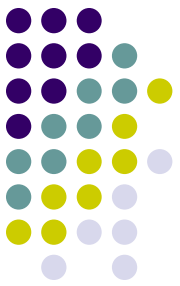


Q

Pediatric Leukemia and the Eye

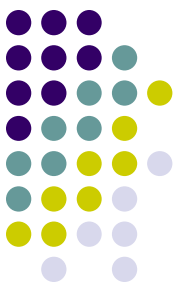
Where does leukemia rank among childhood malignancies in terms of incidence?



A

Pediatric Leukemia and the Eye

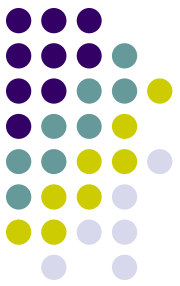
Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile



Q

Pediatric Leukemia and the Eye

3



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Leukemia accounts for what proportion of childhood malignancies?

A

Pediatric Leukemia and the Eye

4



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

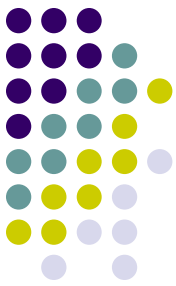
Leukemia accounts for what proportion of childhood malignancies?

About 1/3

Q

Pediatric Leukemia and the Eye

5



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Leukemia accounts for what proportion of childhood malignancies?

About 1/3

How many new cases of childhood leukemia occur every year in the US?

A

Pediatric Leukemia and the Eye

6



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Leukemia accounts for what proportion of childhood malignancies?

About 1/3

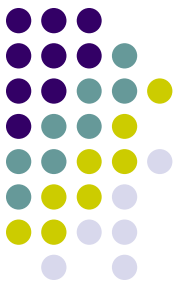
How many new cases of childhood leukemia occur every year in the US?

About 4000

Q

Pediatric Leukemia and the Eye

7



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Leukemia accounts for what proportion of childhood malignancies?

About 1/3

How many new cases of childhood leukemia occur every year in the US?

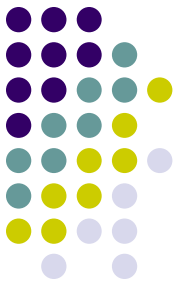
About 4000

*To put this in perspective: How many new cases of **retinoblastoma** are there every year in the US?*

A

Pediatric Leukemia and the Eye

8



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Leukemia accounts for what proportion of childhood malignancies?

About 1/3

How many new cases of childhood leukemia occur every year in the US?

About 4000

*To put this in perspective: How many new cases of **retinoblastoma** are there every year in the US?*

Only 200-300 or so



Pediatric Leukemia and the Eye



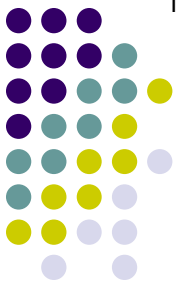
Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?

A

Pediatric Leukemia and the Eye

10



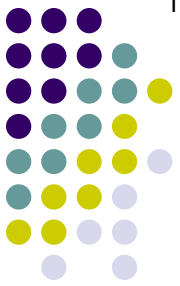
Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Q

Pediatric Leukemia and the Eye

11



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?

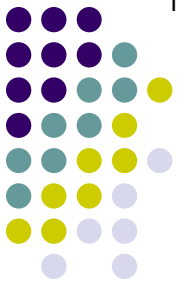
Lymphocytic

Does it tend to be acute, or chronic?

A

Pediatric Leukemia and the Eye

12



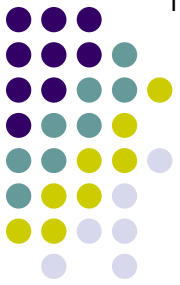
Where does leukemia rank among childhood malignancies in terms of incidence?
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Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Q

Pediatric Leukemia and the Eye



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?

Lymphocytic

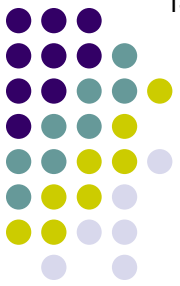
Does it tend to be acute or chronic?
Acute

Putting it all together, what sort of leukemia occurs in most pediatric cases?

A

Pediatric Leukemia and the Eye

14



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute or chronic?
Acute

Putting it all together, what sort of leukemia occurs in most pediatric cases?
Acute lymphocytic (ALL)



Pediatric Leukemia and the Eye

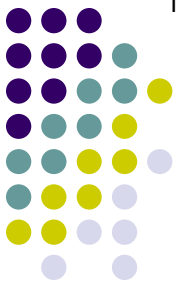
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Does it tend to be acute or chronic?
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Putting it all together, what sort of leukemia occurs in most pediatric cases?
Acute lymphocytic (ALL)

*My way to remember that ALL is **the** pediatric leukemia:
I think of ALL as standing for 'Adults Least Likely'*



Pediatric Leukemia and the Eye

Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
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Does it tend to be acute or chronic?
Acute

Putting it all together, what sort of leukemia occurs in most pediatric cases?
Acute lymphocytic (ALL)

*My way to remember that ALL is **the** pediatric leukemia:
I think of ALL as standing for 'Adults Least Likely'*

In contrast, the common form in adults is acute *myelogenous* leukemia, AML = 'Adults **M**ost **L**ikely'

Q

Pediatric Leukemia and the Eye

17



Where does leukemia rank among childhood malignancies in terms of incidence?

It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?

Lymphocytic

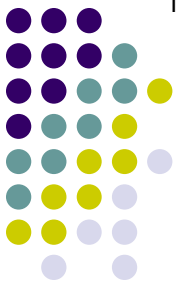
Does it tend to be acute, or chronic?

Acute

Is ophthalmic involvement common in leukemia?

A

Pediatric Leukemia and the Eye



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Does it tend to be acute, or chronic?

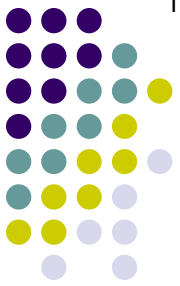
Acute

Is ophthalmic involvement common in leukemia?

Indeed it is

Q

Pediatric Leukemia and the Eye



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Does it tend to be acute, or chronic?
Acute

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Clinical involvement of which ophthalmic structures is common?

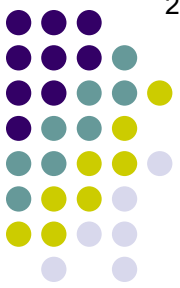
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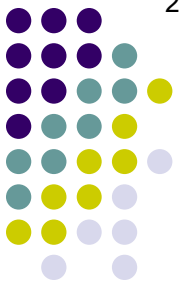
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Is ophthalmic involvement common in leukemia?
Indeed it is

Clinical involvement of which ophthalmic structures is common?
--The orbit
--The anterior chamber
--The iris
--The retina
--The optic nerve



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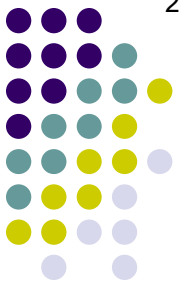
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Which structure is most commonly affected by leukemia?



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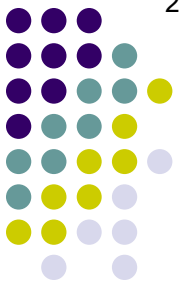
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--The retina
--The optic nerve

Which structure is most commonly affected by leukemia?
The choroid

Q

Pediatric Leukemia and the Eye

23



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

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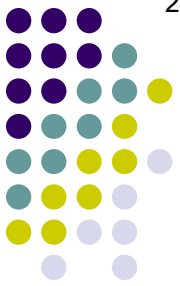
Clinical involvement of which ophthalmic structures is common?

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- The retina
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Say what? The choroid isn't even on the list. What the deal?

Which structure is ...

The choroid



Where does leukemia rank among childhood malignancies in terms of incidence?
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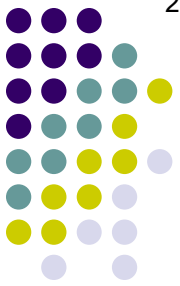
- The orbit
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- The iris
- The retina
- The optic nerve

Which structure is /

The choroid

Say what? The choroid isn't even on the list. What the deal?

The deal is this: Being the most vascular structure in the eye, it should come as no surprise that the choroid is the structure most likely to be involved with a hematologic malignancy. That said...



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

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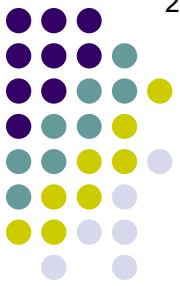
- The orbit
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- The optic nerve

Which structure is /

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The deal is this: Being the most vascular structure in the eye, it should come as no surprise that the choroid is the structure most likely to be involved with a hematologic malignancy. That said...*leukemic choroidal lesions are very subtle, and thus easily missed on exam.* For this reason, the choroid doesn't make the list of ophthalmic structures likely to manifest **clinical** involvement in leukemia.



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

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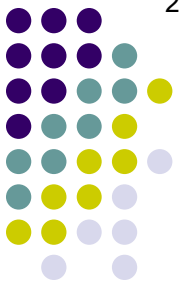
The deal is this: Being the most vascular structure in the eye, it should come as

Which structure

The choroid

If choroidal involvement isn't clinically apparent, how on earth are you supposed to know it's present?

to be involved with a
lesions are very subtle,
choroid doesn't make the
involvement in leukemia.



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It will manifest on

test

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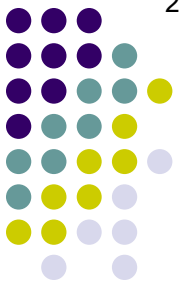
Which structure

The choroid

If choroidal involvement isn't clinically apparent, how on earth are you supposed to know it's present?

It will manifest on ultrasonography*

**OCT is likely correct as well, but my Academy source only mentions ultrasound*



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

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Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

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- The optic nerve

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Which structure

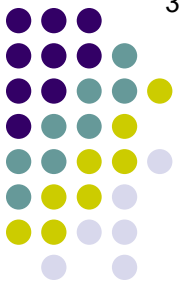
The choroid

If choroidal involvement isn't clinically apparent, how on earth are you supposed to know it's present?

It will manifest on ultrasonography as

two words

to be involved with a
lesions are very subtle,
choroid doesn't make the
involvement in leukemia.



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

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- The orbit
- The anterior chamber
- The iris
- The retina
- The optic nerve

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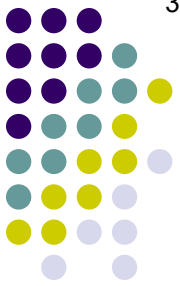
Which structure

The choroid

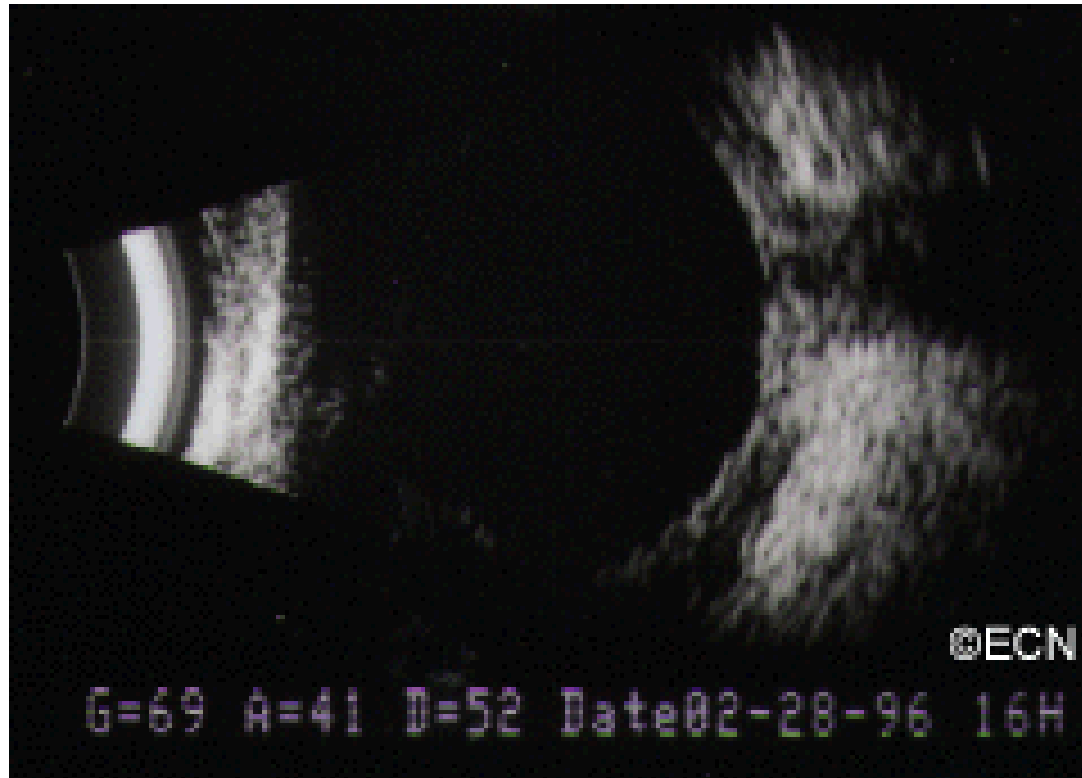
If choroidal involvement isn't clinically apparent, how on earth are you supposed to know it's present?

It will manifest on ultrasonography as diffuse thickening

to be involved with a lesions are very subtle, choroid doesn't make the involvement in leukemia.



Pediatric Leukemia and the Eye

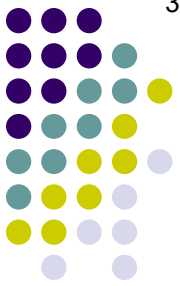


Leukemia: Choroidal thickening on *b*-scan

Q

Pediatric Leukemia and the Eye

32



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

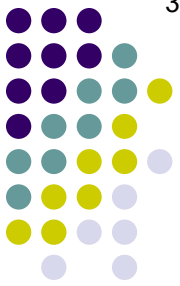
Clinical involvement of which ophthalmic structures is common?

- The orbit?
- The anterior chamber?
- The iris?
- The retina?
- The optic nerve?

OK, smart guy, which structure is clinically involved most frequently?

Which structure is most commonly affected ^{clinically} by leukemia?

~~The choroid~~



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

Clinical involvement of which ophthalmic structures is common?

- The orbit
- The anterior chamber
- The iris
- The retina!**
- The optic nerve

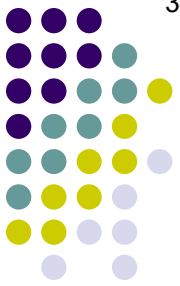
OK, smart guy, which structure is clinically involved most frequently?
The retina

Which structure is most commonly affected ^{clincially} by leukemia? **The retina**
~~The choroid~~

Q

Pediatric Leukemia and the Eye

34



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

Clinical involvement of which ophthalmic structures is common?

- The orbit
- The anterior chamber
- The iris
- The retina
- The optic nerve
- The vitreous?

The vitreous isn't on the list. Is it like the choroid, ie, commonly involved but clinically inapparent?

Which structure is most commonly involved?
The choroid



Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

Clinical involvement of which ophthalmic structures is common?

- The orbit
- The anterior chamber
- The iris
- The retina
- The optic nerve
- The vitreous? *No!*

The vitreous isn't on the list. Is it like the choroid, ie, commonly involved but clinically inapparent?

Which structure is most commonly involved?
No, just the opposite—vitreous involvement is **very rare** in leukemia
The choroid



Pediatric Leukemia and the Eye

Where does leukemia rank among childhood malignancies in terms of incidence?
It is #1 by a mile

Re its histology: Does pediatric leukemia tend to be lymphocytic, or myelogenous?
Lymphocytic

Does it tend to be acute, or chronic?
Acute

Is ophthalmic involvement common in leukemia?
Indeed it is

Clinical involvement of which ophthalmic structures is common?

- The orbit
- The anterior chamber
- The iris

--The retina! *Next, we will drill down on retinal involvement in leukemia*

- The optic nerve

clinically

Which structure is most commonly affected by leukemia? The retina

~~The choroid~~



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy more vs less common than in adult leukemics

A

Pediatric Leukemia and the Eye



- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: (abb.) + one word



A

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**

What is the mechanism by which retinal hemorrhages come to pass?



A

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**

What is the mechanism by which retinal hemorrhages come to pass?

The interplay of three derangements produced by the leukemia:

--?

--?

--?



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**

What is the mechanism by which retinal hemorrhages come to pass?

The interplay of three derangements produced by the leukemia:

- Anemia
- Vascular occlusion
- Thrombocytopenia



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be specific appearance



Q/A

Pediatric Leukemia and the Eye

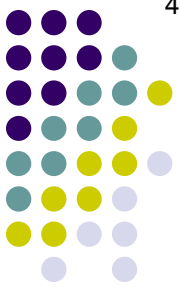
- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka** eponym



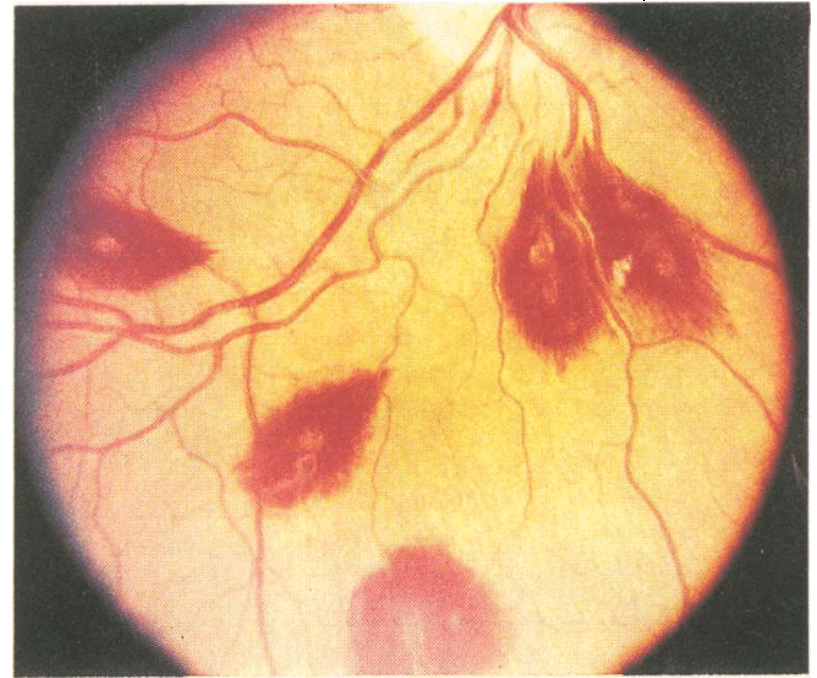
A

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka Roth spots)**



Pediatric Leukemia and the Eye



Retinal hemorrhages in leukemia
(Full disclosure: I don't know if these are kids)



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka *Roth spots*)**

What is the DDx for Roth spots?

--Leukemia (duh)

--?

--?

--?

--(There are many others)



A

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka *Roth spots*)**

What is the DDx for Roth spots?

- Leukemia (duh)
- Subacute bacterial endocarditis
- Anemia
- Endophthalmitis
- (There are many others)



Q

Pediatric Leukemia and the Eye

- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka *Roth spots*)**

Of these, which is the most commonly cause of Roth spots?

What is the DDx for Roth spots?

--Leukemia?

--Subacute bacterial endocarditis?

--Anemia?

--Endophthalmitis?

--(There are many others)

A

Pediatric Leukemia and the Eye



- *Pediatric leukemia and the eye*
 - Retinopathy **less** common than in adult leukemics
 - Most common eye finding: **RNFL hemorrhages**
 - Can be **white centered (aka Roth spots)**

Of these, which is the most commonly cause of Roth spots?
SABE

What is the DDx for Roth spots?

- Leukemia
- Subacute bacterial endocarditis!**
- Anemia
- Endophthalmitis
- (There are many others)



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Note: There is inconsistency across Academy sources with regard to the term *Roth spots*.
 --Early in the BCSC *Path* book, *Roth spot* and *white-centered hemorrhage* are used interchangeably and are said to occur “in a number of conditions;” later, the term ***pseudo-Roth spot*** is used to refer to white-centered hemorrhages secondary to leukemia. (Per the master index, *pseudo-Roth spot* appears nowhere else in the BCSC.)

--The *Uveitis* book uses ‘Roth spots’ when referring to white-centered hemorrhages secondary to bacterial endophthalmitis, but not when referring to those secondary to leukemia (these are simply termed ‘white-centered hemorrhages’).

--The *Peds* book just says retinal hemorrhages in leukemia “may have white centers.”

--The Academy source *EyeWiki* uses *Roth spot* to refer to white-centered hemorrhages of **any** cause.

--Puzzlingly, neither *Roth spot* nor *white-centered hemorrhage* appear in the index of the *Retina* book.

What’s the correct usage? I dunno. Caveat emptor.



Q

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Is the RNFL the only location at which intraocular leukemic hemorrhages can occur?



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Not by a long shot. Intraretinal hemorrhages can occur at any level (ie, not just the NFL).
Preretinal as well as vitreous hemorrhages can also occur. Finally, both subretinal and choroidal hemorrhages may occur as well.



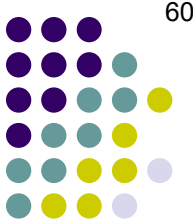
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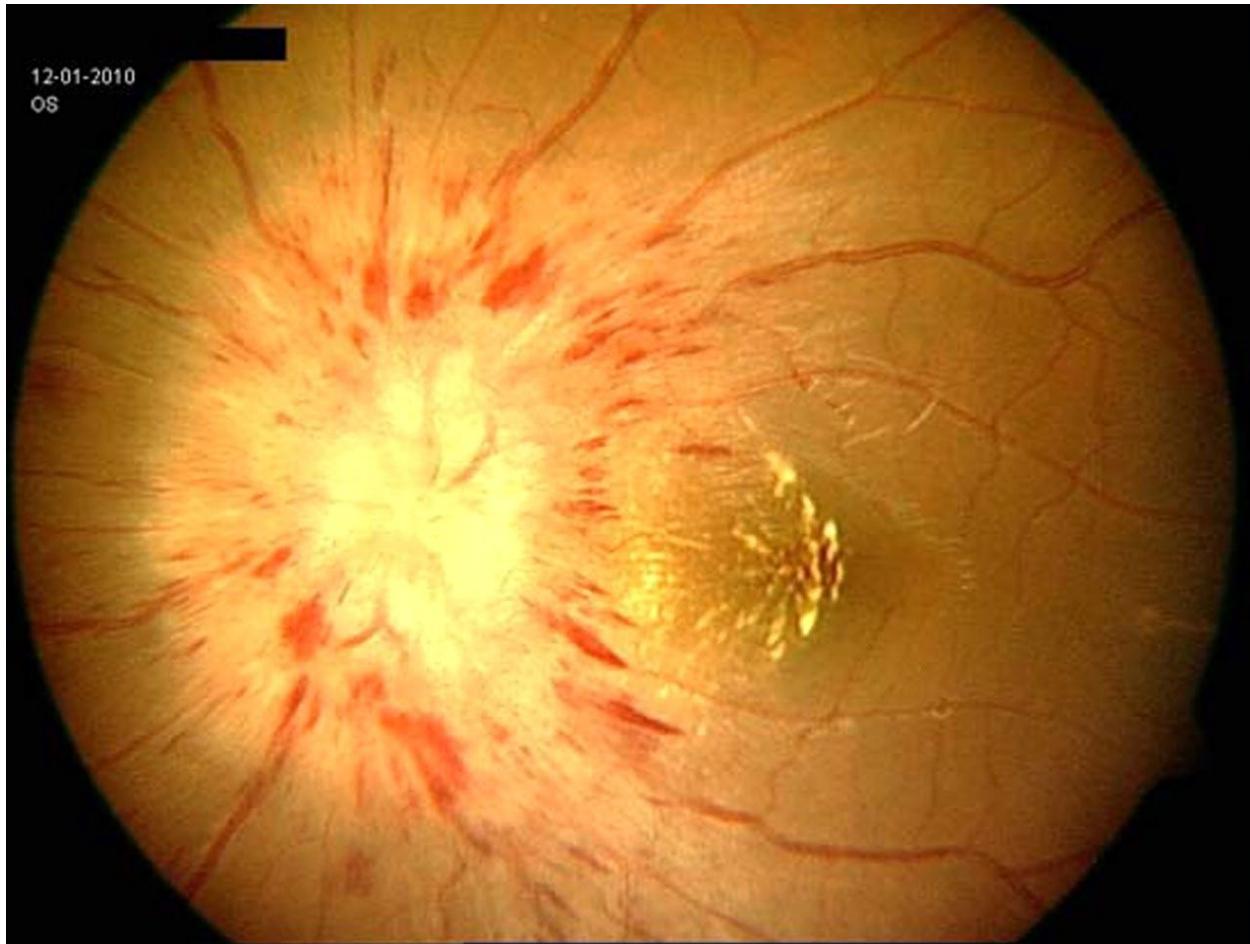
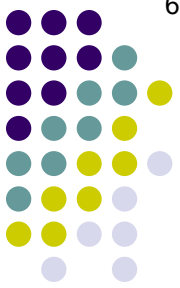
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Pediatric Leukemia and the Eye



Leukemia: ONH infiltration
(20 y.o. with recurrent ALL)



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Medical emergency—need emergent **treatment**

A/Q

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*  chemotherapy is also indicated



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Q

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 - H
 - H
 - H

The *three H's* of anterior segment leukemic infiltration



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 - Leukemic infiltration of *anterior segment* can produce:
 - **Heterochromia iridis**
 - **Hypopyon**
 - **Hyphema**

Pediatric Leukemia and the Eye



Normal right iris



Left iris: Diffuse thickening, yellowish infiltrate

Leukemia: Heterochromia iridis

Pediatric Leukemia and the Eye



Normal right iris

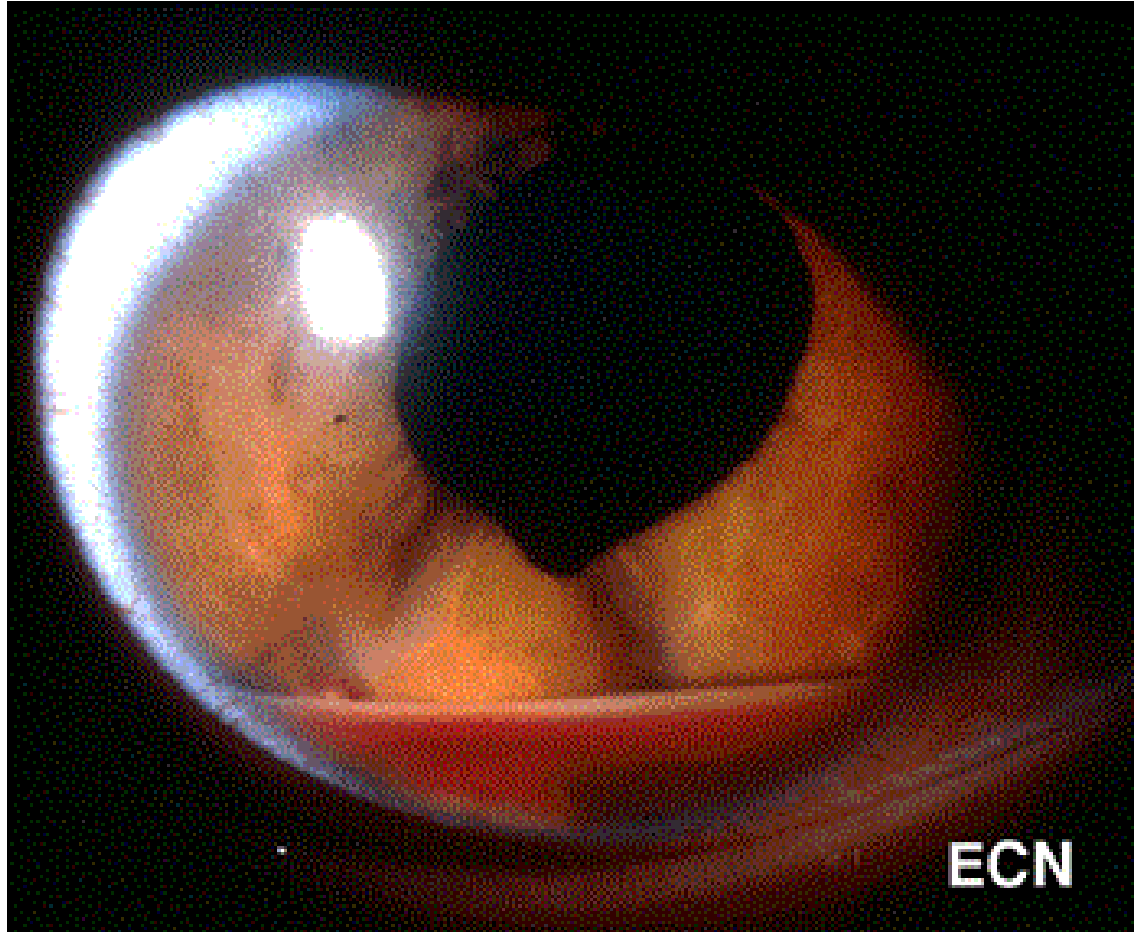


Left iris **Diffuse thickening** yellowish infiltrate

Recall what was said earlier about leukemic involvement of the choroid resulting in its diffuse thickening...

Leukemia: Heterochromia iridis

Pediatric Leukemia and the Eye



Leukemia: Hyphema (with a little hypopyon as well)



Q

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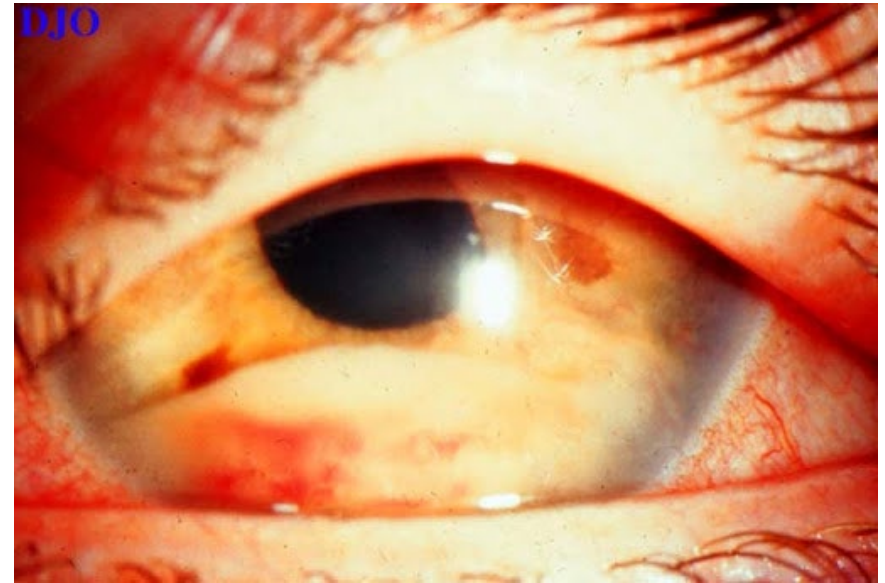
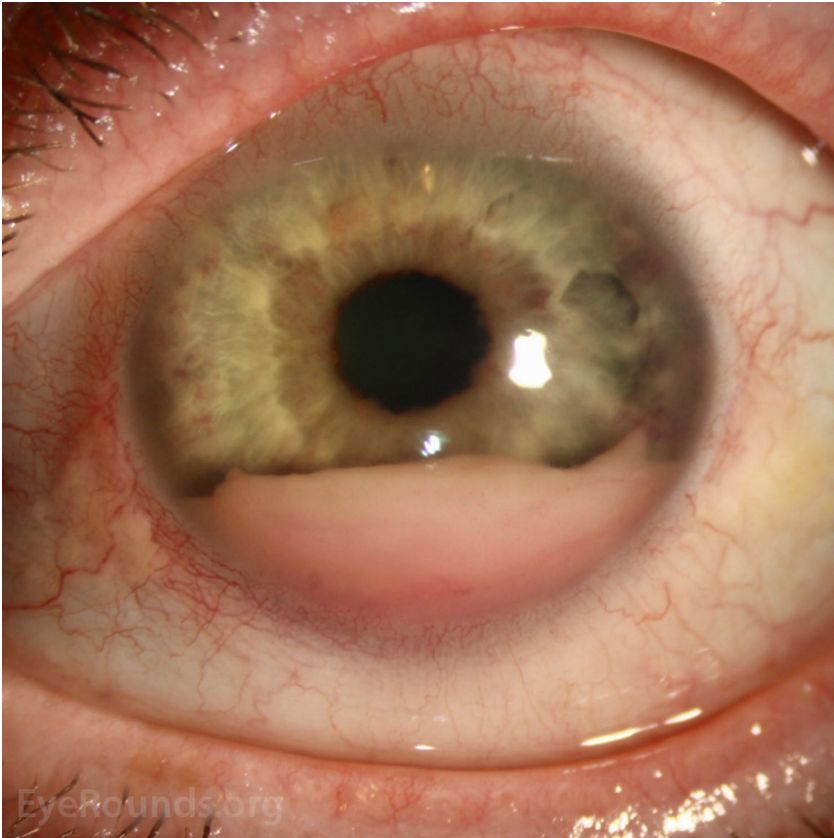
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*Is it a hypopyon, or **pseudo**hypopyon?*

As with Roth spots vs Pseudo-Roth spots vs white-centered hemorrhages, the BCSC is unclear in this regard. Caveat emptor.

Pediatric Leukemia and the Eye



With a little hyphema as well

Leukemia: (Pseudo)hypopyon



Q

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Eyes with leukemic manifestations in the anterior chamber are at risk for the development of glaucoma by two separate mechanisms.

What are they?

--?

--?

- **Heterochromia iridis**
- **Hypopyon**
- **Hyphema**

central vision:

on therapy

cur!

can produce:



Q

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-- **two words** can develop

central vision:

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and subsequent pupillary-block glaucoma

central vision:

on therapy

cur!

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If a child (or adult, for that matter) presents with hypopyon, what general sort of condition is likely to top the initial DDx?



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Masquerade syndromes



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Uveitis

Let's do a brief overview of **masquerade syndromes** then call it a day...

What

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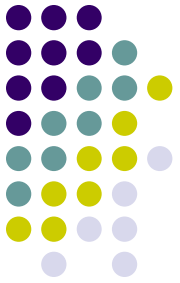
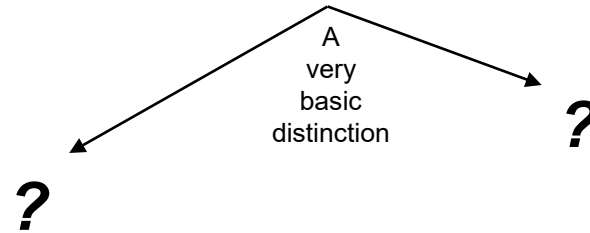


Masquerade syndromes



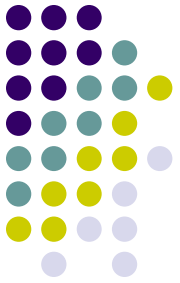
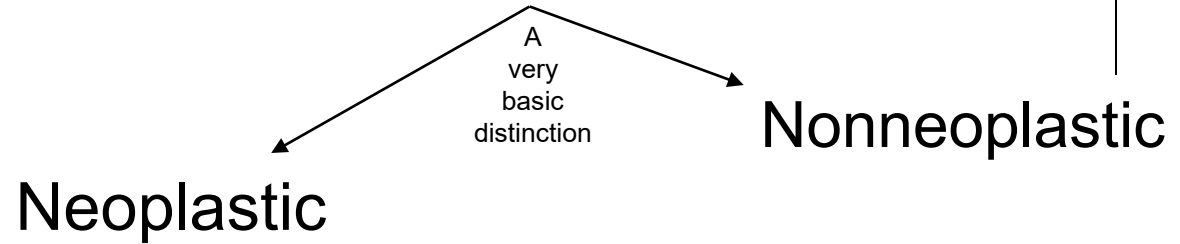
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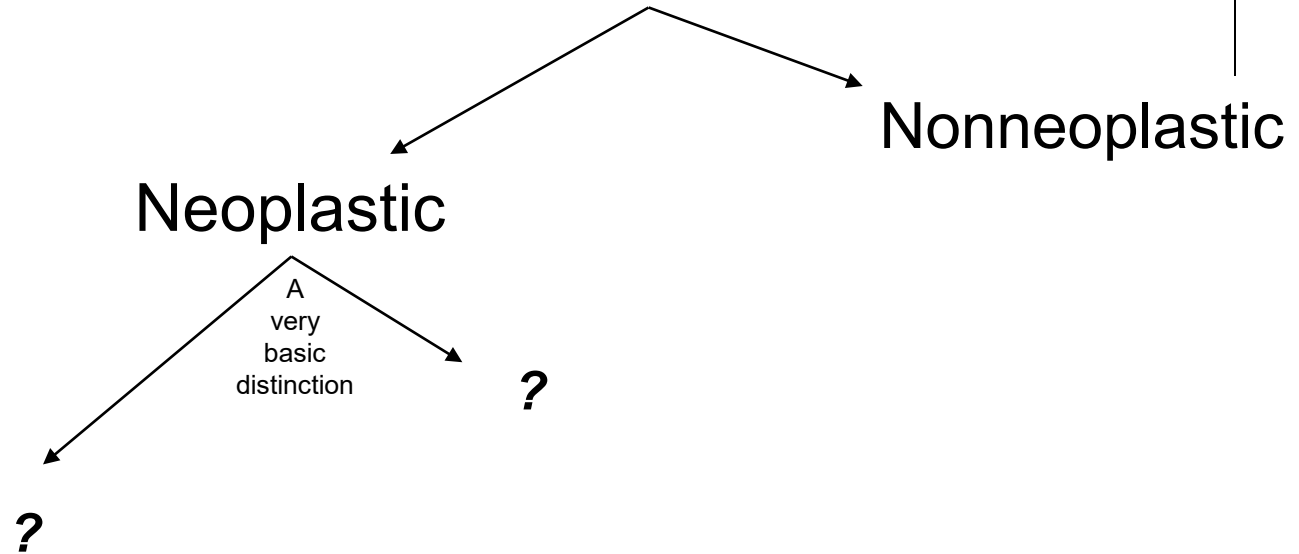
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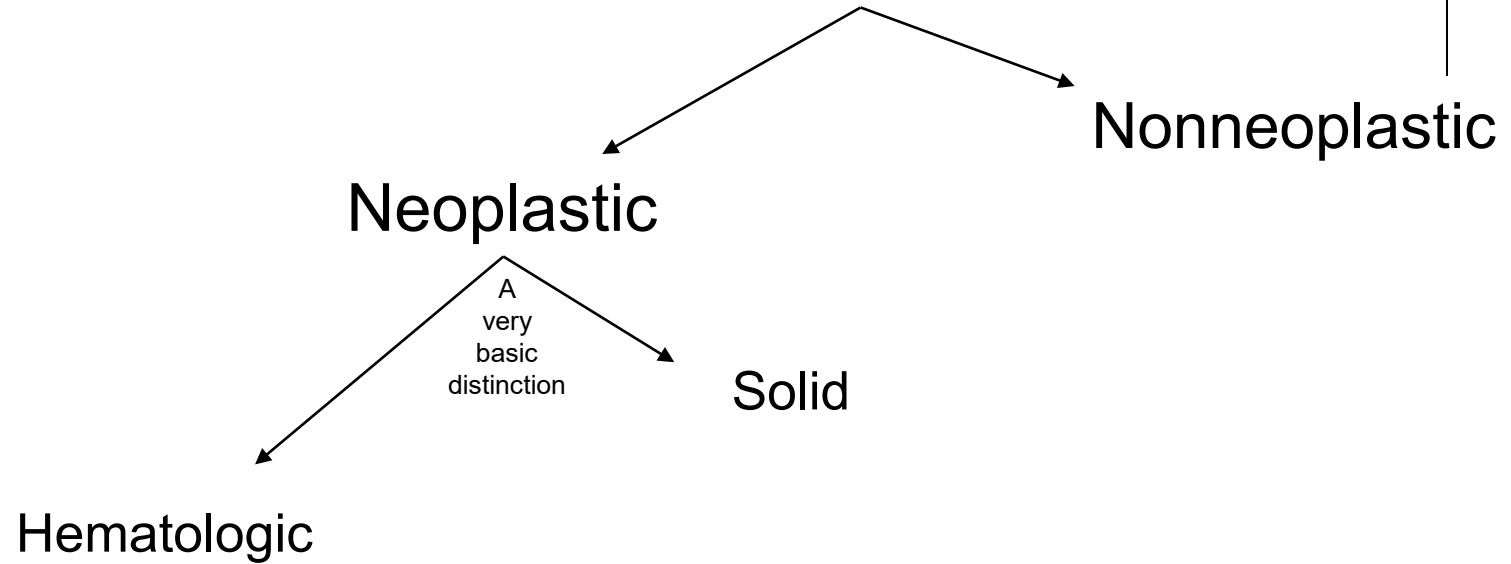
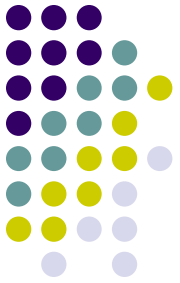
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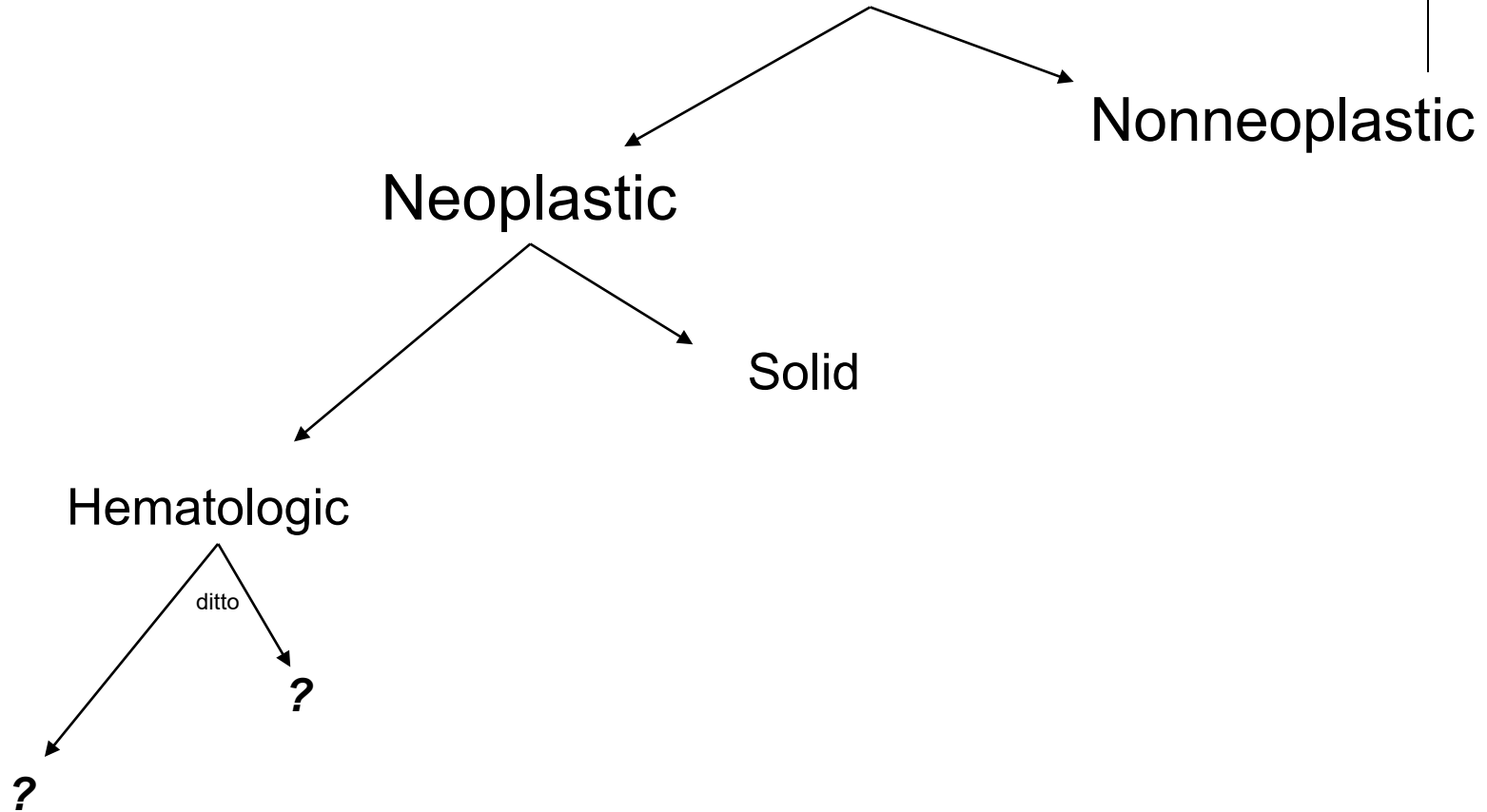
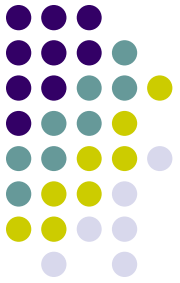
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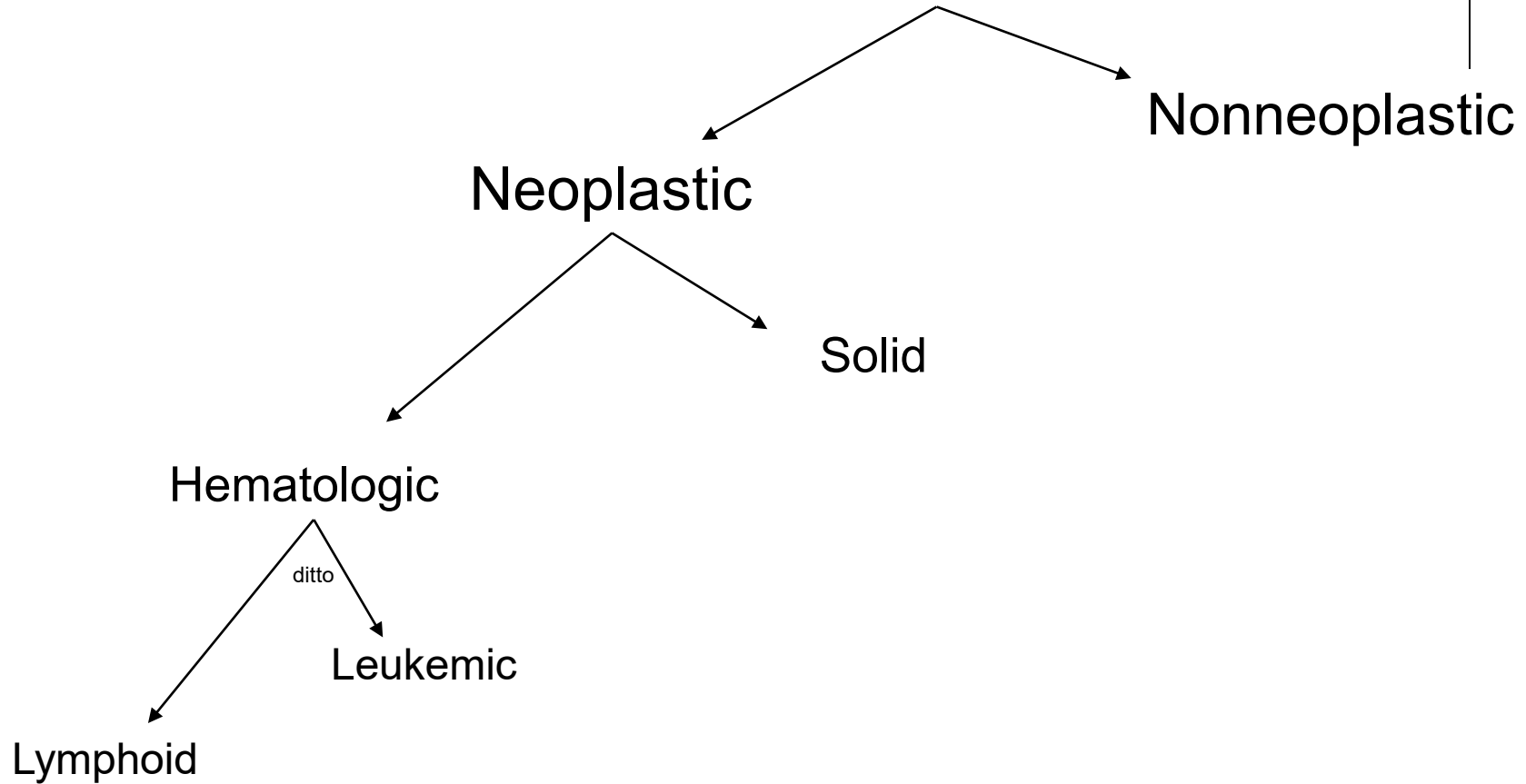
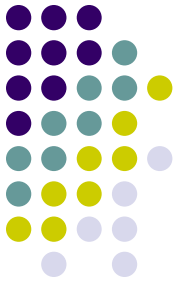
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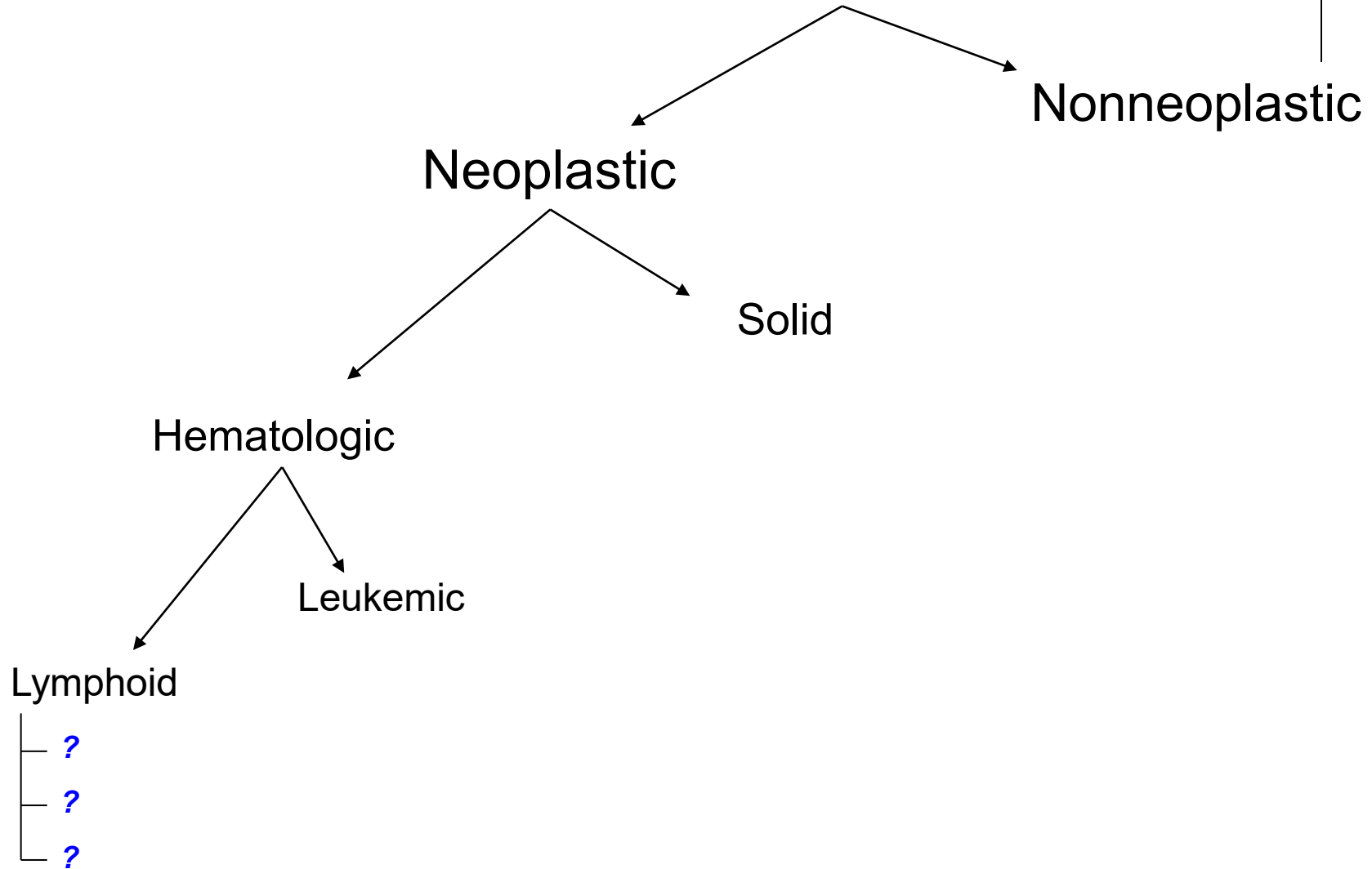
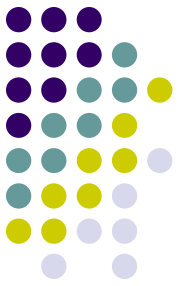
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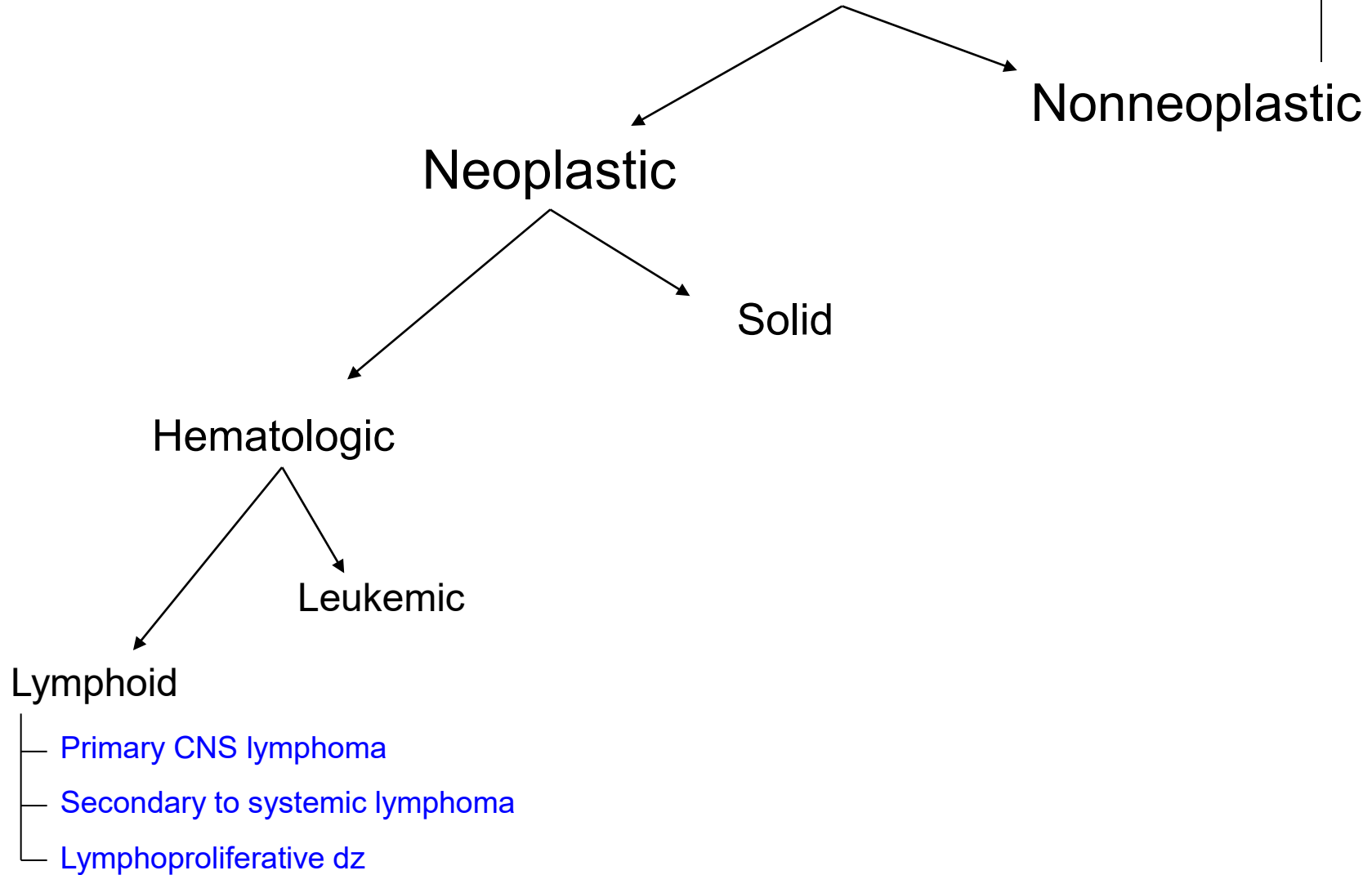
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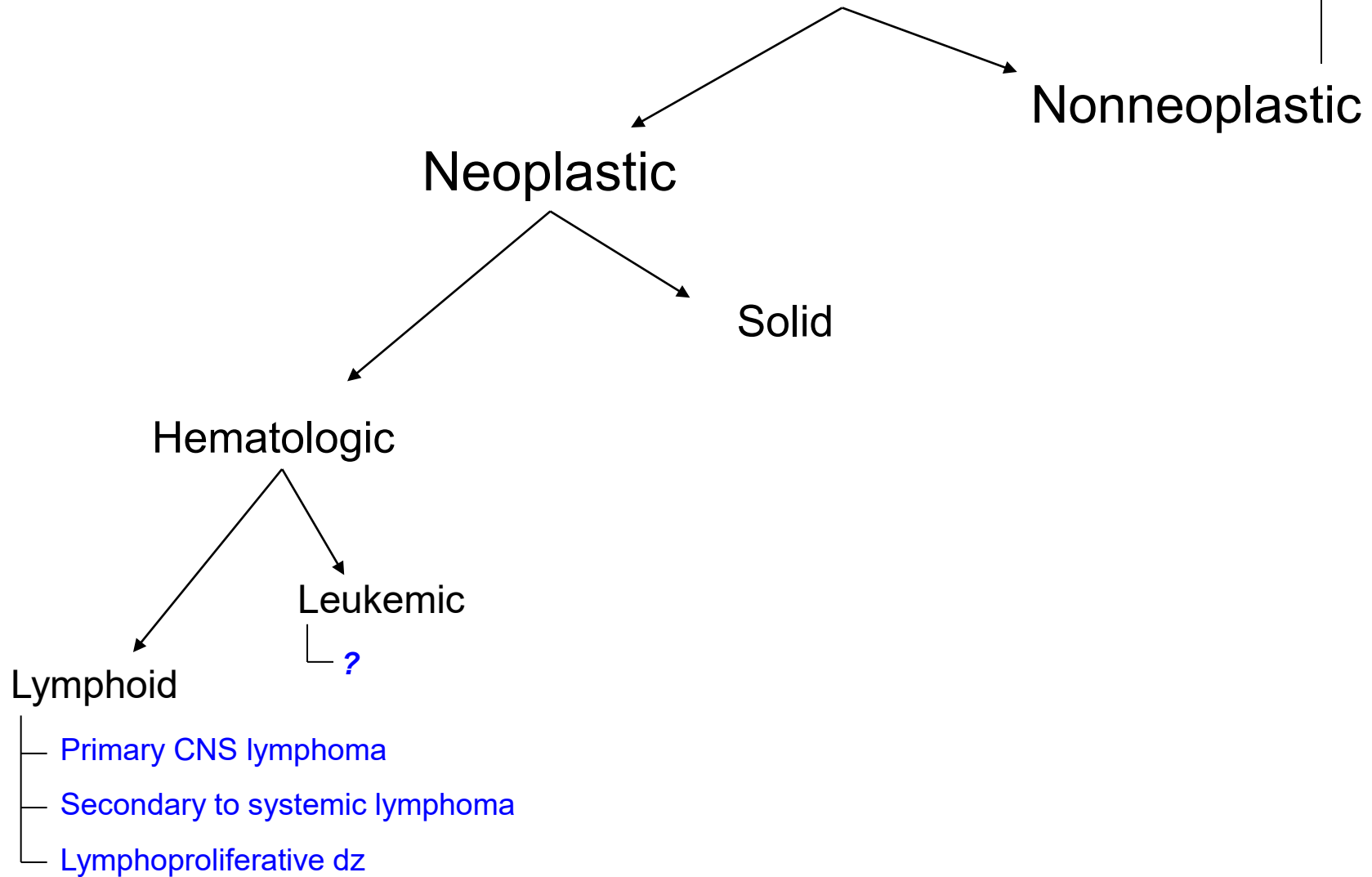
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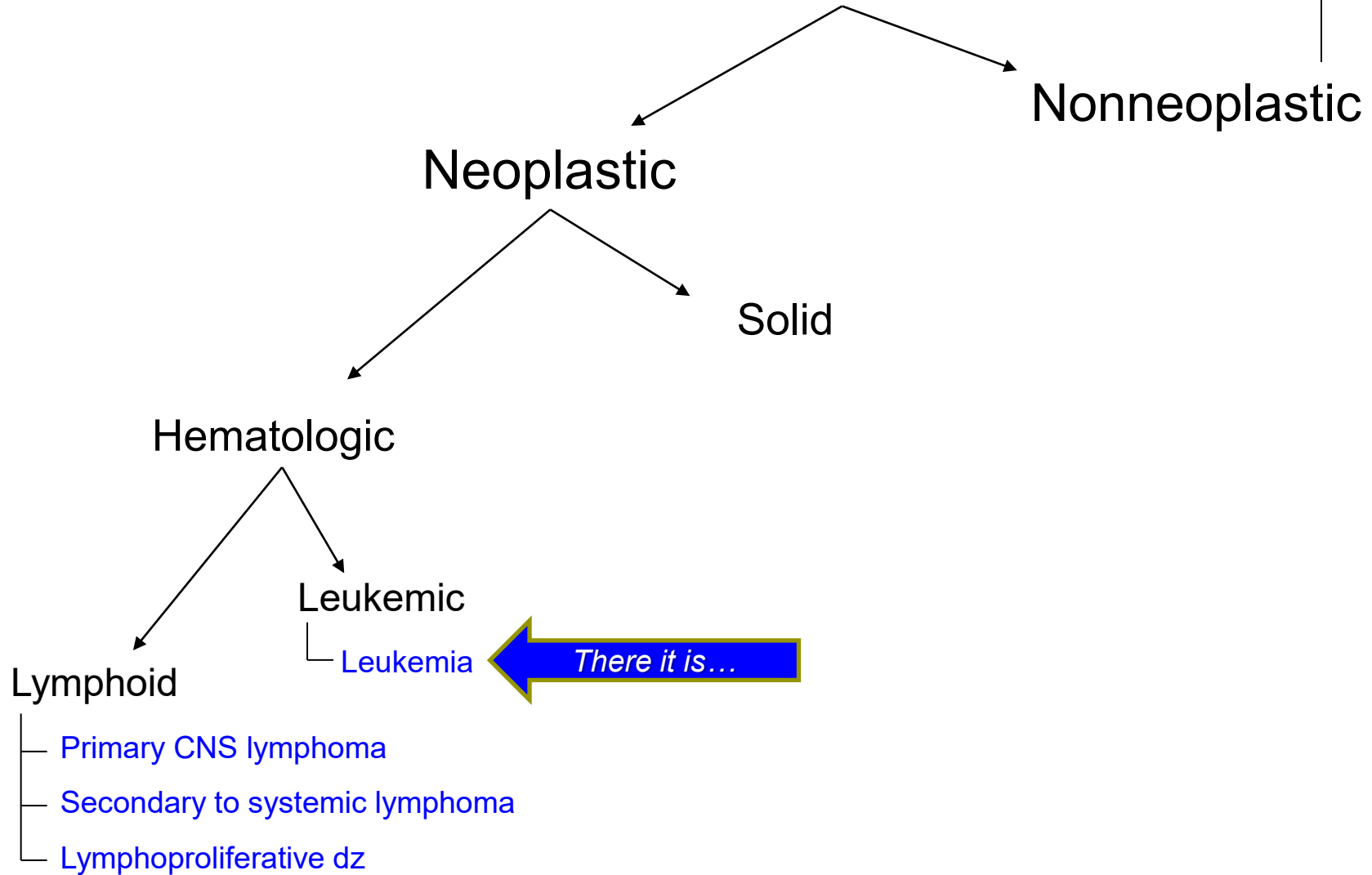
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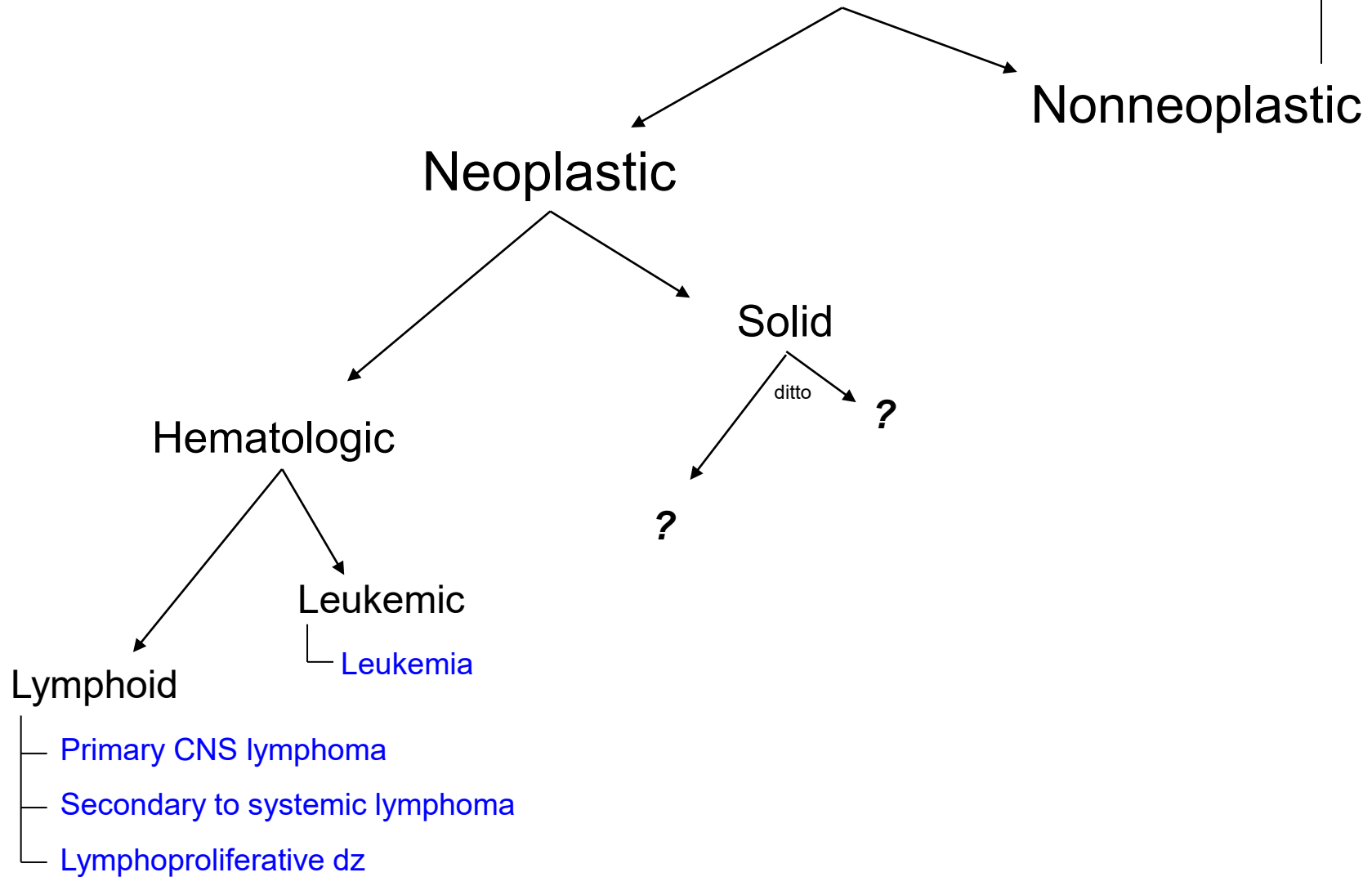
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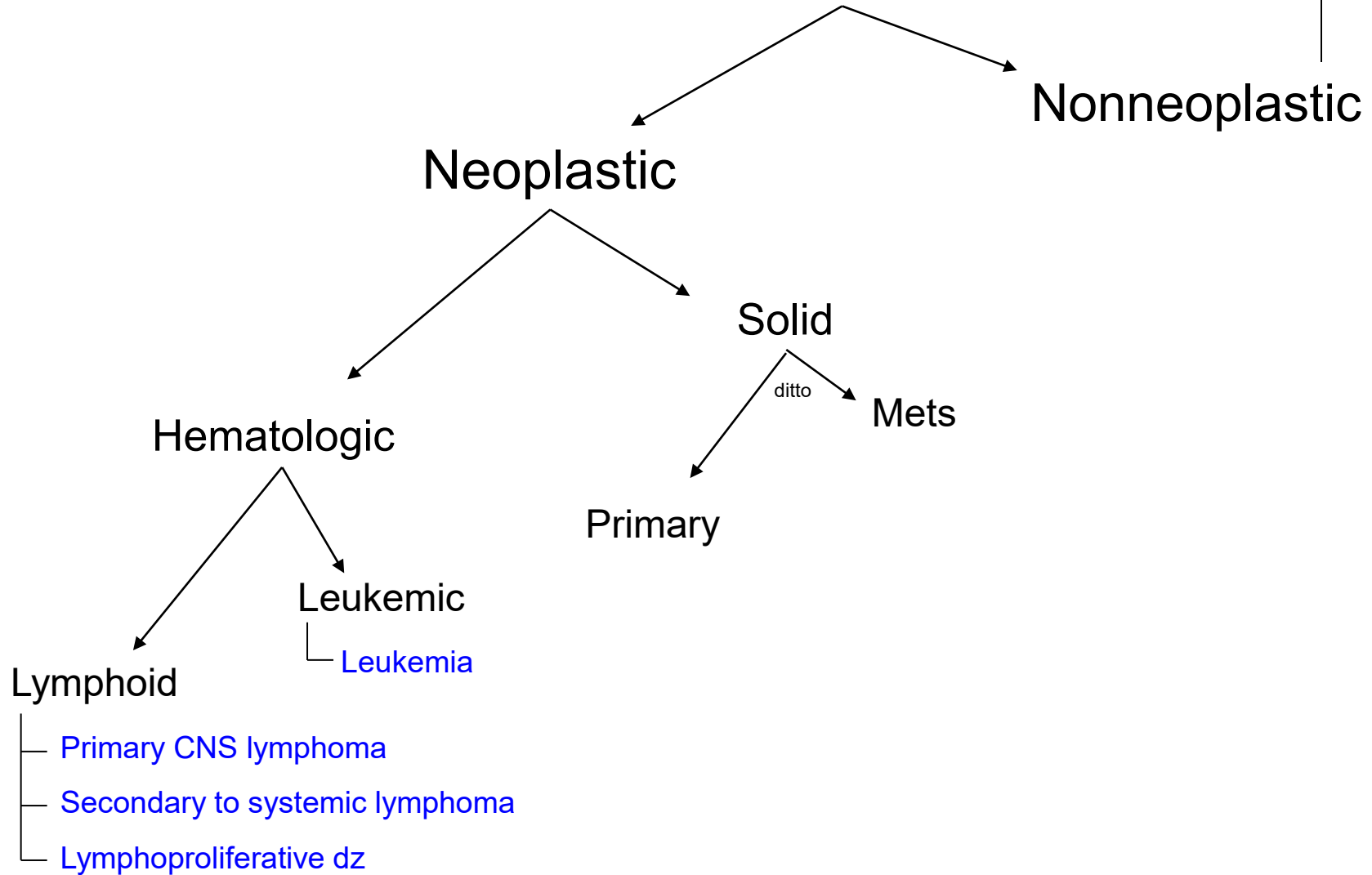
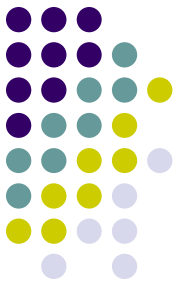
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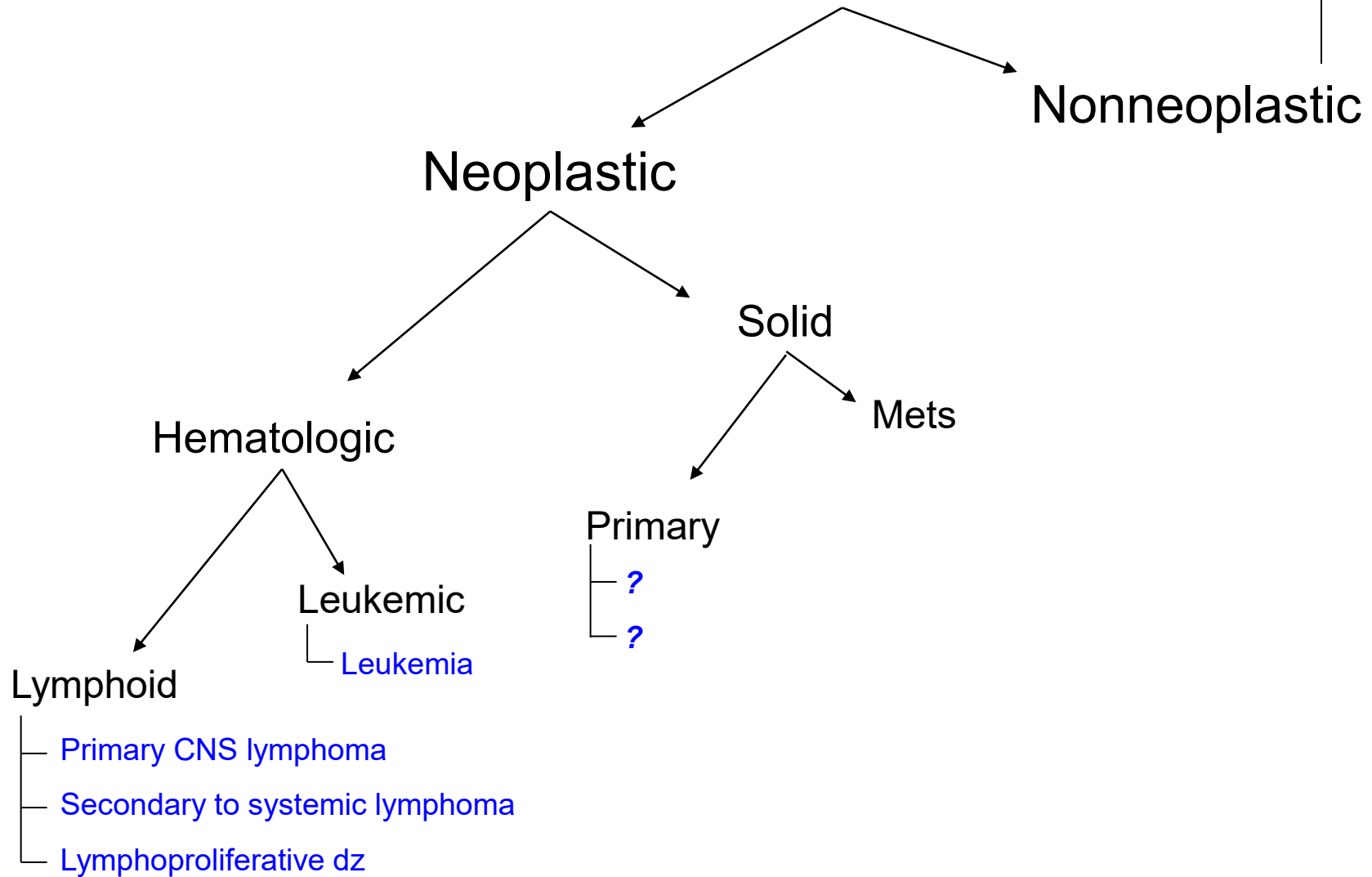
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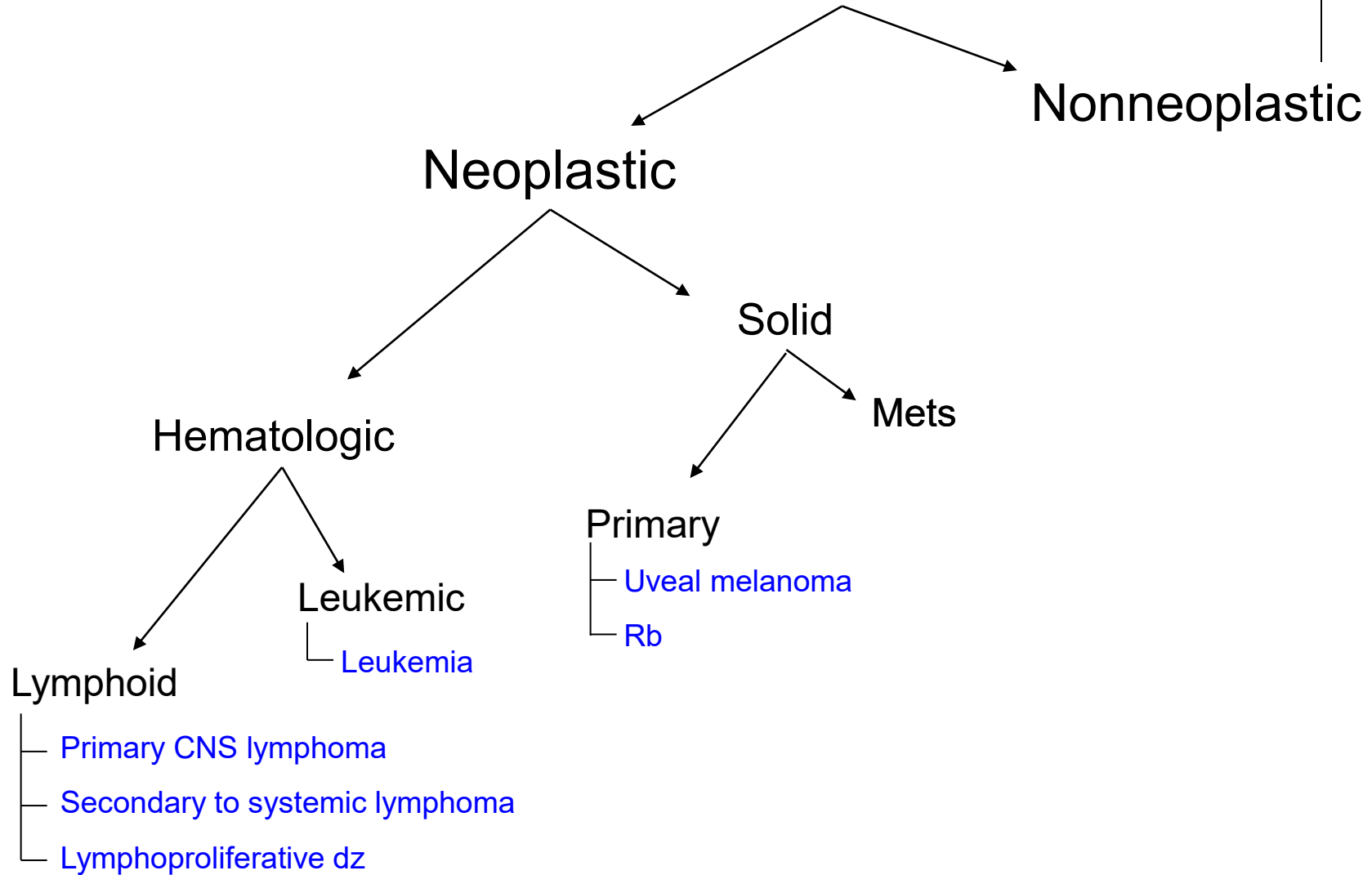
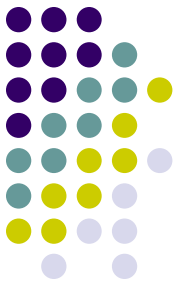
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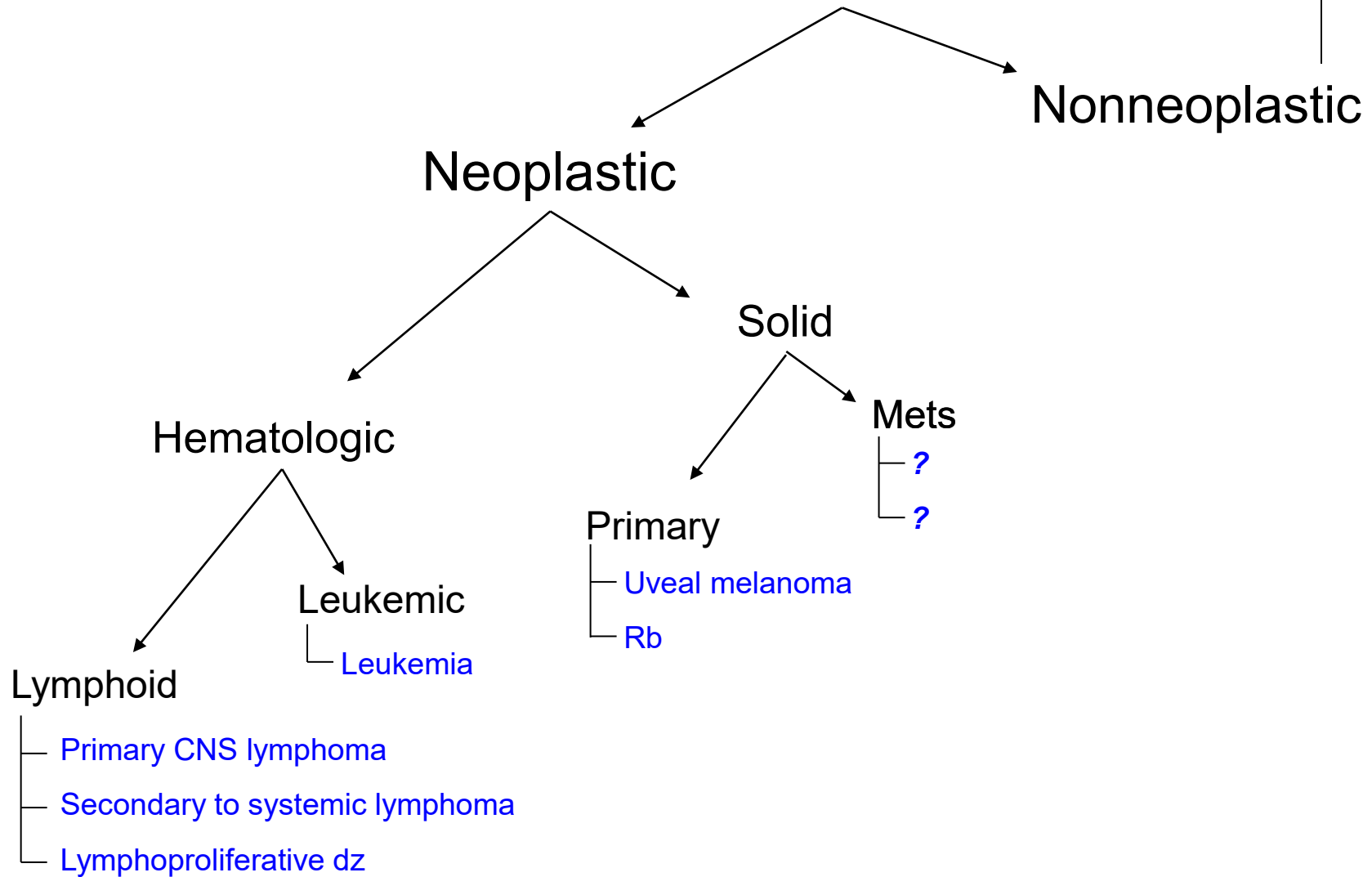
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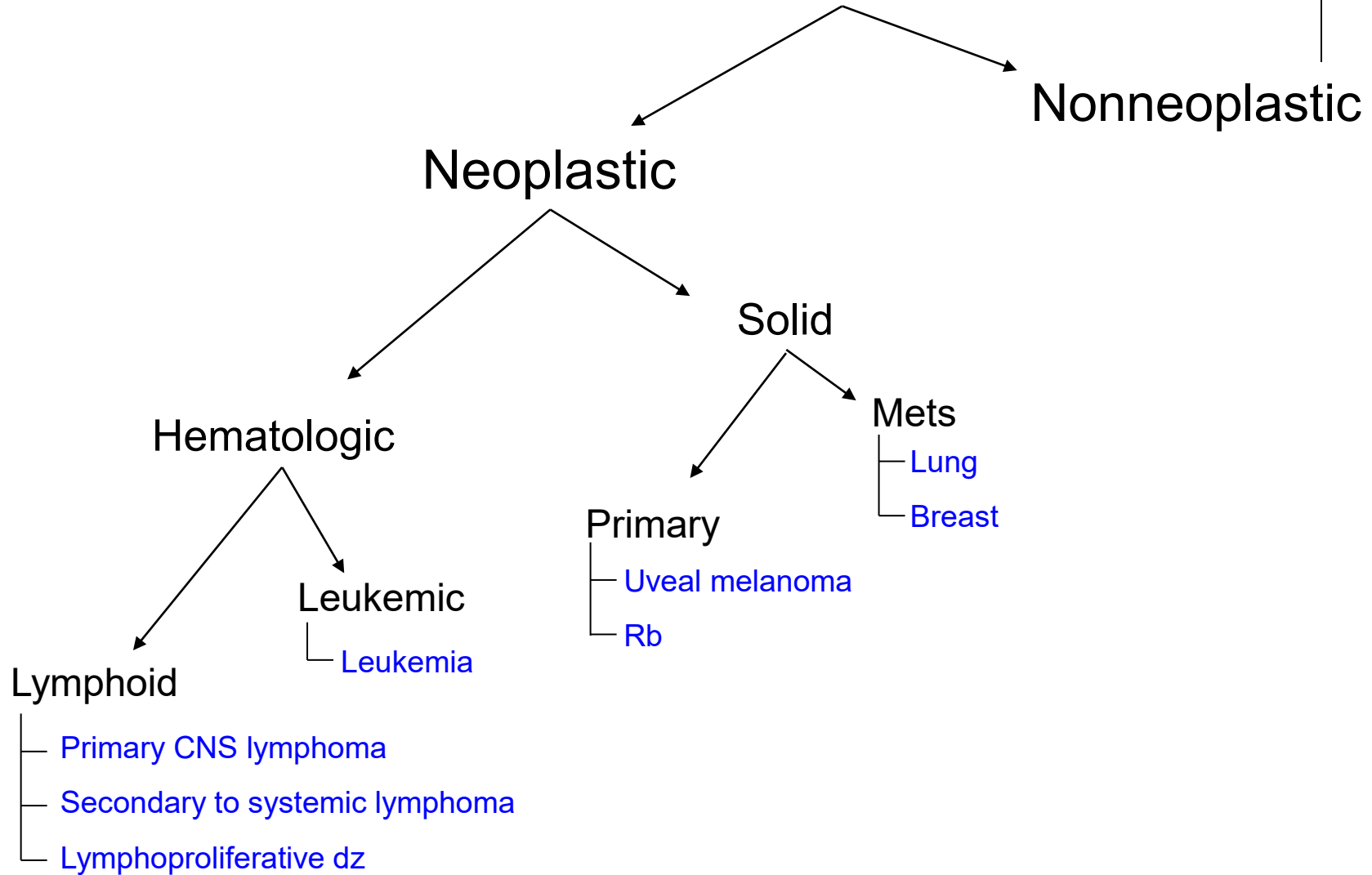
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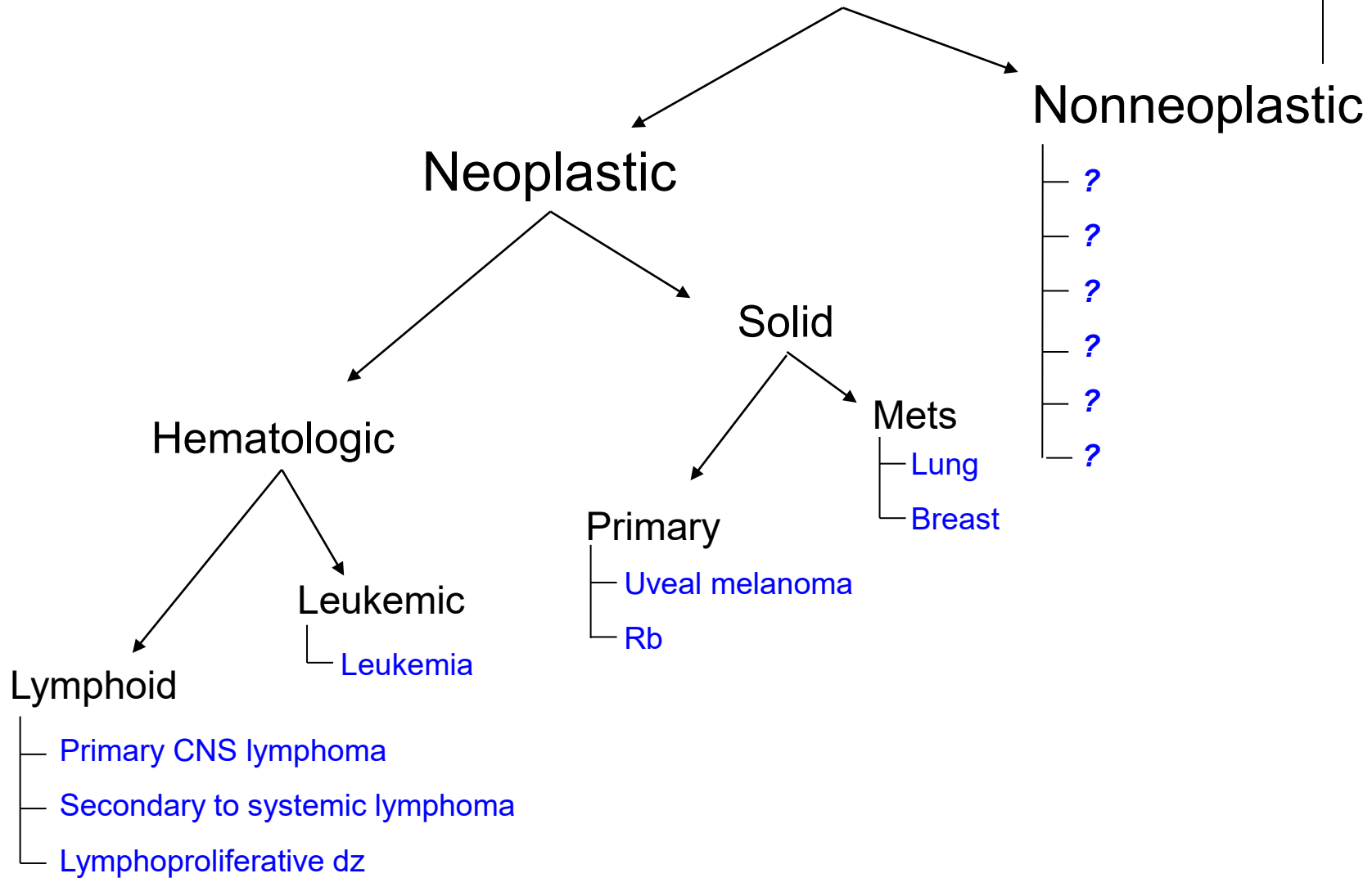
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Masquerade Syndrome



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