pathway—an acute rise in intraocular venous pressure produces backpressure in the capillary and arteriolar beds, causing some of these vessels to rupture.
For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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In sharp contrast, Purtscher’s results from an occlusive process occurring within the arterial side of the peripapillary vascular bed.
Involves intraocular bleeding/hemorrhage: All of them

2ndry to compression injury of chest, head: Purtscher

Cotton-wool spots common, expected: Purtscher

2ndry to coughing, vomiting, straining at stool: Valsalva

2ndry to pancreatitis, SLE, amniotic-fluid embolization, long-bone fracture: None (but…)

2ndry to abrupt intracranial hemorrhage: Terson

Vision loss often permanent: Purtscher

2ndry to an acute increase in intraocular venous pressure: Valsalva; Terson

For each statement, assign the proper condition(s): Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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6. 2ndry to abrupt intracranial hemorrhage: Terson
7. Vision loss often permanent: Purtscher
8. 2ndry to an acute increase in intraocular venous pressure: Valsalva; Terson

As we shall see, this is the first of many ways in which Purtscher’s differs from Valsalva and Terson’s retinopathies!

Yet another example:

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For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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Purtscher retinopathy: Arteriolar obstruction
For each statement, assign the proper condition(s):
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Purtscher retinopathy: Arteriolar obstruction

Capillary flow voids at both superficial capillary plexus (B) and deep (C) capillary plexus are visualized by optical coherence tomography angiography. Fluorescein angiography showed multifocal filling defect and irregularly enlarged foveal avascular zone (D).
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Purtscher retinopathy: Retinal edema
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- Retinal edema common, expected: Purtscher
- DDx includes PVD, retinal mAcroaneurysm:

Note: MacroA, not microA!
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Valsalva vs Terson vs Purtscher: Highlights

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**Valsalva vs Terson vs Purtscher: Highlights**

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1. Intraocular heme present?
   - **Yes** for all conditions

2. Mechanism:
   - **Increased intraocular venous pressure** for both Valsalva and Terson
   - **Occlusion of arterioles, capillaries** for Purtscher

3. CWS present?
   - **No** for Valsalva and Terson
   - **Yes** for Purtscher
For each statement, assign the proper condition(s):
Valsalva retinopathy; Terson syndrome; Purtscher retinopathy

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So, other than presenting with intraocular heme…
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| Visual prognosis? | Good | Good | Bad |

Valsalva and Terson’s are very similar, and differ greatly from Purtscher’s!