Motility Disorders: The Sinus, the Fissure, and the Apex

Supranuclear

Nuclear

Fedarcular
Subarachnoid
Cavernous sinus
Orbital
Neuromuscular junction
Extraocular muscle

Infranuclear

This slide captures one way to think about the motility disorders. If it is unfamiliar, I strongly suggest you review the slide-set entitled ‘Motility disorders: Overview’ before proceeding.
In this slide-set, we’ll take a look at motility disorders stemming from pathology of the cavernous sinus (CS), superior orbital fissure (SOF) and the orbital apex (OA).
Motility Disorders: The Sinus, the Fissure, and the Apex

Motility Disorders: The Sinus, the Fissure, and the Apex

Supranuclear

Nuclear

Infranuclear

Fascicular

Subarachnoid

Cavernous sinus

Superior orbital fissure

Orbital apex

Neuromuscular junction

Extraocular muscle

What is the hallmark of pathology involving these three locations?
Motility Disorders: The Sinus, the Fissure, and the Apex

Supranuclear

Nuclear

Infranuclear

What is the hallmark of pathology involving these three locations? Deficits implicating multiple nerves simultaneously.

Fascicular
Subarachnoid

Cavernous sinus
Superior orbital fissure
Orbital apex

Neuromuscular junction
Extraocular muscle

Optic nerve
CN3
CN4
CN6
Postganglionic sympathetics
MLF
Motility Disorders: *The Sinus, the Fissure, and the Apex*

Supranuclear

Nuclear

*Internuclear*

Fascicular

Subarachnoid

**Cavernous sinus**

Superior orbital fissure

Orbital apex

Neuromuscular junction

Extraocular muscle

Infranuclear

What is the hallmark of pathology involving these three locations? Deficits implicating multiple nerves simultaneously

Which nerves can be involved?

--?

--?

--?
Motility Disorders: The Sinus, the Fissure, and the Apex

What is the hallmark of pathology involving these three locations? Deficits implicating multiple nerves simultaneously.

Which nerves can be involved?
- Optic nerve
- CN3
- CN4
- CNV (specifically V1 and V2)
- CN6
- Postganglionic sympathetics
Motility Disorders: The Sinus, the Fissure, and the Apex

What is the hallmark of pathology involving these three locations?

Deficits implicating multiple nerves simultaneously

Which nerves can be involved?

- Optic nerve
- CN3
- CN4
- CNV (specifically V1 and V2)
- CN6
- Postganglionic sympathetics

Note: Some sources contend that the mandibular nerve (V3) can be affected by pathology in the posteriormost portion of the sinus. However, the most recent (at the time this slide-set was last edited) version of the BCSC Neuro book makes no mention of this.
Anatomically speaking, how are the cavernous sinus, superior orbital fissure and orbital apex related to one another?
Anatomically speaking, how are the cavernous sinus, superior orbital fissure and orbital apex related to one another? They are ‘ducks in a row’ in that the orbital apex is in direct communication with the cavernous sinus via the superior orbital fissure.
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus    Superior orbital fissure    Orbital apex

How many CSs are in a standard human head?
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus  Superior orbital fissure  Orbital apex

*How many CSs are in a standard human head?*
Two
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus
Superior orbital fissure
Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Motility Disorders: *The Sinus, the Fissure, and the Apex*

- Cavernous sinus
- Superior orbital fissure
- Orbital apex

*How many CSs are in a standard human head?*
Two

*Where are they located?*
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus
How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

What structure occupies the pituitary fossa?
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus  Superior orbital fissure  Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

What structure occupies the pituitary fossa?
The pituitary gland, duh
Motility Disorders: The Sinus, the Fissure, and the Apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

What structure occupies the pituitary fossa?
The pituitary gland, duh

What does this anatomic arrangement indicate regarding pituitary pathology and the CS?
How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

What structure occupies the pituitary fossa?
The pituitary gland, duh

What does this anatomic arrangement indicate regarding pituitary pathology and the CS?
It implies that pituitary pathology can directly impact one or both CSs
Cavernous sinus  Superior orbital fissure  Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
Motility Disorders: The Sinus, the Fissure, and the Apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

Orbital apex

How many CSs are in a standard human head?

Two

Where are they located?

Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?

Venous sinus

Are the two CSs isolated, or in communication with one another?

Yes, they are in communication via numerous venous connections

Was this a random anatomy question, or is this fact of clinical significance?

The latter, as it explains how some pathologic processes can spread from one CS to the other
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior  ➔  Anterior

Cavernous sinus  Superior orbital fissure  Orbital apex

**How many CSs are in a standard human head?**

Two

**Where are they located?**

Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

**In a nutshell, what sort of structure is the CS?**

A venous sinus -- one of a number responsible for draining the cranial vault

**Are the two CSs isolated, or in communication with one another?**

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Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

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How many CSs are in a standard human head?

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Where are they located?

Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?

Venous sinus -- one of a number responsible for draining the cranial vault

Are the two CSs isolated, or in communication with one another?

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Was this a rando anatomy question, or is this fact of clinical significance?

The latter, as it explains how some pathologic processes can spread from one CS to the other
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus
Superior orbital fissure
Orbital apex

How many CSs are in a standard human head?

Two

Where are they located?
Just behind the orbits, and just lateral to the sphenoid sinus

In a nutshell, what sort of structure is the CS?
Venous sinus

Are the two CSs isolated, or in communication with one another?
They are in communication via numerous venous connections

Was this a rando anatomy question, or is this fact of clinical significance?
The latter, as it explains how pathologic processes can spread from one CS to the other

Draining the cranial vault
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior  Anterior

Cavernous sinus  Superior orbital fissure  Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus.

In a nutshell, what sort of structure is the CS?
A venous sinus—one of a number responsible for draining the cranial vault.

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses.
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Cavernous sinus Superior orbital fissure Orbital apex → Anterior

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
Venous sinus—one of a number responsible for draining the cranial vault

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus
Superior orbital fissure
Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus -- one of a number responsible for draining the cranial vault

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses

What are the other three?
-- Sphenoid sinus
-- ? sinuses
-- ? sinuses
-- ? sinuses
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus  Superior orbital fissure  Orbital apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses

What are the other three?
--Sphenoid sinus
--Frontal sinuses
--Ethmoid sinuses
--Maxillary sinuses
**Motility Disorders: The Sinus, the Fissure, and the Apex**

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus -- one of a number responsible for draining the cranial vault

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses

What are the other three?

Relative to the eyes, where is each located?
--Sphenoid sinus: ? the eyes
--Frontal sinuses: ? the eyes
--Ethmoid sinuses: ? the eyes
--Maxillary sinuses: ? the eyes
Motility Disorders: The Sinus, the Fissure, and the Apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Is the sphenoid sinus another venous sinus?
No, it is one of the four paranasal air sinuses

What are the other three?
Relative to the eyes, where is each located?
--Sphenoid sinus: behind the eyes
--Frontal sinuses: above the eyes
--Ethmoid sinuses: between the eyes
--Maxillary sinuses: below the eyes
Motility Disorders: *The Sinus, the Fissure, and the Apex*

Cavernous sinus  
Superior orbital fissure  
Orbital apex

*How many CSs are in a standard human head?*  
Two

*Where are they located?*  
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

*In a nutshell, what sort of structure is the CS?*  
A venous sinus--one of a number responsible for draining the cranial vault

*Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?*
Motility Disorders: The Sinus, the Fissure, and the Apex

**Cavernous sinus**

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins
How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Cavernous sinus Superior orbital fissure Orbital apex → Anterior

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus—one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus
Motility Disorders: The Sinus, the Fissure, and the Apex

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Cavernous sinus
Superior orbital fissure
Orbital apex

How many CSs are in a standard human head? Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Dorello’s canal
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus       Superior orbital fissure       Orbital apex

Posterior ← Anterior

How many CSs are in a standard human head?
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Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain? ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Dorello’s canal

Which cranial nerve travels in Dorello’s canal on its way to the CS?
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Cavernous sinus Superior orbital fissure Orbital apex → Anterior

How many CSs are in a standard human head?
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Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Dorello’s canal

Which cranial nerve travels in Dorello’s canal on its way to the CS? CN6
How many CSs are in a standard human head? 
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS? 
A venous sinus, one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

Was this a set of rando anatomy questions, or is there a clinical point being made here, too?

The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Dorello’s canal

Which cranial nerve travels in Dorello’s canal on its way to the CS? CN6
How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus, one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

Was this a set of rando anatomy questions, or is there a clinical point being made here, too?
As before, not rando. The clinical significance here is that if CS pathology extends via the inferior petrosal sinus, it can bag CN6 in the tight confines of Dorello’s canal, thereby providing another mechanism by which CS disease can produce ocular dysmotility.

The internal jugular (IJ) veins

What structure is the main conduit for blood leaving the CS to get to the IJ vein?
The inferior petrosal sinus

Through what eponymous space does the inferior petrosal sinus run?
Dorello’s canal

Which cranial nerve travels in Dorello’s canal on its way to the CS? CN6
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

How many CSs are in a standard human head?
Two

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Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structures drain into the CS?
Motility Disorders: *The Sinus, the Fissure, and the Apex*

Cavernous sinus  Superior orbital fissure  Orbital apex

**How many CSs are in a standard human head?**
Two

**Where are they located?**
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

**In a nutshell, what sort of structure is the CS?**
A venous sinus--one of a number responsible for draining the cranial vault

**Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?**
The internal jugular (IJ) veins

**What structures drain into the CS?**
The eye and orbit (along with some intracranial blood)
Motility Disorders: The Sinus, the Fissure, and the Apex

**Posterior** ← Cavernous sinus ← Superior orbital fissure ← Orbital apex → Anterior

**How many CSs are in a standard human head?**
Two

**Where are they located?**
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

**In a nutshell, what sort of structure is the CS?**
A venous sinus--one of a number responsible for draining the cranial vault

**Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?**
The internal jugular (IJ) veins

**What structures drain into the CS?**
The eye and orbit (along with some intracranial blood)

**What vessel is the main conduit for blood leaving the eye to get to the CS?**
The superior orbital vein
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Cavernous sinus Superior orbital fissure Orbital apex → Anterior

How many CSs are in a standard human head?
Two

Where are they located?
Just behind the orbits, and just lateral to the sella turcica/pituitary fossa and the sphenoid sinus

In a nutshell, what sort of structure is the CS?
A venous sinus--one of a number responsible for draining the cranial vault

Into what vessels do the sinuses ultimately drain; ie, how does intracranial blood get out of the head?
The internal jugular (IJ) veins

What structures drain into the CS?
The eye and orbit (along with some intracranial blood)

What vessel is the main conduit for blood leaving the eye to get to the CS?
The superior ophthalmic vein
### Motility Disorders: The Sinus, the Fissure, and the Apex

<table>
<thead>
<tr>
<th>Posterior</th>
<th>Anterior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cavernous sinus</strong></td>
<td>Superior orbital fissure</td>
</tr>
</tbody>
</table>

A *number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others?*

--?
--CN6
--?
--?
--?
--?
--?
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

Orbital apex

A number of critical structures are located within each CS.
CN6 was alluded to a few slides ago--what are the others?

--The internal carotid artery
--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus
Superior orbital fissure
Orbital apex

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others?

---The internal carotid artery
---CN6
---CN3
---CN4
---V1
---V2
---Postganglionic sympathetics
---Not the...

What eye-critical structure is notable for its absence from this list?
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others?

--The internal carotid artery
--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics

What eye-critical structure is notable for its absence from this list? The optic nerve
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

--The internal carotid artery: ?
--CN6: ?
--CN3: ?
--CN4: ?
--V1: ?
--V2: ?
--Postganglionic sympathetics: ?
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

- The internal carotid artery: The cavern
- CN6: The cavern
- CN3: The lateral wall
- CN4: The lateral wall
- V1: The lateral wall
- V2: The lateral wall
- Postganglionic sympathetics: The cavern
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

--- The internal carotid artery: The cavern
--CN6: The cavern
--CN3: The lateral wall
--CN4: The lateral wall
--V1: The lateral wall
--V2: The lateral wall
--Postganglionic sympathetics: 

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus  Superior orbital fissure  Orbital apex

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?
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--V2: The lateral wall
--Postganglionic sympathetics: Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology

What other signs/symptoms of CS disease might be present?
--
--
--
Cavernous sinus  Superior orbital fissure  Orbital apex

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

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--CN6: The cavern
--CN3: The lateral wall
--CN4: The lateral wall
--V1: The lateral wall
--V2: The lateral wall
--Postganglionic sympathetics:

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis
Motility Disorders: *The Sinus, the Fissure, and the Apex*

**Cavernous sinus**

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

--- The internal carotid artery: The cavern

--- **CN6**: The cavern

--- **CN3**: The lateral wall

--- **CN4**: The lateral wall

--- **V1**: The lateral wall

--- **V2**: The lateral wall

--- **Postganglionic sympathetics**: Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology, especially if signs and symptoms of orbital congestion are present as well!

--- **Engorged ocular surface veins**

--- **Increased IOP**

--- **Chemosis**
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus Superior orbital fissure Orbital apex

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

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--V1: The lateral wall
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--Postganglionic sympathetics

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology, as if signs and symptoms of orbital congestion are present as well!

How does CS pathology lead to orbital congestion and concomitant changes to the ocular surface, and IOP?
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

Orbital apex

Posterior

Anterior

A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

--The internal carotid artery: The cavern

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--CN3: The lateral wall

--CN4: The lateral wall

--V1: The lateral wall

--V2: The lateral wall

--Postganglionic sympathetics

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology, as if signs and symptoms of CS disease might be present.

--Engorged ocular surface veins

--Increased IOP

--Chemosis

How does CS pathology lead to orbital congestion and concomitant changes to the ocular surface, and IOP?

Recall that most intraocular blood (and much orbital blood) drains into the CS via the superior ophthalmic vein. If CS pathology impedes venous drainage of the eye and orbit, the increased pressure on the venous side will produce the findings described.

What other signs/symptoms of CS disease might be present?

Engorged ocular surface veins

Increased IOP

Chemosis

as well!
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?
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--CN3: The lateral wall
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--V2: The lateral wall
--Postganglionic sympathetics:

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology, as if signs and symptoms of CS disease might be present.

How does CS pathology lead to orbital congestion and concomitant changes to the ocular surface, and IOP?
Recall that most intraocular blood (and much orbital blood) drains into the CS via the superior ophthalmic vein. If CS pathology impedes venous drainage of the eye and orbit, the increased pressure on the venous side will produce the findings described.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis

signs and symptoms of orbital congestion are present as well!
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago--what are the others? Where within the CS is each located?

--The internal carotid artery: The cavern
--CN6: The cavern
--CN3: The lateral wall
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Three general categories of CS pathology:
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Three general categories of CS pathology:

Neoplastic
Vascular
Inflammatory
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What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Can a neoplasia inducing a CS syndrome arise:

--As a primary in the CS?
--As a metastasis to the CS?
--In the pituitary gland, medial to the CS?
--In the ethmoid sinus, medial to the CS?
--As a sphenoid-wing meningioma, lateral to the CS?
--In an infiltrative manner, eg, from leukemia?
A number of critical structures are located within each CS.

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Two broad types of CS vascular pathology:

Neoplastic

Vascular

Inflammatory
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Motility Disorders: The Sinus, the Fissure, and the Apex
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Two types of CS thrombosis:

Neoplastic

Vascular

Thrombosis

Fistula

Inflammatory

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Two types of CS thrombosis:
- Septic
- Aseptic

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Motility Disorders: The Sinus, the Fissure, and the Apex

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Three sites are notorious for spreading to the CS—what are they?

-?
-?
-?

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Motility Disorders: The Sinus, the Fissure, and the Apex

In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site?

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Three sites are notorious for spreading to the CS--what are they?

- The mid-face
- The oral cavity (usually in the form of a dental infection)
- The sphenoid/ethmoid sinuses

What other signs/symptoms of CS disease might be present?

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Neoplastic
- Septic
- Vascular
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Inflammatory
Motility Disorders: *The Sinus, the Fissure, and the Apex*

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What about orbital cellulitis—can it be the nidus for CS thrombosis?

What other signs/symptoms of CS disease might be present?
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Motility Disorders: The Sinus, the Fissure, and the Apex

Neoplastic

Vascular

Inflammatory

Septic

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Orbital cellulitis? No

What about orbital cellulitis—can it be the nidus for CS thrombosis? In theory yes, but it is considered to be a very rare source in practice.

What other signs/symptoms of CS disease might be present?
- Engorged ocular surface veins
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Motility Disorders: The Sinus, the Fissure, and the Apex

Neoplastic
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**In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site?**

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Motility Disorders: The Sinus, the Fissure, and the Apex

What other signs/symptoms of CS disease might be present?

Engorged ocular surface veins

Increased IOP

Chemosis

Inflammation
In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site?

In most cases it originates elsewhere and spreads to the CS

In addition to simultaneous ophthalmic neuropathies and signs of orbital congestion, how does septic CS thrombosis present?

The pt is usually ill-appearing, with constitutional signs of infection (fever, chills, etc).

Headache and N/V are the rule.

Are the ophthalmic findings unilateral, or bilateral?

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Neoplastic

Vascular

Thrombosis

Fistula

Inflammatory

Septic

Aseptic
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What other signs/symptoms of CS disease might be present?

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In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site? In most cases it originates elsewhere and spreads to the CS.

A number of critical structures are located within each CS. Where within the CS is each located?

- **The internal carotid artery**: The cavern.
- **CN6**: The cavern.
- **CN3**: The lateral wall.
- **CN4**: The lateral wall.
- **V1**: The lateral wall.
- **V2**: The lateral wall.
- **Postganglionic sympathetics**.

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
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**Motility Disorders: The Sinus, the Fissure, and the Apex**

What other signs/symptoms of CS disease might be present?

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In addition to simultaneous ophthalmic neuropathies and signs of orbital congestion, how does septic CS thrombosis present?

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In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site? In most cases it originates elsewhere and spreads to the CS.

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Motility Disorders: The Sinus, the Fissure, and the Apex

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What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

How is septic CS thrombosis managed?

Given its high mortality rate, it should be managed as the medical emergency it is. Appropriate imaging and labs should be obtained. Broad-spectrum abx therapy should be started without delay (and probably anti-coag therapy as well). Invite your friends on the Neurosurgery and Infectious Disease services to the party.

In inflammatory CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site?

In most cases it originates elsewhere and spreads to the CS.

In addition to simultaneous ophthalmic neuropathies and signs of orbital congestion, it presents with:

- Engorged ocular surface veins
- Increased IOP
- Chemosis

Are the ophthalmic findings unilateral, or bilateral?

The typical case presents unilaterally, but quickly becomes bilateral if appropriate and aggressive tx isn’t initiated. In the proper clinical context (ie, a very ill pt), bilateral simultaneous ophthalmic neuropathies is essentially diagnostic of septic CS thrombosis.

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis
In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site?

In most cases it originates elsewhere and spreads to the CS.

A number of critical structures are located within each CS. What are the others?

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What other signs/symptoms of CS disease might be present?

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In septic CS thrombosis, is the intra-cavernous infection usually primary to the sinus, or does it originate in another site? How is septic CS thrombosis managed?

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What other signs/symptoms of CS disease might be present?

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Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior

Anterior

Neoplastic

Septic

Vascular

Thrombosis

Aseptic

Fistula

Inflammatory
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Motility Disorders: The Sinus, the Fissure, and the Apex

- Posterior
- Superior orbital fissure
- Orbital apex

What about aseptic CS thrombosis—how does it present?

It presents in similar fashion to the septic variety, except:

- The patient is not nearly as ill-appearing; and
- The signs/symptoms of orbital congestion are not as severe.

Further, and not surprisingly, lab work fails to reveal evidence of an infection.

How is it managed?

With anticoagulation/anti-platelet therapy
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**Neoplastic**

**Vascular**

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**Inflammatory**

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How is it managed?

Motility Disorders: The Sinus, the Fissure, and the Apex
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Cavernous sinus

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Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology

Motility Disorders: The Sinus, the Fissure, and the Apex
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Motility Disorders: The Sinus, the Fissure, and the Apex
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect?

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect?
It is the configuration--unique in the human body--of having an arterial structure (the internal carotid artery and its branches) wholly within the confines of a venous structure (ie, the CS itself)

What other signs/symptoms of CS disease might be present?
---Engorged ocular surface veins
---Increased IOP
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What is the fundamental problem that results from a fistula within the CS?

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It is the configuration--unique in the human body--of having an arterial structure (the internal carotid artery and its dural branches) wholly within the confines of a venous structure (ie, the CS itself)

What is the fundamental problem that results from a fistula within the CS?
It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree to flow into the low-pressure, venous-sided CS. The subsequent increase in blood pressure within the CS impedes venous flow into the CS, leading to congestion of the eye and orbit.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins  
--Increased IOP  
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A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

- The internal carotid artery: The cavern
- CN3: The lateral wall
- CN4: The lateral wall
- V1: The lateral wall
- V2: The lateral wall
- Postganglionic sympathetics

What other signs/symptoms of CS disease might be present?
- Engorged ocular surface veins
- Increased IOP
- Chemosis

An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. Earlier in the slide-set, the main venous conduit from the eye and orbit to the CS was identified. What was it again?

It’s the superior ophthalmic vein. It’s the only vein in the human body that drains into the low-pressure, venous-sided CS. The subsequent increase in blood pressure within the CS impedes venous flow into the CS, leading to congestion of the eye and orbit.

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

Neoplastic

Vascular

Fistula

Inflammatory

Fistula

Septic

Aseptic

High-flow

Low-flow
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. Earlier in the slide-set, the main venous conduit from the eye and orbit to the CS was identified. What was it again? The superior ophthalmic vein.

It’s unique in the human body in that it has an arterial structure (the internal carotid artery and its dural branches) wholly within the confines of a venous structure (ie, the CS itself). What is the fundamental problem that results from a fistula within the CS? It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree to flow into the low-pressure, venous-sided CS. The subsequent increase in blood pressure within the CS impedes venous flow into the CS, leading to congestion of the eye and orbit.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis

Neoplastic
Vascular
Inflammatory

Fistula
Thrombosis
High-flow
Low-flow
Septic
Aseptic
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. Earlier in the slide-set, the main venous conduit from the eye and orbit to the CS was identified. What was it again?
The superior ophthalmic vein

In a pt with a CS fistula, what is the appearance of the superior ophthalmic vein on orbital imaging studies?

It’s enlarged. This is an important sign to search for when reviewing imaging studies in cases of suspected CS fistulas!

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. Earlier in the slide-set, the main venous conduit from the eye and orbit to the CS was identified. What was it again? The superior ophthalmic vein. In a pt with a CS fistula, what is the appearance of the superior ophthalmic vein on orbital imaging studies? It is enlarged. This is an important sign to search for when reviewing imaging studies in cases of suspected CS fistulas! What other signs/symptoms of CS disease might be present? --Engorged ocular surface veins --Increased IOP --Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect?
It is the configuration--unique in the human body--of having an arterial structure (the internal carotid artery and its dural branches) wholly within the confines of a venous structure (ie, the CS itself)

What is the fundamental problem that results from a fistula within the CS?
It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree to flow into the low-pressure, venous-sided CS. The subsequent increase in blood pressure within the CS impedes venous flow into the CS, leading to congestion of the eye and orbit. Further, if the pressure increase within the CS is significant enough, reversal of blood flow through the venous structures that drain into the CS will occur--that is, blood will circulate from the CS to the eye and orbit.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect?

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What is the fundamental problem that results from a fistula within the CS?

It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree to flow into the low-pressure, venous-sided CS. This impedes venous flow into the CS, leading to congestion of the eye and orbit. If the pressure increase within the CS is significant enough, reversal of blood flow will occur through the venous structures that drain into the CS will occur--that is, blood will circulate from the CS to the eye and orbit.

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Reversal of blood produces a classic finding on the ocular surface. What is that finding?

Arterialization of conj vessels

What is the classic term used to describe the appearance of these arterialized conj vessels?

‘Corkscrewing’
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect? It is the configuration--unique in the human body--of having an arterial structure (the internal carotid artery and its dural branches) wholly within the confines of a venous structure (ie, the CS itself).

What is the fundamental problem with this configuration? It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree into the low-pressure, venous-sided CS, which impedes venous flow into the CS. If the pressure increase within the CS is significant enough, reversal of blood flow through the venous structures that drain into the CS will occur--that is, blood will circulate from the CS to the eye and orbit. What is the classic finding on the ocular surface? Arterialization of conj vessels.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis
An aspect of CS anatomy makes it uniquely vulnerable to the development of A-V fistulas. What is that aspect?

It is the configuration--unique in the human body--of having an arterial structure (the internal carotid artery and its dural branches) wholly within the confines of a venous structure (ie, the CS itself).

What is the fundamental problem?

It’s a pressure thing. A fistula allows high-pressure blood from the arterial side of the CS to flow into the low-pressure, venous-sided CS. This impeds venous flow into the CS.

If the pressure increase within the CS is significant enough, reversal of blood flow through the venous structures that drain into the CS will occur--that is, blood will circulate from the CS to the eye and orbit.

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
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Reversal of blood produces a classic finding on the ocular surface. What is that finding?

Arterialization of conj vessels

What is the classic term used to describe the appearance of these arterialized conj vessels?

Corkscrewing

Inflammatory
Motility Disorders: The Sinus, the Fissure, and the Apex

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What is the fundamental problem?
It’s a pressure thing. A fistula allows high-pressure blood from the arterial tree into the low-pressure, venous-sided CS. This impedes venous flow into the CS.

If the pressure increase within the CS is significant enough, reversal of blood flow through the venous structures that drain into the CS will occur--that is, blood will circulate from the CS to the eye and orbit.

What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis

Reversal of blood produces a classic finding on the ocular surface. What is that finding?
Arterialization of conj vessels

What is the classic term used to describe the appearance of these arterialized conj vessels?
‘Corkscrewing’

Inflammatory

Vascular

Neoplastic

Fistula

Thrombosis

Septic

Aseptic

Neoplastic

Septic

Aseptic

High-flow

Low-flow
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

--The internal carotid artery
--CN6: The cavern
--CN3: The lateral wall
--CN4: The lateral wall
--V1: The lateral wall
--V2: The lateral wall

--Postganglionic sympathetics:

What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?
A low-flow fistula involves… whereas a high-flow fistula involves…

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

CS pathology:

Neoplastic
Vascular
Fistula
Inflammatory

Septic
Aseptic
High-flow
Low-flow

Posterior
Anterior

Cavernous sinus
Superior orbital fissure
Orbital apex
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

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--- Postganglionic sympathetics

What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?

A low-flow fistula involves…a dural branch of the internal carotid, whereas a high-flow fistula involves…the internal carotid itself.

What other signs/symptoms of CS disease might be present?

--- Engorged ocular surface veins
--- Increased IOP
--- Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus
Superior orbital fissure
Orbital apex

CS pathology

- Neoplastic
- Vascular
  - Fistula
    - High-flow
    - Low-flow
- Inflammatory
  - Thrombosis
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A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

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The internal carotid artery

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Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

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--Increased IOP
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Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Superior orbital fissure Orbital apex

-- A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

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What is the anatomic difference between low- and high-flow fistulas? 

What is the most common cause of high-flow fistulas?

---

Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
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Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Superior orbital fissure Orbital apex

What is the anatomic difference between low- and high-flow fistulas?

What is the most common cause of high-flow fistulas?

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Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Superior orbital fissure Orbital apex

What is the anatomic difference between low- and high-flow fistulas?

What is the most common cause of high-flow fistulas?

---

Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ← Superior orbital fissure Orbital apex

What is the anatomic difference between low- and high-flow fistulas?

What is the most common cause of high-flow fistulas?
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- Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

-- Engorged ocular surface veins
-- Increased IOP
-- Chemosis

What is the anatomic difference between low- and high-flow fistulas?

- Low-flow fistula involves a dural branch of the internal carotid, whereas a high-flow fistula involves the internal carotid itself.

What is the most common cause of high-flow fistulas?

Severe head trauma

CS pathology:

- Neoplastic
- Vascular
  - Thrombosis
  - Fistula
    - High-flow
    - Low-flow
- Septic
- Aseptic
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What other signs/symptoms of CS disease might be present?
- Engorged ocular surface veins
- Increased IOP
- Chemosis

CS pathology

- Neoplastic
- Vascular
  - Fistula
    - High-flow
    - Low-flow
- Inflammatory

High-flow versus low-flow fistulas:
- Low-flow fistula involves...a dural branch of the internal carotid, whereas a high-flow fistula involves...the internal carotid itself.

How about low-flow fistulas--are they secondary to trauma as well?

Motility Disorders: The Sinus, the Fissure, and the Apex
A number of critical structures are located within each CS.

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- The internal carotid artery: The cavern
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- Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex

How about low-flow fistulas—are they 2ndry to trauma as well?
No, most of these are spontaneous

CS pathology

- Neoplastic
- Vascular
  - Fistula
    - High-flow
    - Low-flow
- Inflammatory

High-flow vs. low-flow fistulas:

- A low-flow fistula involves…a dural branch of the internal carotid, whereas a high-flow fistula involves…the internal carotid itself.

Septic
- Aseptic
- Thrombosis
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- Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

Motility Disorders: The Sinus, the Fissure, and the Apex

How about low-flow fistulas—are they 2ndry to trauma as well? No, most of these are spontaneous

Is there a gender predilection?

CS pathology:

- Neoplastic
- Vascular
  - Fistula
  - High-flow
  - Low-flow
- Inflammatory

Septic
Aseptic

High-flow fistula involves a dural branch of the internal carotid, whereas a high-flow fistula involves the internal carotid itself.

What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?

Neoplastic
Thrombosis

Aseptic
A number of critical structures are located within each CS.

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--Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

How about low-flow fistulas—are they 2ndry to trauma as well?
No, most of these are spontaneous

Is there a gender predilection?
Yes, ♀ are more likely to be affected

Motility Disorders: The Sinus, the Fissure, and the Apex

(How to distinguish between low- and high-flow fistulas)

A low-flow fistula involves...a dural branch of the internal carotid, whereas a high-flow fistula involves...the internal carotid itself

Large-flow fistulas are highly suggestive of:

Neoplastic
Vascular
Fistula
Inflammatory

Septic
Aseptic

Thrombosis
High-flow
Low-flow
A number of critical structures are located within each CS.

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What other signs/symptoms of CS disease might be present?

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How about low-flow fistulas—are they secondary to trauma as well?
No, most of these are spontaneous

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CS pathology

- Neoplastic
  - Thrombosis
  - Aseptic

- Vascular
  - Fistula
    - High-flow
    - Low-flow

- Inflammatory
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What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

Is there a gender predilection?
Yes, ♀ are more likely to be affected

Is it more likely to occur in younger, or older women?

How about low-flow fistulas—are they secondary to trauma as well?
No, most of these are spontaneous

CS pathology:

Neoplastic
Vascular
  - Thrombosis
  - Fistula
    - High-flow
    - Low-flow
  - Aseptic
  - Septic

Inflammatory
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What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

111

Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous

Superior orbital fissure
Orbital apex

Posterior
Anterior

Is there a gender predilection?
Yes, \( \text{♀} \) are more likely to be affected

Is it more likely to occur in younger, or older women?
Older

What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?

A low-flow fistula involves... a dural branch of the internal carotid, whereas a high-flow fistula involves... the internal carotid itself

How about low-flow fistulas—are they 2ndry to trauma as well?
No, most of these are spontaneous

Is it more likely to occur in younger, or older women?

Septic
Aseptic

Inflammatory
Neoplastic
Vascular
Fistula
Thrombosis

Motility Disorders: The Sinus, the Fissure, and the Apex

Orbital apex

Posterior
Anterior
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What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?

A low-flow fistula involves a dural branch of the internal carotid, whereas a high-flow fistula involves the internal carotid itself.

With respect to their clinical presentation, how do high- and low-flow fistulas differ?

They don't—*at least, not in a manner reliable enough to be distinguish between them.* That is, one cannot differentiate between high-flow and low-flow fistulas on the basis of the extent of the neural deficits, or the severity of the congestion signs/symptoms.

Inflammatory

Neoplastic

Vascular

Fistula

High-flow

Low-flow
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What other signs/symptoms of CS disease might be present?
--Engorged ocular surface veins
--Increased IOP
--Chemosis

Is there any way to distinguish between the high- and low-flow versions in the clinic?

A low-flow fistula involves...a dural branch of the internal carotid, whereas a high-flow fistula involves...the internal carotid itself.

With respect to their clinical presentation, how do high- and low-flow fistulas differ?
They don't--at least, not in a manner reliable enough to be distinguish between them. That is, one cannot differentiate between high- and low-flow fistulas on the basis of the extent of the neural deficits, or the severity of the congestion signs/symptoms.

Is there any way to distinguish between the high- and low-flow versions in the clinic?

There's one--the presence of a bruit, which signifies the fistula is high-flow...
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- Postganglionic sympathetics:

What other signs/symptoms of CS disease might be present?

- Engorged ocular surface veins
- Increased IOP
- Chemosis

Is there any way to distinguish between the high- and low-flow versions in the clinic?

There’s one—the presence of a bruit, which signifies the fistula is high-flow. It’s enough to be distinguish between them. That is, one cannot differentiate between high- and low-flow fistulas on the basis of the extent of the neural deficits, or the severity of the congestion signs/symptoms.

With respect to their clinical presentation, how do high- and low-flow fistulas differ?

They don’t—at least, not in a manner reliable enough to be distinguish between them. That is, one cannot differentiate between high- and low-flow fistulas on the basis of the extent of the neural deficits, or the severity of the congestion signs/symptoms.

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What is the anatomic difference between low- and high-flow fistulas (other than flow rate, duh)?

A low-flow fistula involves…a dural branch of the internal carotid, whereas a high-flow fistula involves…the internal carotid itself.

Motility Disorders: The Sinus, the Fissure, and the Apex
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What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
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What other signs/symptoms of CS disease might be present?

--Engorged ocular surface veins
--Increased IOP
--Chemosis

The BCSC Neuro book discusses one specific inflammatory condition by name. What is that condition?

Tolosa-Hunt syndrome

Painful ophthalmoplegia secondary to noninfectious inflammation of the cavernous sinus

Is it common, or rare?

Very rare

Is there an age predilection?

No

Is there a gender predilection?

No
A number of critical structures are located within each CS. CN6 was alluded to a few slides ago—what are the others? Where within the CS is each located?

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What other signs/symptoms of CS disease might be present?

- Engorged ocular surface
- Increased IOP
- Chemosis

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What other signs/symptoms of CS disease might be present?

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--Increased IOP
--Chemosis

The BCSC Neuro book discusses one specific inflammatory condition by name. What is that condition? Tolosa-Hunt syndrome

What is the Tolosa-Hunt syndrome?

Painful ophthalmoplegia secondary to noninfectious inflammation of the cavernous sinus

Is it common, or rare?

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Is the pain exquisitely responsive? Yes

Is there a response to steroids? Yes

The (well-deserved) reputation for being steroid-responsive enjoyed by Tolosa-Hunt can be highly misleading—why?

Because other, far more common causes of painful ophthalmoplegia are steroid-responsive too. So steroid-responsiveness should not be interpreted as confirming the diagnosis of Tolosa-Hunt.
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**Motility Disorders: The Sinus, the Fissure, and the Apex**

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**Is it common, or rare?**

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Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus Superior orbital fissure Orbital apex

The BCSC Neuro book discusses one specific inflammatory condition by name. What is that condition? Tolosa-Hunt syndrome

The Neuro book puts it this way: “Not infrequently, it is later discovered that the cause of the painful ophthalmoplegia in patients initially diagnosed with Tolosa-Hunt syndrome is neoplastic.”

Which neoplasm in particular?
- Lymphoma
- Exquisitely responsive

What other causes are steroid-responsive, and thus giving a false sense of confirmation of Tolosa-Hunt? Neoplasm
- Infectious
  - Neoplasm
  - Lymphoma
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Which two causes are particularly notorious for being steroid-responsive, and thus giving a false confirmation of Tolosa-Hunt?

--Neoplasm

--Infectious

Which type of infectious in particular?

Exquisitely responsive

Inflammatory

Fungal
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The takeaway point: Tolosa-Hunt is vastly more likely to appear on a test than in your exam chair. So, while you should feel free to sling the diagnosis around on the OKAP, prudence dictates to be much more circumspect with it in the clinic. (Andrew Lee, among others, argues that the diagnosis should not be made by anyone other than a trained neuro-oph.)

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Inflammatory
Motility Disorders: *The Sinus, the Fissure, and the Apex*

**Cavernous sinus**  
**Superior orbital fissure**  
**Orbital apex**

*What bony relationship forms the SOF?*
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.
Superior orbital fissure

What bony relationship forms the SOF?
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How long is the SOF?
Motility Disorders: The Sinus, the Fissure, and the Apex

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How long is the SOF?
About 2 cm
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Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone

How long is the SOF?
About 2 cm

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn

What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles
Superior orbital fissure

What bony relationship forms the SOF?
The SOF is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF?
The SOF is about 2 cm long.

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn.

What is the annulus of Zinn?
The annulus of Zinn is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

What portion of the SOF is straddled by the annulus?
Superior orbital fissure

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About 2 cm

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What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles

What portion of the SOF is straddled by the annulus?
Roughly the middle third
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF?
About 2 cm.

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--?
--?
--?

What portion of the SOF is straddled by the annulus?
Roughly the middle third.
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

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By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus
--The intra-annular portion
--The inferior portion below it

What portion of the SOF is straddled by the annulus?
Roughly the middle third.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

- **Posterior**
  - Cavernous sinus

  - Superior orbital fissure

  - Orbital apex

- **Anterior**

**What bony relationship forms the SOF?**
It is the gap between the greater and lesser wings of the sphenoid bone.

**How long is the SOF?**
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  - What portion of the SOF is straddled by the annulus?
    - Roughly the middle third

- By dint of its location, the annulus divides the SOF into three sections. What are they called?
  - The **superior** portion is above the annulus.
  - The **intra-annular** portion.
  - The **inferior** portion below it.

**What structures pass through the superior portion of the SOF?**
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

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What portion of the SOF is straddled by the annulus?
Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
Superior, intra-annular, inferior.

What structures pass through the superior portion of the SOF?
- Superior ophthalmic vein
- Lacrimal and frontal nerves
- CN4

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Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

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--- The superior portion is above the annulus.
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--- The inferior portion below it.

What structures pass through the superior portion of the SOF?
--- The superior ophthalmic vein.
--- The lacrimal and frontal nerves.
--- CN4.
Motility Disorders: The Sinus, the Fissure, and the Apex

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- The inferior portion below it

What structures pass through the superior portion of the SOF?
- The superior ophthalmic vein
- The lacrimal and frontal nerves
- CN4

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve).
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
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What is the annulus of Zinn?
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What portion of the SOF is straddled by the annulus?
Roughly the middle third.

What are the structures that pass through the superior portion of the SOF?
-- The superior ophthalmic vein
-- The lacrimal and frontal nerves
--CN4

By dint of its location, what sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal nerves?
Sensory.

What are they called?
--The superior portion
--The intra-annular portion
--The inferior portion below it

What portion of the SOF is straddled by the annulus?
Roughly the middle third.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

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What structures pass through the superior portion of the SOF?
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--The lacrimal and frontal nerves
--CN4

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
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**Motility Disorders: The Sinus, the Fissure, and the Apex**

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Motility Disorders: The Sinus, the Fissure, and the Apex

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To which cranial nerve do they belong? CN5, specifically V1 (aka the ophthalmic nerve).
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

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What structures pass through the superior portion of the SOF?
--- The superior ophthalmic vein
--- The lacrimal and frontal nerves
--- CN4

V1/the ophthalmic nerve divides into three branches, two of which are the frontal and lacrimal. What is the other?
--- Frontal
--- Lacrimal

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve)
Motility Disorders: *The Sinus, the Fissure, and the Apex*

**Cavernous sinus**
**Superior orbital fissure**
**Orbital apex**

**Posterior** ↔ **Anterior**

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By dint of its location, the annulus divides the SOF into three sections. What are they called?
--- **The superior portion** is above the annulus.
--- **The intra-annular portion**.
--- **The inferior portion** below it.

What structures pass through the superior portion of the SOF?
-- The superior ophthalmic vein
-- The lacrimal and frontal nerves
-- CN4

**V1/the ophthalmic nerve divides into three branches, two of which are the frontal and lacrimal. What is the other?**
-- Nasociliary
-- Frontal
-- Lacrimal

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve).

V1/the ophthalmic nerve divides into three branches, two of which are the frontal and lacrimal. What is the other?
-- Nasociliary
-- Frontal
-- Lacrimal

What sort (i.e., sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve).

V1/the ophthalmic nerve divides into three branches, two of which are the frontal and lacrimal. What is the other?
-- Nasociliary
-- Frontal
-- Lacrimal

What sort (i.e., sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve).
Superior orbital fissure

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By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion
--The intra-annular portion
--The inferior portion below it

What structures pass through the superior portion of the SOF?
--The superior ophthalmic vein
--The lacrimal and frontal nerves
--CN4

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve)

V1/the ophthalmic nerve divides into three branches, two of which are the frontal and lacrimal. What is the other?
--Nasociliary
--Frontal
--Lacrimal

Note that the initials of the V1 branches make a good mnemonic!
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus Superior orbital fissure Orbital apex

**What bony relationship forms the SOF?**
It is the gap between the greater and lesser wings of the sphenoid bone.

**How long is the SOF?**
About 2 cm.

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It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

**What portion of the SOF is straddled by the annulus?**
Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
- The **superior** portion is above the annulus.
- The **intra-annular** portion.
- The **inferior** portion below it.

**What structures pass through the superior portion of the SOF?**
- The superior ophthalmic vein
- The lacrimal and frontal nerves
- CN 4

What sort (ie, sensory, motor, autonomic, etc) of nerves are the **lacrimal and frontal**?
**Sensory**

To which cranial nerve do they belong? CN 5, specifically V1 (aka the ophthalmic nerve).

The lacrimal nerve...heads toward, and is sensory to, the lacrimal gland.
The frontal nerve...divides into two terminal branches (the supraorbital and supratrochlear nerves), which are sensory to the forehead, upper lids, and a portion of the conj...
Motility Disorders: The Sinus, the Fissure, and the Apex

What becomes of the lacrimal and frontal nerves, i.e., where do they go and what do they do?
The lacrimal nerve...heads toward, and is sensory to, the lacrimal gland
The frontal nerve...

What sort (i.e., sensory, motor, autonomic, etc.) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve)

By dint of its location, the lacrimal and frontal nerves are straddled by the annulus:
--The superior portion is above the annulus
--The intra-annular portion
--The inferior portion below it

What portion of the SOF is straddled by the annulus?
Roughly the middle third
Motility Disorders: The Sinus, the Fissure, and the Apex

**What bony relationship forms the SOF?**
It is the gap between the greater and lesser wings of the sphenoid bone.

**How long is the SOF?**
About 2 cm.

**The SOF is straddled by a very important structure—what is the eponymous name of this structure?**
The annulus of Zinn.

**What is the annulus of Zinn?**
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

**What portion of the SOF is straddled by the annulus?**
Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--- The **superior** portion is above the annulus.
--- The **intra-annular** portion.
--- The **inferior** portion below it.

What structures pass through the superior portion of the SOF?
--- The superior ophthalmic vein
--- The lacrimal and frontal nerves
--- CN4

**What sort (i.e., sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?**
Sensory.

**To which cranial nerve do they belong?**
CN5, specifically V1 (aka the ophthalmic nerve).

**What becomes of the lacrimal and frontal nerves, i.e., where do they go and what do they do?**
The lacrimal nerve...heads toward, and is sensory to, the lacrimal gland.
The frontal nerve...
Motility Disorders: The Sinus, the Fissure, and the Apex

What becomes of the lacrimal and frontal nerves, ie, where do they go and what do they do?
The lacrimal nerve…heads toward, and is sensory to, the lacrimal gland.
The frontal nerve…divides into two terminal branches (the lacrimal and frontal nerves), which are sensory to the forehead, upper lids, and a portion of the conjunctiva.

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V1 (aka the ophthalmic nerve)

By dint of its location, the sinus, fissure, and apex are called:
--The superior portion is above the annulus
--The intra-annular portion
--The inferior portion below it

What portion of the SOF is straddled by the annulus?
Roughly the middle third

How long is the SOF?
About 2 cm

What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

What structures pass through the superior portion of the SOF?
--The superior ophthalmic vein
--The lacrimal and frontal nerves
--CN4
Motility Disorders: The Sinus, the Fissure, and the Apex

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF?
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Posterior

Cavernous sinus
Superior orbital fissure
Orbital apex

Anterior
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
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By dint of its location, the annulus divides the SOF into three sections. What are they called?
-- The superior portion is above the annulus.
-- The intra-annular portion.
-- The inferior portion below it.

What portion of the SOF is straddled by the annulus?
Roughly the middle third.

What structures pass through the annulus itself?
-- ?
-- ?
-- ?
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
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What portion of the SOF is straddled by the annulus?
Roughly the middle third

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus
--The intra-annular portion
--The inferior portion below it

What structures pass through the annulus itself?
--The nasociliary nerve
--CN3
--CN6
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone

How long is the SOF?
About 2 cm

Is CN3 a single entity as it passes through the SOF?
No--by the time it reaches the SOF, CN3 has already split into superior and inferior divisions

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus
--The intra-annular portion
--The inferior portion below it

Roughly the middle third

The annulus of Zinn

It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles

What portion of the SOF is straddled by the annulus?
Roughly the middle third
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

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The annulus or Zinn?
The nasociliary nerve—CN3.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
- Superior portion is above the annulus.
- Intra-annular portion.
- Inferior portion below it.

Roughly the middle third is straddled by the annulus.
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

Posterior ← Cavernous sinus Superior orbital fissure Orbital apex Anterior

What bony relationship forms the SOF? It is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF? About 2 cm.

Is CN3 a single entity as it passes through the SOF? No--by the time it reaches the SOF, CN3 has already split into superior and inferior divisions.

The annulus divides the SOF into three sections.

---The superior portion is above the annulus
---The intra-annular portion
---The inferior portion below it

What portion of the SOF is straddled by the annulus? Roughly the middle third.

What structures pass through the annulus itself?

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- CN3
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Motility Disorders: The Sinus, the Fissure, and the Apex

**Superior orbital fissure**

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Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
- **Superior** portion is above the annulus
- **Intra-annular** portion
- **Inferior** portion below it

Which muscles are innervated by fibers in the:
*Superior division*?
Superior rectus, and the levator

*Inferior division*?
The medial rectus, inferior rectus and inferior oblique

No—by the time it reaches the SOF, CN3 has already split into superior and inferior divisions.
The annulus itself straddles the nasociliary nerve.

Is CN3 a single entity as it passes through the SOF?
No—it has already split into superior and inferior divisions.
Motility Disorders: The Sinus, the Fissure, and the Apex

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The medial rectus, inferior rectus and inferior oblique.
Motility Disorders: The Sinus, the Fissure, and the Apex

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Inferior division?

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What structures pass through the annulus itself?
--The nasociliary nerve
--CN3
--CN6

--The superior portion is above the annulus.
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--The inferior portion below it.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Superior orbital fissure**

*What bony relationship forms the SOF?*
It is the gap between the greater and lesser wings of the sphenoid bone.

*How long is the SOF?*
About 2 cm.

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What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

What portion of the SOF is straddled by the annulus?
Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?

--- The superior portion is above the annulus.
--- The intra-annular portion.
--- The inferior portion below it.

What structures pass through the annulus itself?

--- The nasociliary nerve.
--- CN3.
--- CN6.

Is CN3 a single entity as it passes through the SOF?
No—by the time it reaches the SOF, CN3 has already split into superior and inferior divisions.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF?
About 2 cm.

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus.
--The intra-annular portion is below the annulus.
--The inferior portion is the part between the superior and intra-annular portions.

What structures pass through the inferior portion?
Roughly the middle third.
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone

How long is the SOF?
About 2 cm

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus
--The intra-annular portion is below the annulus
--The inferior portion

What structures pass through the inferior portion?
Not much. Sometimes, the inferior ophthalmic vein passes through it.
Motility Disorders: The Sinus, the Fissure, and the Apex

**Superior orbital fissure**

What bony relationship forms the SOF?
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How long is the SOF?
About 2 cm

The SOF is straddled by a very important structure--what is the eponymous name of this structure?
The annulus of Zinn

By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?

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Motility Disorders: The Sinus, the Fissure, and the Apex

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How long is the SOF?
About 2 cm.

The SOF is straddled by a very important structure—what is the eponymous name of this structure?
The annulus of Zinn.

By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?
No! The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused!

---The inferior portion
---The intra-annular portion
---Below it
Motility Disorders: *The Sinus, the Fissure, and the Apex*

**Superior orbital fissure**

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*How long is the SOF?*
About 2 cm.

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*What is the annulus of Zinn?*
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

*What portion of the SOF is straddled by the annulus?*
Roughly the middle third.

*By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?*
No! The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused.

*What bony relationship forms the inferior orbital fissure?*
It is formed by a gap in the confluence between the orbital bones comprising the floor and medial wall.

*What structures pass through the inferior orbital fissure?*
- The infraorbital nerve and artery
- The zygomatic nerve and artery
- Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland
- The inferior ophthalmic vein (sometimes)
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

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By the way: What structures pass through the inferior orbital fissure?
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**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Superior orbital fissure**

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*What bony relationship forms the inferior orbital fissure?*
It is formed by a gap in the confluence among the orbital bones comprising the floor and medial wall.

*What structures pass through the inferior orbital fissure?*

---

The inferior portion

---

The intra-annular portion

---

Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Superior orbital fissure**

**What bony relationship forms the SOF?**
It is the gap between the greater and lesser wings of the sphenoid bone.

**How long is the SOF?**
About 2 cm.

The SOF is straddled by a very important structure—what is the eponymous name of this structure?

The annulus of Zinn

What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

What portion of the SOF is straddled by the annulus?
Roughly the middle third.

By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?
No! The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused.

**What structures pass through the inferior orbital fissure?**
- The infraorbital nerve and artery
- The zygomatic nerve and artery
- Postganglionic parasympathetics heading up from the ganglion to the lacrimal gland
- The inferior ophthalmic vein (sometimes)

The inferior orbital fissure is formed by a gap in the confluence among the orbital bones comprising the floor and medial wall. It is straddled by the annulus, which divides the SOF into three sections:

- The superior portion is above the annulus
- The intra-annular portion
- The inferior portion below it
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone

How long is the SOF?
About 2 cm

The SOF is straddled by a very important structure--

What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles

What portion of the SOF is straddled by the annulus?
Roughly the middle third

By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?
No!
The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused!

What structures pass through the inferior orbital fissure?
--The infraorbital nerve and artery
--The zygomatic nerve and artery
--Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland
--The inferior ophthalmic vein (sometimes)
**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Superior orbital fissure**

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

How long is the SOF?
About 2 cm.

The SOF is straddled by a very important structure—what is the eponymous name of this structure?
The annulus of Zinn

What is the annulus of Zinn?
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

What portion of the SOF is straddled by the annulus?
Roughly the middle third.

By dint of its location, the annulus divides the SOF into three sections. What are they called?
- Superior
- Intra-annular
- Inferior

By the way: Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms?
No!
The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused!

What structures pass through the inferior orbital fissure?
- The infraorbital nerve and artery
- The zygomatic nerve and artery
- Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland
- The inferior ophthalmic vein (sometimes)

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal?
Sensory

To which cranial nerve do they belong?
CN5, specifically V2 (aka the maxillary nerve)
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

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By the way. Are the terms ‘inferior orbital fissure’ and ‘inferior portion of the SOF’ synonyms?
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What structures pass through the inferior orbital fissure?
--The infraorbital nerve and artery
--The zygomatic nerve and artery
--Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland
--The inferior ophthalmic vein (sometimes)

By dint of its location, the annulus divides the SOF into three sections. What are they called?
--The superior portion is above the annulus
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What portion of the SOF is straddled by the annulus?
Roughly the middle third
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF? It is the gap between the greater and lesser wings of the sphenoid bone.

What sort (ie, sensory, motor, autonomic, etc) of nerves are the lacrimal and frontal? Sensory.

To which cranial nerve do they belong? CN5, specifically V2 (aka the maxillary nerve).

What structures pass through the inferior orbital fissure? - The infraorbital nerve and artery
- The zygomatic nerve and artery
- Postganglionic parasympathetics heading up from the pterygopalatine ganglion to the lacrimal gland
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By the way. Are the terms ‘inferior portion of the SOF’ and ‘inferior orbital fissure’ synonyms? No! The inferior orbital fissure is a separate and distinct structure from the inferior portion of the SOF. Don’t get them confused!

Roughly the middle third of the SOF is straddled by the annulus.
Motility Disorders: The Sinus, the Fissure, and the Apex

Superior orbital fissure

What bony relationship forms the SOF?
It is the gap between the greater and lesser wings of the sphenoid bone.

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Sensory

To which cranial nerve do they belong?
CN5, specifically V2 (aka the maxillary nerve)

By the way. Are the terms ‘inferior orbital fissure’ and ‘infraorbital fissure’ synonyms?
No, the inferior orbital fissure is part of the SOF while the infraorbital fissure is a separate entity.
**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Superior orbital fissure**

*What bony relationship forms the SOF?*
It is the gap between the greater and lesser wings of the sphenoid bone.

*How long is the SOF?*
About 2 cm.

*The SOF is straddled by a very important structure—what is the eponymous name of this structure?*
The annulus of Zinn

*What is the annulus of Zinn?*
It is a ring-shaped structure formed by the tendinous insertions of the four rectus muscles.

*Roughly the middle third of the SOF is straddled by the annulus. What are the portions called?*
- The superior portion is above the annulus
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*To which cranial nerve do they belong?*
CN5, specifically V2 (aka the maxillary nerve)
**Motility Disorders: The Sinus, the Fissure, and the Apex**

**Cavernous sinus**
- Superior orbital fissure
- Orbital apex

---

**Superior orbital fissure**

- CN6
- CN3
- CN4
- V1
- V2
- Postganglionic sympathetics:
  - Engorged ocular surface veins
  - Increased IOP
  - Chemosis

As stated earlier in the slide-set, this is how CS pathology presents clinically. How does SOF pathology present?

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology especially if signs and symptoms of orbital congestion are present as well!
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

Orbital apex

Posterior

Anterior

--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics:

--Engorged ocular surface veins
--Increased IOP
--Chemosis

As stated earlier in the slide-set, this is how CS pathology presents clinically. How does SOF pathology present? In the exact same manner.

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology and SOF pathology especially if signs and symptoms of orbital congestion are present as well!
Motility Disorders: The Sinus, the Fissure, and the Apex

- Cavernous sinus
- Superior orbital fissure
- Orbital apex

**Posterior** ← Anterior

**Cavernous sinus**

superior orbital fissure

orbital apex

**As stated earlier in the slide-set, this is how CS pathology presents clinically. How does SOF pathology present?**

In the exact same manner

---

**If CS pathology and SOF pathology present in identical fashion, how does one distinguish between them clinically?**

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of:

- **CS pathology and SOF pathology** especially if signs and symptoms of orbital congestion are present as well!

---

- CN6
- CN3
- CN4
- V1
- V2
- Postganglionic sympathetics:

---

- Engorged ocular surface veins
- Increased IOP
- Chemosis
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus

Superior orbital fissure

Orbital apex

Posterior ← Anterior

As stated earlier in the slide-set, this is how CS pathology presents clinically. How does SOF pathology present?

In the exact same manner

Simultaneous deficits involving structures innervated by some (or all) of these nerves is highly suggestive of CS pathology especially if signs and symptoms of orbital congestion are present as well!

If CS pathology and SOF pathology present in identical fashion, how does one distinguish between them clinically?

One doesn’t—they cannot be reliably differentiated clinically. Further, given that the CS and SOF are contiguous, it is not uncommon for a pathologic process to involve both simultaneously.

---CN6
---CN3
---CN4
---V1
---V2
---Postganglionic sympathetics:

--Engorged ocular surface veins
--Increased IOP
--Chemosis

CS pathology and SOF pathology
Motility Disorders: The Sinus, the Fissure, and the Apex

Posterior ↔ Orbital apex ↔ Anterior

Cavernous sinus Superior orbital fissure Orbital apex

What critical structure is present at the orbital apex (OA) that wasn’t present at the SOF or in the CS?

--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics:
--?

--Engorged ocular surface veins
--Increased IOP
--Chemosis
Motility Disorders: The Sinus, the Fissure, and the Apex

What critical structure is present at the orbital apex (OA) that wasn’t present at the SOF or in the CS?

The optic nerve

--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics:
--The optic nerve

--Engorged ocular surface veins
--Increased IOP
--Chemosis
Motility Disorders: The Sinus, the Fissure, and the Apex

**Orbital apex**

*What critical structure is present at the orbital apex (OA) that wasn’t present at the SOF or in the CS?*

The optic nerve

---CN6
---CN3
---CN4
---V1
---V2
---Postganglionic sympathetics:
---The optic nerve

---Engorged ocular surface veins
---Increased IOP
---Chemosis
What critical structure is present at the orbital apex (OA) that wasn’t present at the SOF or in the CS? The optic nerve

What does the presence of the optic nerve indicate about the clinical presentation of pathology at the OA? It indicates that vision could be affected

--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics:
--The optic nerve

--Engorged ocular surface veins
--Increased IOP
--Chemosis
Motility Disorders: The Sinus, the Fissure, and the Apex

Cavernous sinus  Superior orbital fissure  Orbital apex

Posterior  Anterior

--CN6
--CN3
--CN4
--V1
--V2
--Postganglionic sympathetics:  
  --The optic nerve

Simultaneous deficits involving structures innervated by some (or all) of these nerves, along with the optic nerve, is highly suggestive of orbital apex pathology especially if signs and symptoms of orbital congestion are present as well!

--Engorged ocular surface veins
--Increased IOP
--Chemosis