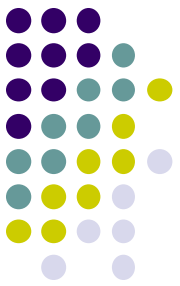
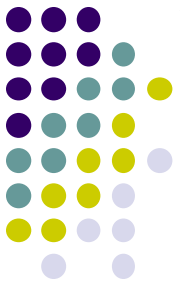


Comitant Esotropia



Esotropia (ET) is a form of strabismus in which the eyes are ‘turned in’ with respect to one another. It is the most common form of strabismus encountered in clinical practice.

Comitant Esotropia

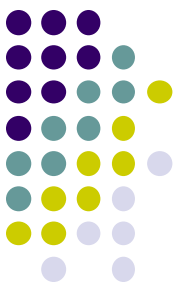


Esotropia (ET) is a form of strabismus in which the eyes are ‘turned in’ with respect to one another. It is the most common form of strabismus encountered in clinical practice.

One useful way to classify esotropia is with respect to *comitance*. A **comitant ET** is one in which the magnitude (in prism-diopters) of the esotropia is the same in all fields of gaze. For example, the run-of-the-mill ET typically found in a very young child is usually comitant.

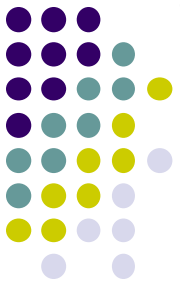
(Prism-diopters are represented by a delta Δ ; eg, $50\Delta = 50$ prism-diopters)

Comitant Esotropia



~50 Δ of comitant esotropia

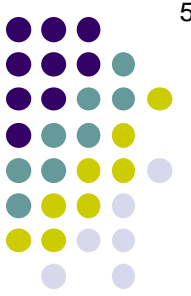
Comitant Esotropia



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Comitant Esotropia



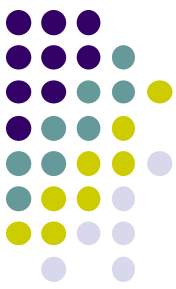
Huge ET in right gaze

Moderate ET in primary gaze

Almost no ET in left gaze

Incomitant ET 2ndry to right CN6 palsy

Comitant Esotropia

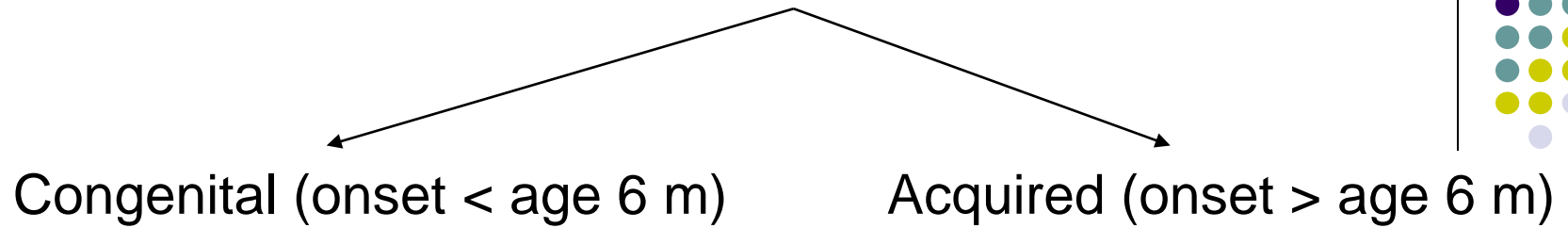


Esotropia (ET) is a form of strabismus in which the eyes are ‘turned in’ with respect to one another. It is the most common form of strabismus encountered in clinical practice.

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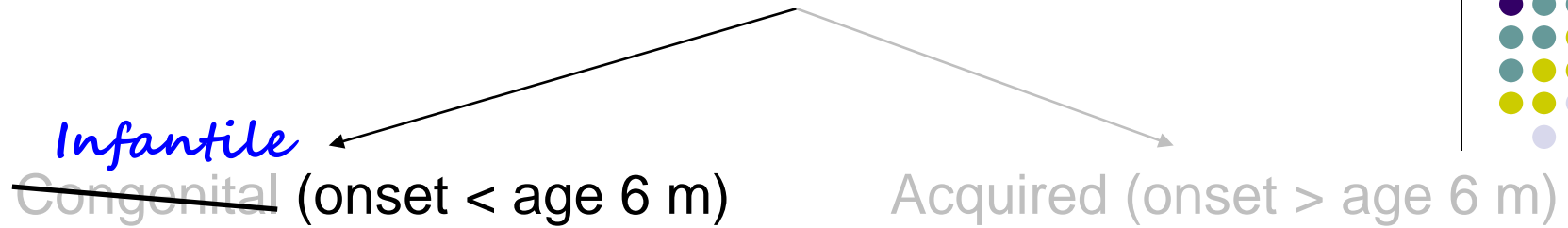
This slide-set will focus on comitant ET. There is no gender predilection for comitant ET; however, there is a racial one: Incidence in White and Black infants is roughly equal, and both are higher than that for infants of Asian descent.

Comitant Esotropia



This is the first step in how we think about comitant ET: Whether it presented congenitally (defined as before age 6 months) or whether it was acquired (later than age 6 months).

Comitant Esotropia

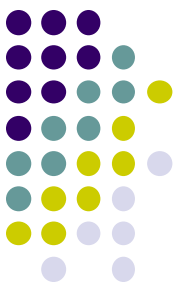


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Comitant Esotropia

Congenital (onset < age 6 m)

Acquired (onset > age 6 m)



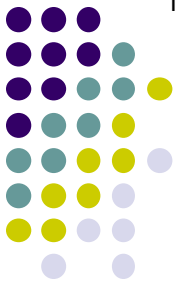
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It's important to note here that brief strabismic episodes are commonly seen in the first few (especially two) months of life. Further, it's not uncommon for the same infant to manifest short periods of both ET *and* XT; this is referred to as *ocular instability of infancy*.

Comitant Esotropia

Congenital (onset < age 6 m)

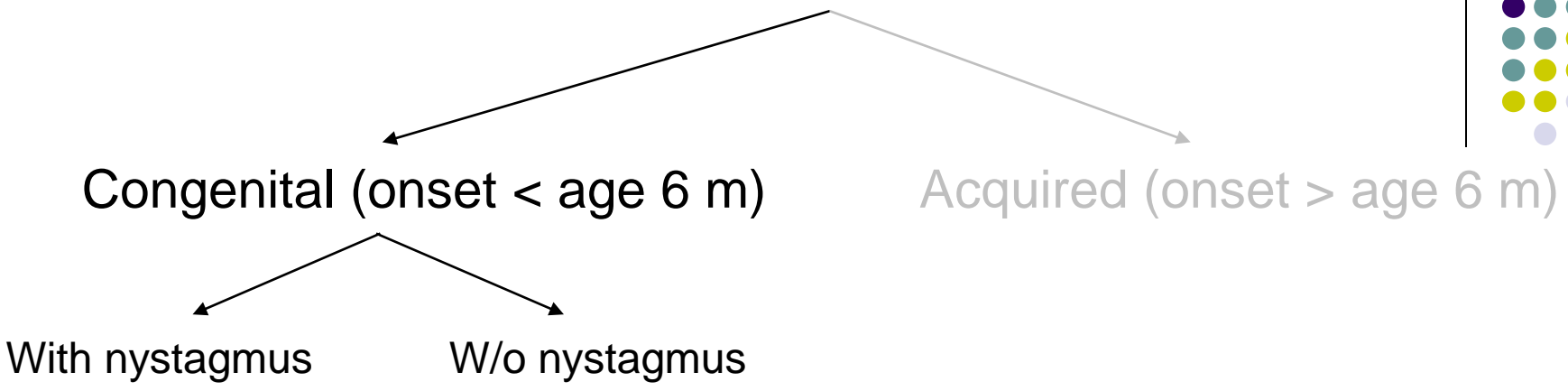
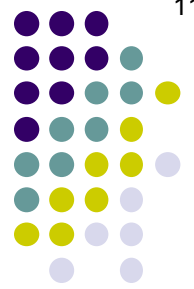
Acquired (onset > age 6 m)



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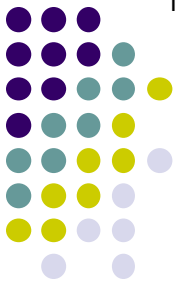
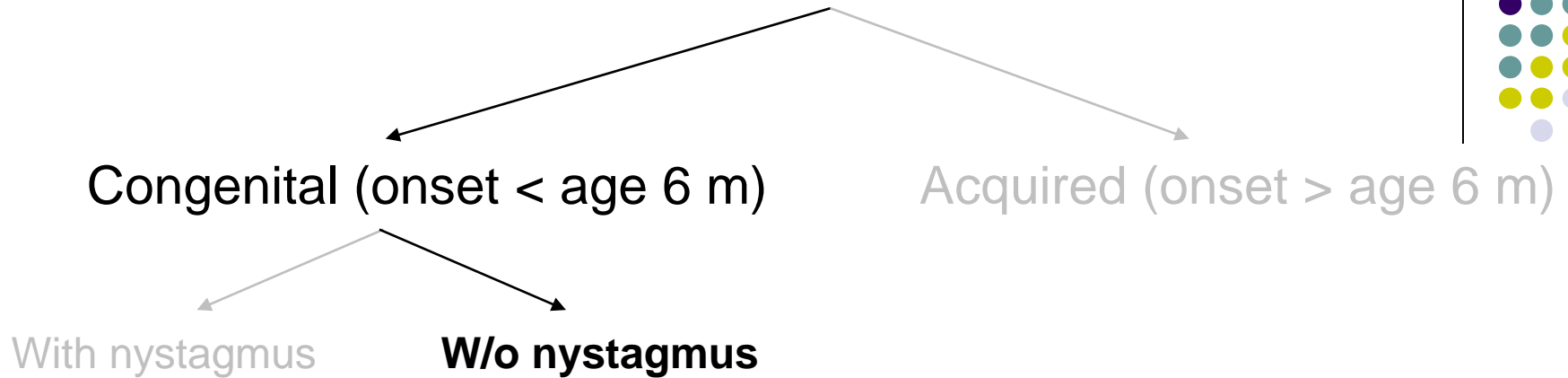
It's important to note here that brief strabismic episodes are commonly seen in the first few (especially two) months of life. Further, it's not uncommon for the same infant to manifest short periods of both ET *and* XT; this is referred to as *ocular instability of infancy*. However, if the ET is 1) present after age 2 months; 2) constant; and/or 3) large, it probably represents a congenital ET.

Comitant Esotropia



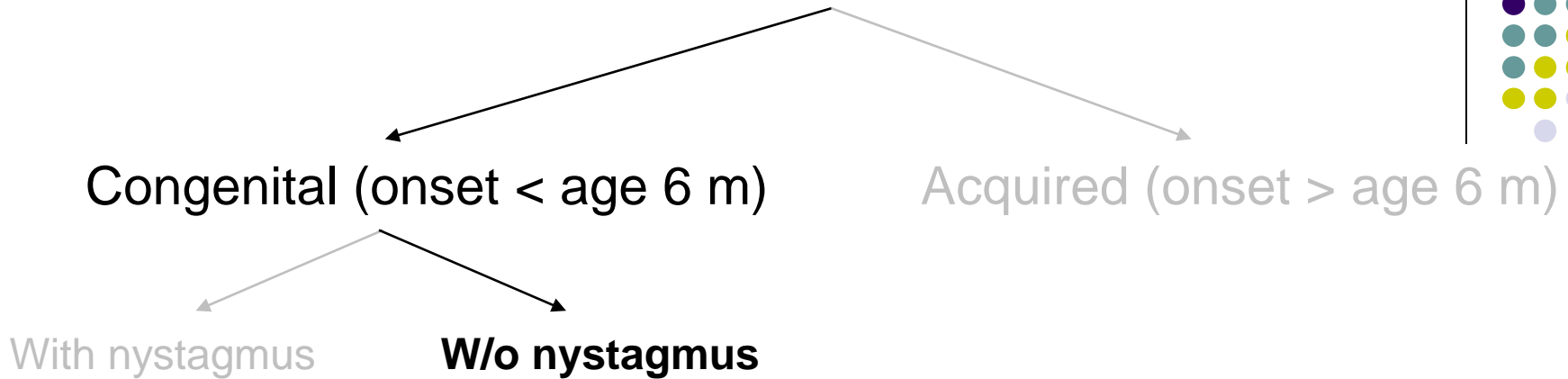
We divvy congenital ET into two groups:
Those presenting *with* nystagmus, and
those presenting *without* it

Comitant Esotropia



Congenital ET without nystagmus is your garden-variety 'my baby's eyes have been crossed since birth' esotropia. The deviation tends to be large— 30Δ or more. A family history is often present.

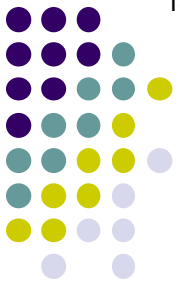
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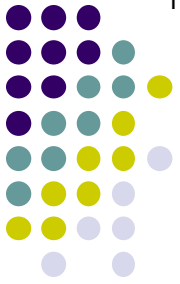
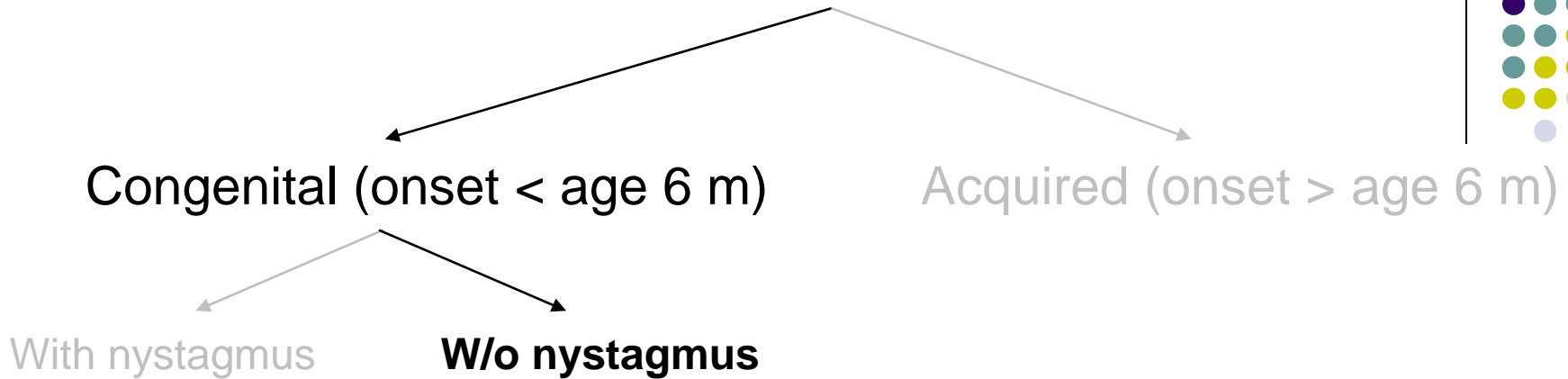
If vision is equal bilaterally, these infants frequently employ *cross fixation*, meaning they will use their (crossed) right eye to look at objects to their left, and their (crossed) left eye to look at those to the right.

Comitant Esotropia



ET with cross-fixation

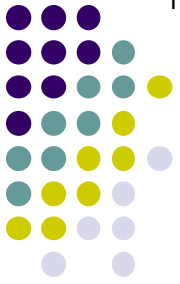
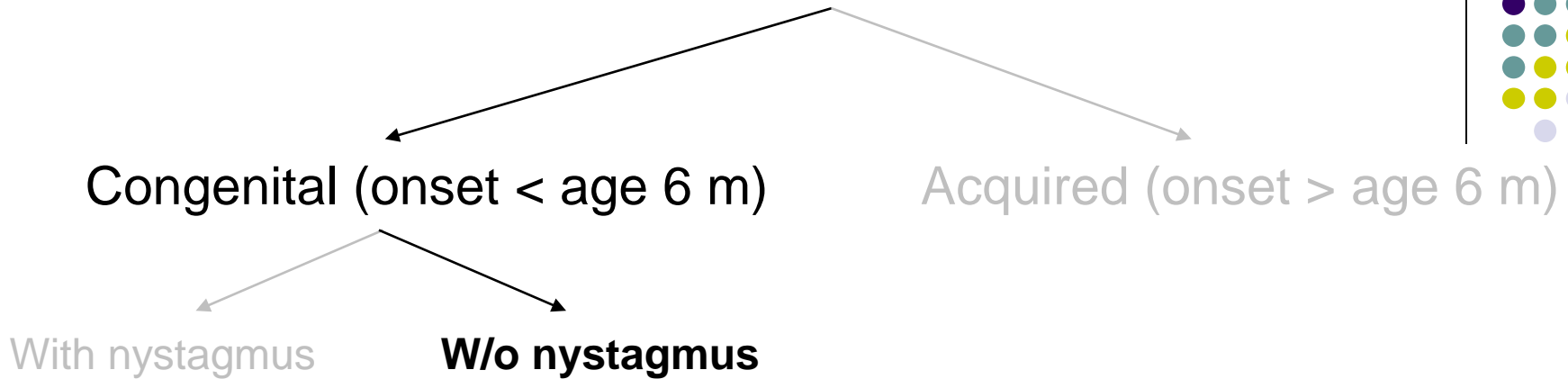
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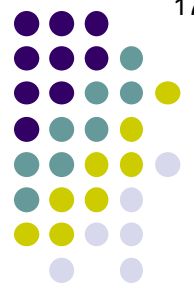
Comitant Esotropia



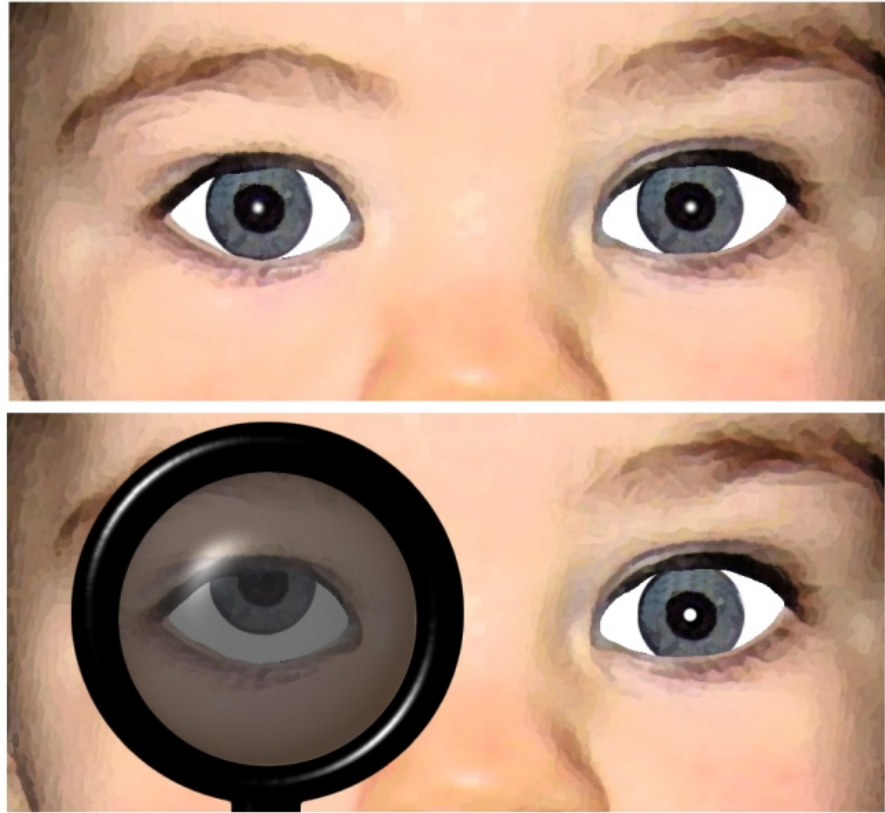
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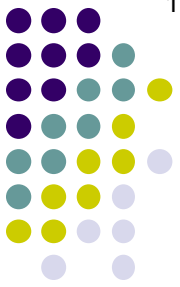
Another common finding in these infants is *dissociated vertical deviation* (DVD), the phenomenon in which one eye slowly elevates and extorts. This may occur spontaneously (*manifest* DVD), or only when the eye is occluded (*latent* DVD).



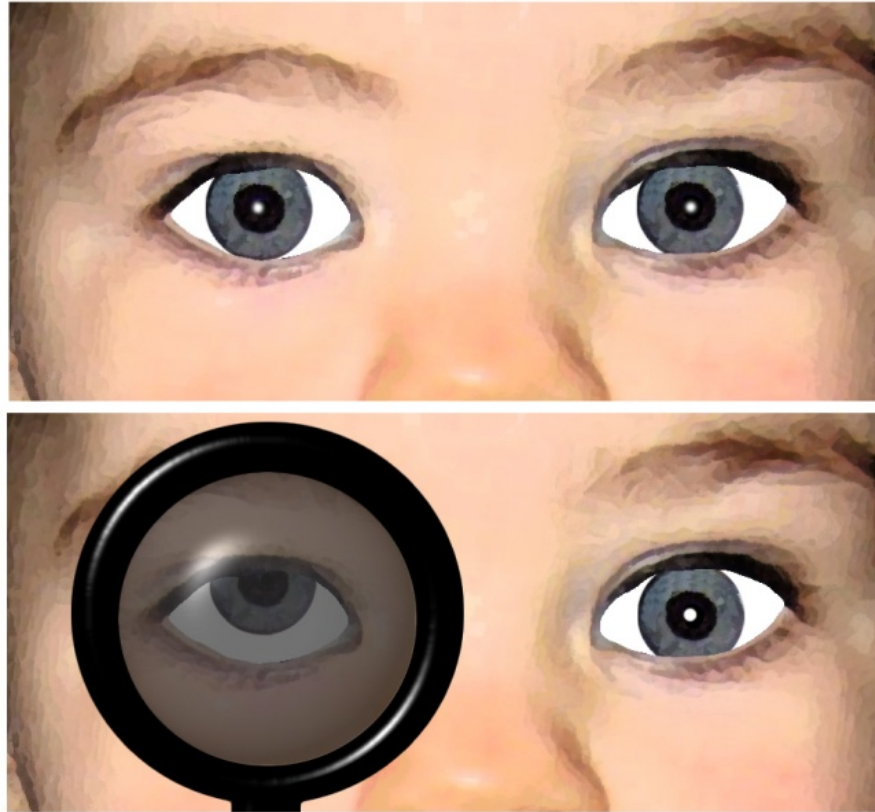
Comitant Esotropia



(Latent) DVD

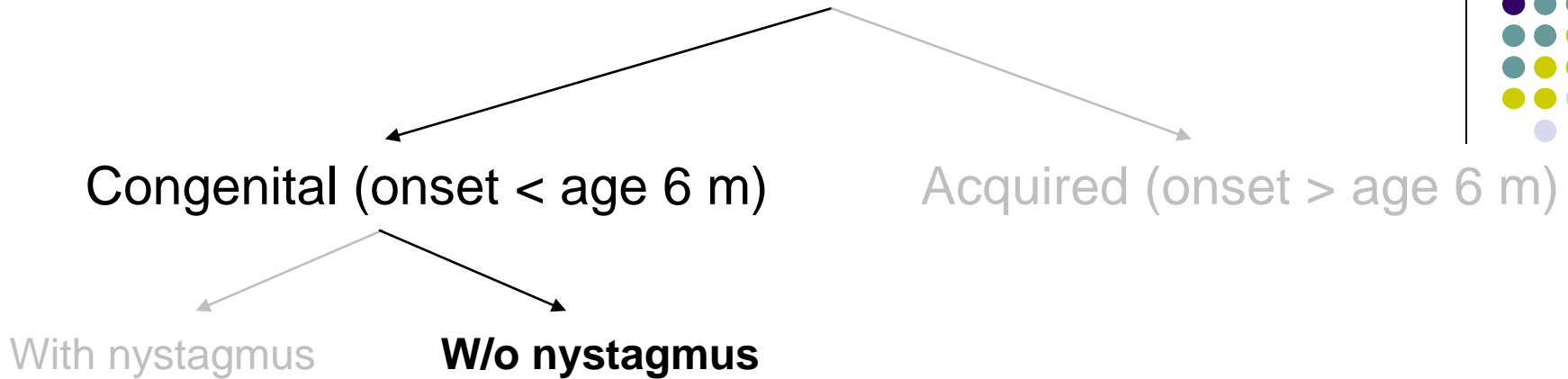


Comitant Esotropia



For more on DVD, see slide-set P7 (see also the set concerning Sherrington's and Hering's law, FELT3)

Comitant Esotropia



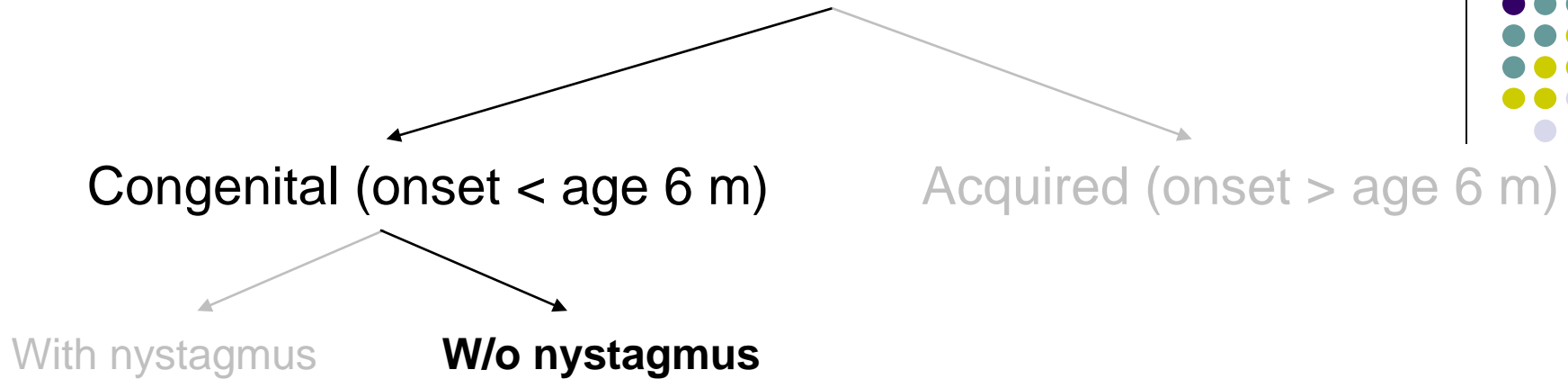
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Management of congenital ET w/o nystagmus is usually surgical via bilateral medial rectus recession. It is generally agreed that surgery should occur before the child’s 2nd birthday if possible.

Comitant Esotropia

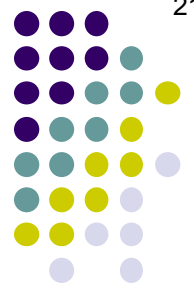


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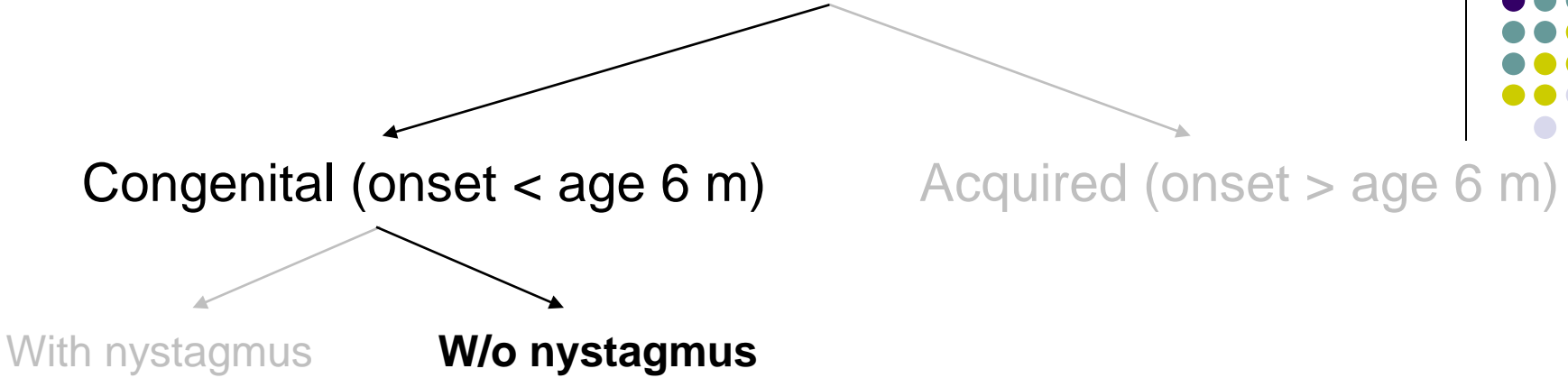
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Management of congenital ET w/o nystagmus is usually surgical via bilateral medial rectus recession. It is generally agreed that surgery should occur before the child’s 2nd birthday if possible. High-grade stereopsis is not a realistic outcome to expect; rather, *monofixation syndrome* is the hope-for outcome.



Comitant Esotropia



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In order to both prevent diplopia and provide some degree of binocular cooperation, the immature visual system responds to strabismus with some combination of three adaptations:

Suppression

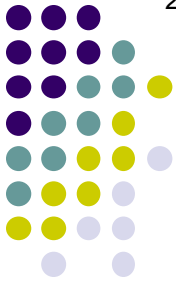
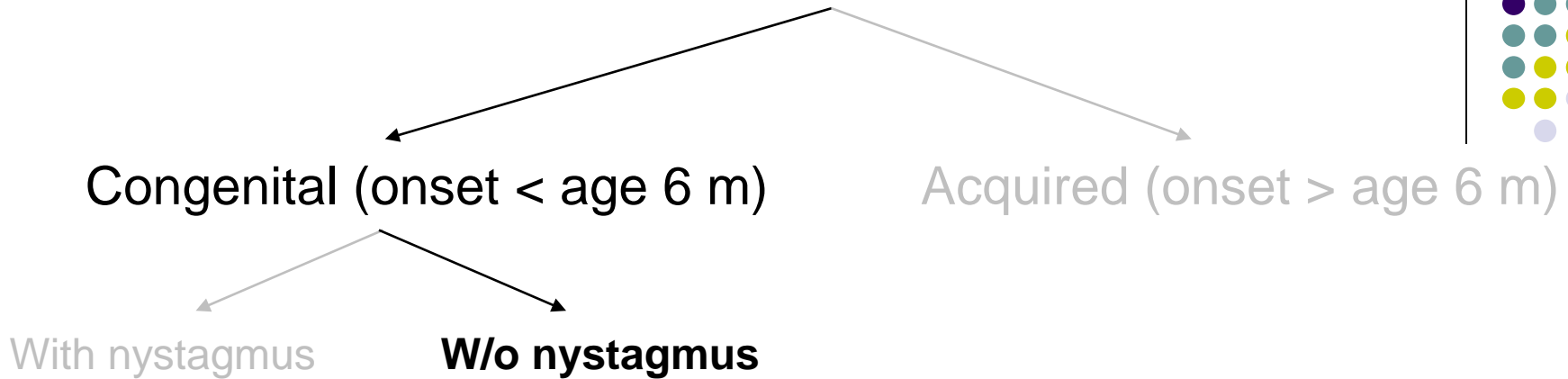
Anomalous retinal correspondence (ARC)

Monofixation syndrome



monofixation syndrome is the hope-for outcome.

Comitant Esotropia



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In order to both prevent diplopia and provide some degree of binocular cooperation, the immature visual system responds to strabismus with some combination of three adaptations:

[Suppression refers to the prevention of an image in one eye from reaching conscious awareness.](#)

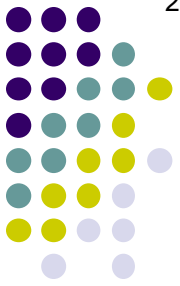
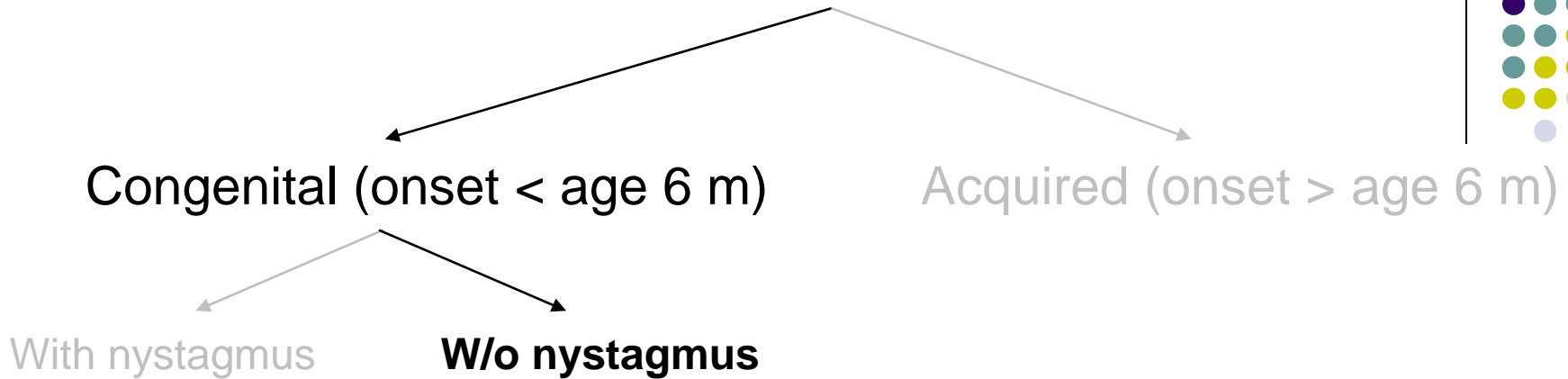
[It is one of the three sensory adaptations to strabismus that was mentioned previously](#)

Anomalous retinal correspondence (ARC)

Monofixation syndrome

generally agreed that, for the child, the hope-for outcome is **monofixation syndrome**. It is stereopsis is not a realistic outcome to expect; rather, **monofixation syndrome** is the hope-for outcome.

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In order to both prevent diplopia and provide some degree of binocular cooperation, the immature visual system responds to strabismus with some combination of three adaptations:

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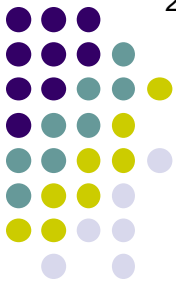
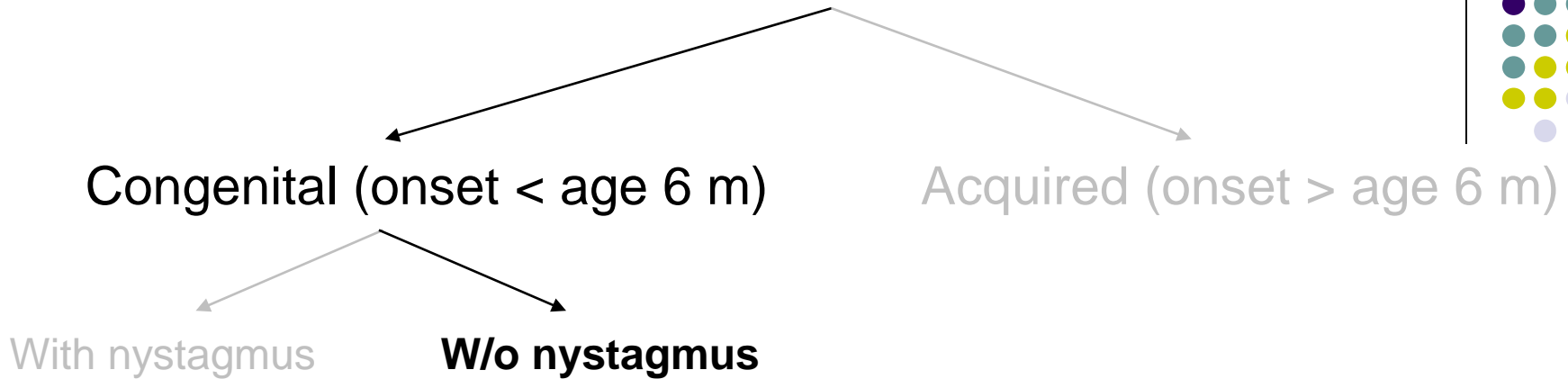
It is one of the three sensory adaptations to strabismus that was mentioned previously

Anomalous retinal correspondence (ARC) is the development of a common visual direction between noncorresponding locations on the two retinas; eg, in ET the fovea in one eye will ‘align’ with a macular location in the fellow eye that is nasal to its fovea. he eye

Monofixation syndrome

on. It is generally agreed that, given the child’s history of presenting with great stereopsis is not a realistic outcome to expect; rather, **monofixation syndrome** is the hope-for outcome.

Comitant Esotropia



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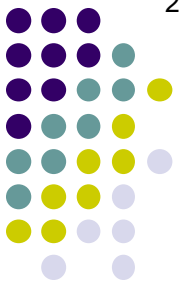
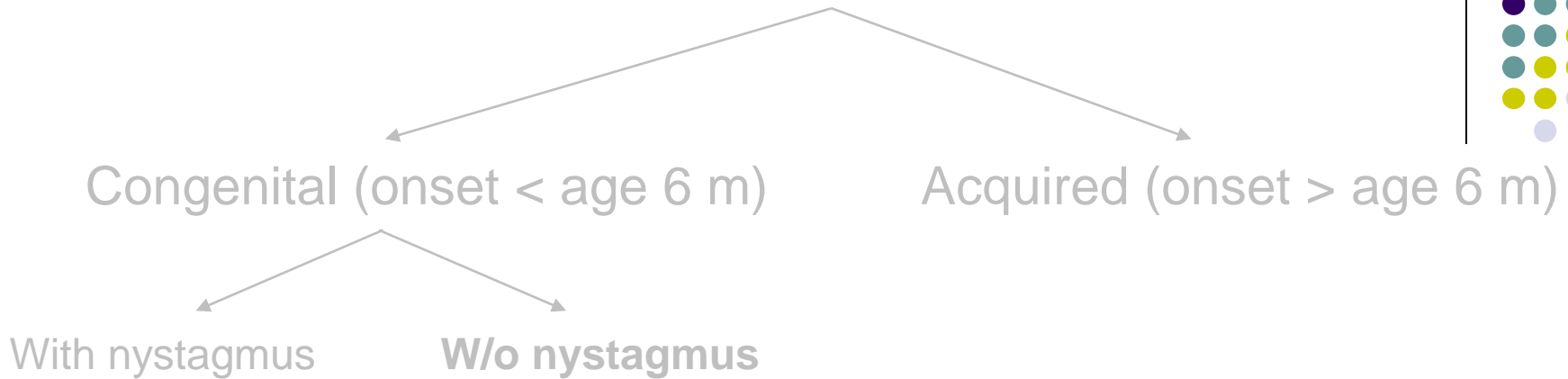
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Monofixation syndrome is a condition in which the pt develops a combination of a small-angle ET along with a small suppression scotoma.

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Comitant Esotropia



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For more on sensory adaptations to strabismus, see slide-set P14

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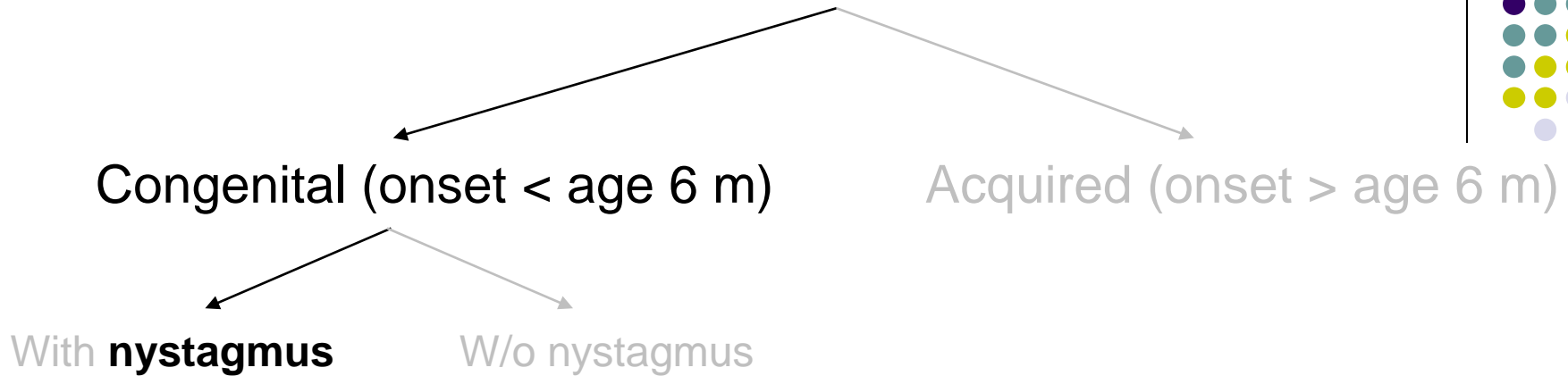
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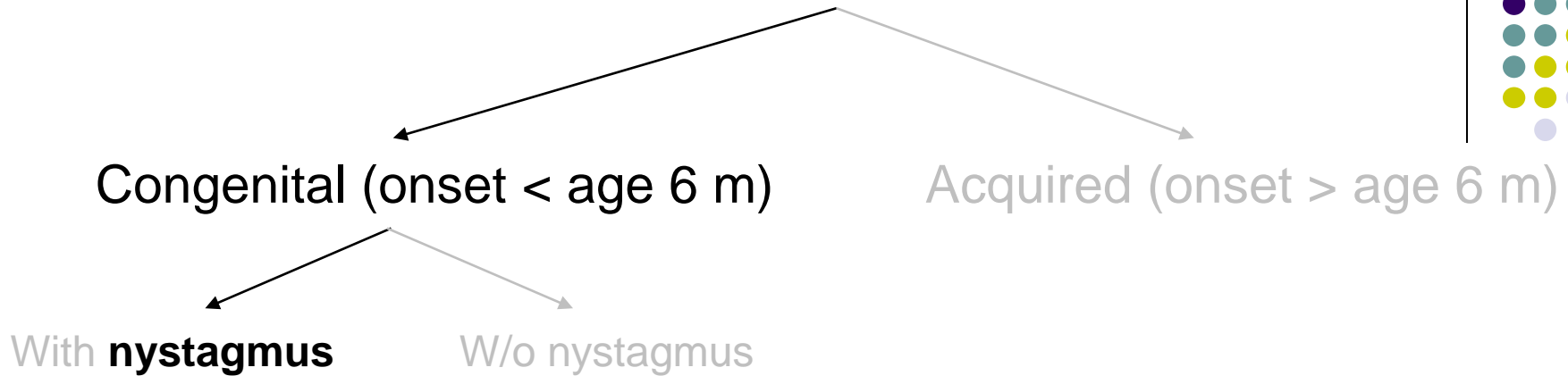
generally agreed that early, consistent correction of the child’s ET is usually in preference to high-grade stereopsis is not a realistic outcome to expect; rather, ***monofixation syndrome*** is the hope-for outcome.

Comitant Esotropia



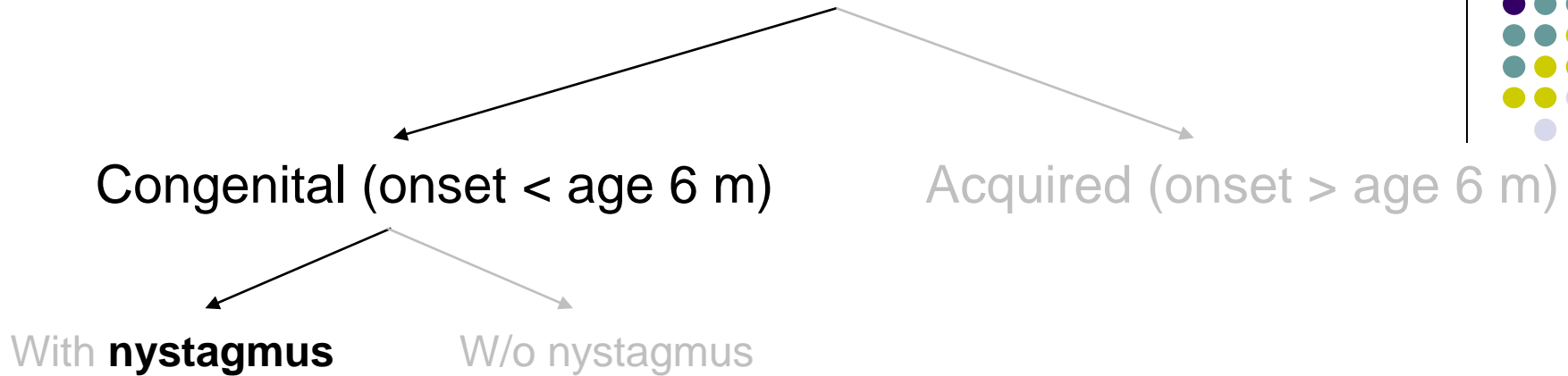
Nystagmus refers to involuntary, rhythmic, back-and-forth oscillations of the eyes. The oscillation may be in any plane, including torsional.

Comitant Esotropia



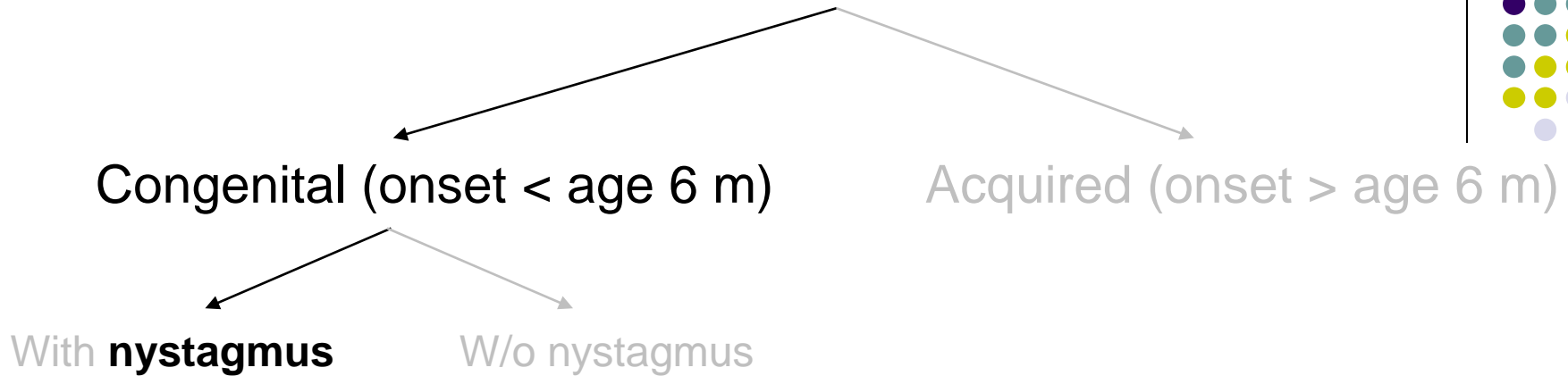
Nystagmus refers to involuntary, rhythmic, back-and-forth oscillations of the eyes. The oscillation may be in any plane, including torsional. **By definition, a nystagmus starts with a relatively slow drift of the eyes away from their intended position, followed by a corrective movement back towards it. The corrective move can be fast or slow; if it's fast the oscillation is called a *jerk* nystagmus; if slow, a *pendular* nystagmus. The nature of a nystagmus may change with direction of gaze; ie, a jerk nystagmus may morph into a pendular one in a different field of gaze.**

Comitant Esotropia



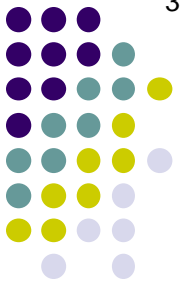
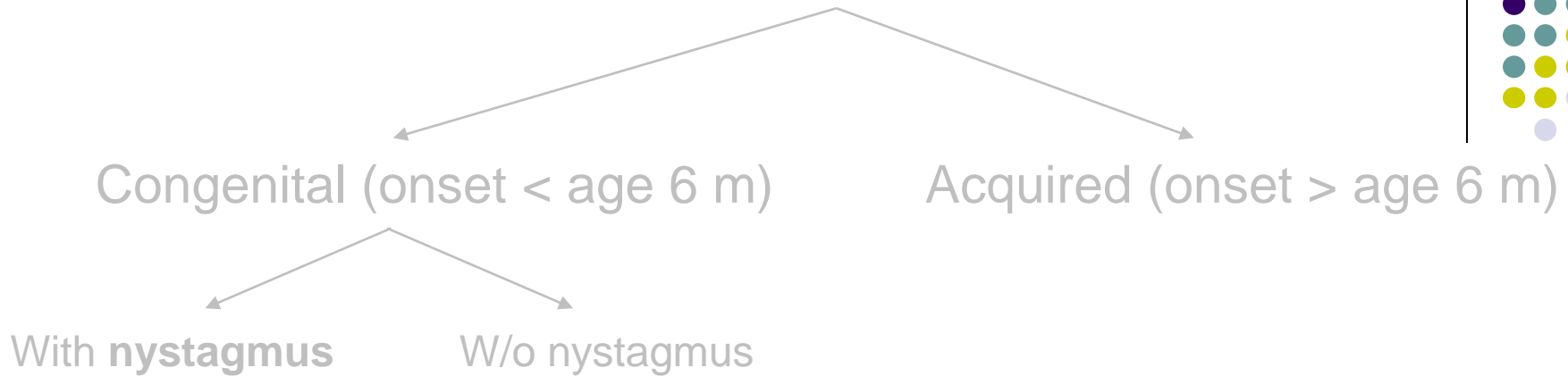
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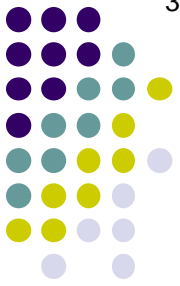
Comitant Esotropia



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For more on nystagmus, see slide-set P4

Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

With nystagmus

W/o nystagmus

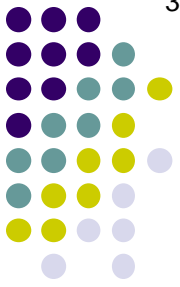
Nystagmus blockage syndrome

Latent nystagmus

Ciancia syndrome

The *Peds/Strabismus* book covers these three forms of **congenital ET with nystagmus**

Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

With nystagmus

W/o nystagmus

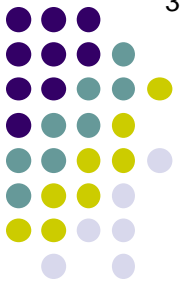
Nystagmus blockage syndrome

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Nystagmus blockage syndrome is the esotropia that develops in pts with *congenital motor nystagmus (CMN)*.

Comitant Esotropia



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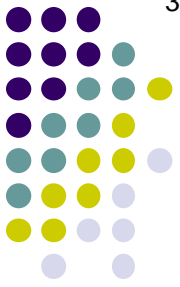
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Comitant Esotropia



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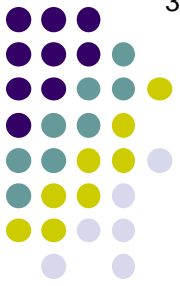
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Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

With nystagmus

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Nystagmus blockage syndrome

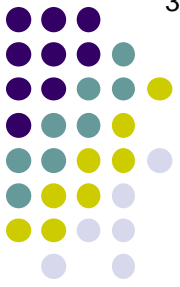
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So why does CMN lead to esotropia? Because early in life, the visual system 'realizes' that the nystagmus is minimized (and thus acuity is maximized) when the eyes are converged.

Comitant Esotropia



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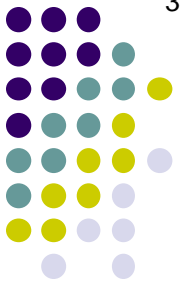
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So why does CMN lead to esotropia? Because early in life, the visual system 'realizes' that the nystagmus is minimized (and thus acuity is maximized) when the eyes are converged. Because of this, the system learns to adopt and maintain an esotropic posture.

Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

With nystagmus

W/o nystagmus

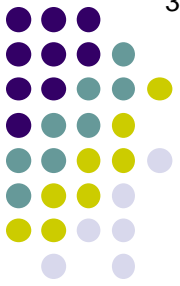
-Nystagmus blockage syndrome

-**Latent nystagmus**

-Ciancia syndrome

Latent nystagmus is an interesting phenomenon in which no nystagmus is present when vision is binocular, but commences if/when one eye is occluded.

Comitant Esotropia



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Acquired (onset > age 6 m)

With nystagmus

W/o nystagmus

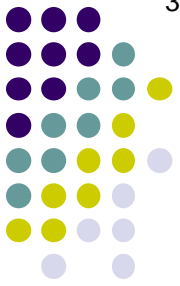
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Ciancia syndrome

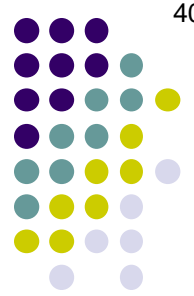
Ciancia syndrome has two features that give it away:
The first is, the ET is very large—usually 50Δ or more.
Second, the nystagmus intensifies if the pt attempts to abduct either eye.

Comitant Esotropia



Ciancia syndrome

Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

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W/o nystagmus

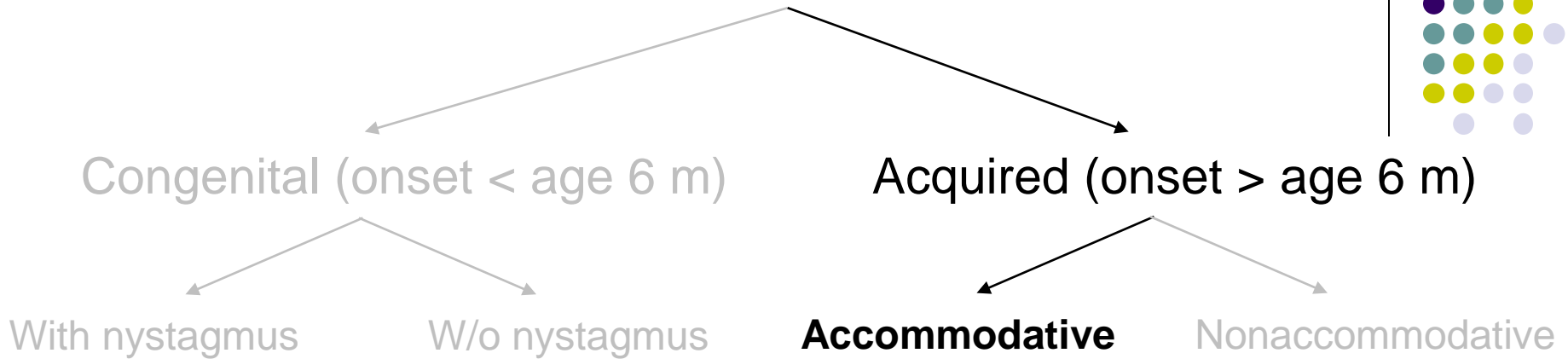
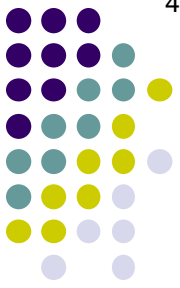
Accommodative

Nonaccommodative

- Nystagmus blockage syndrome
- Latent nystagmus
- Ciancia syndrome

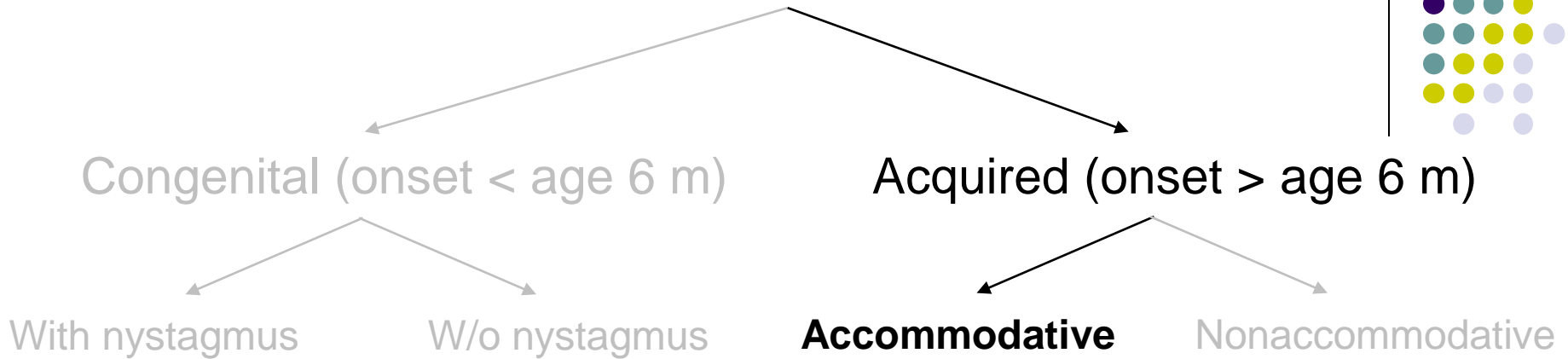
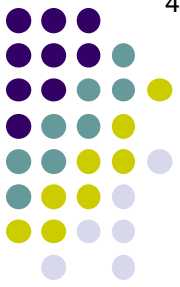
Acquired ET is also divided into two groups: Those that are *accommodative* in nature, and those that are ***nonaccommodative***

Comitant Esotropia



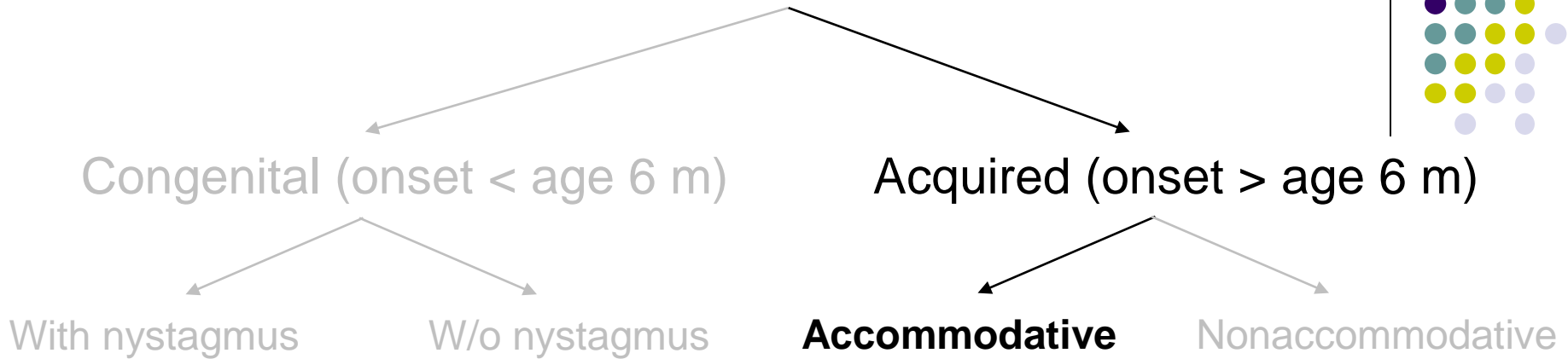
Accommodative esotropia refers to ET stemming from activation of the *accommodative* (aka *near*) *reflex*. Recall that the accommodative reflex has three components: *accommodation*, *miosis*, and *convergence*. Recall further that *accommodation* refers to the cranking in of lenticular 'plus' power to overcome hyperopic blur.

Comitant Esotropia



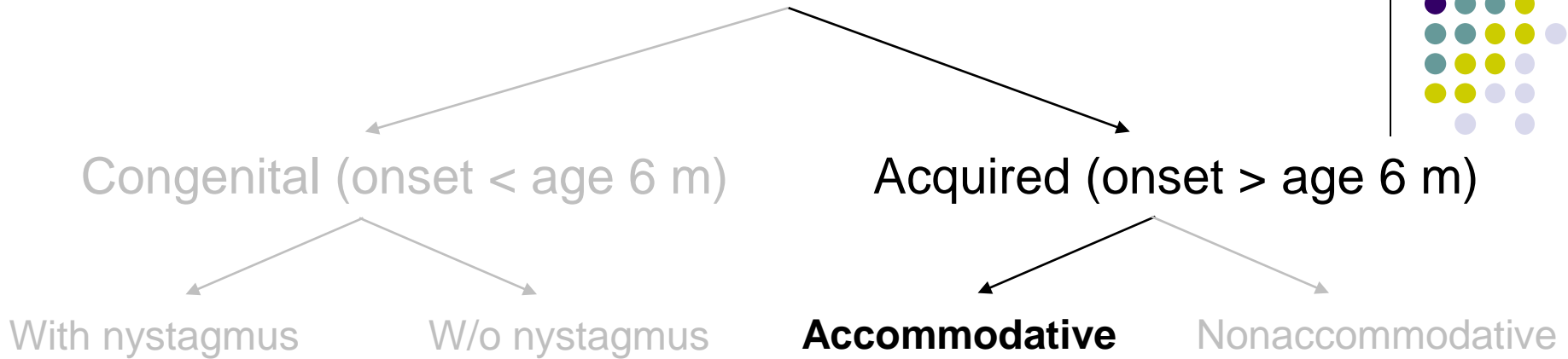
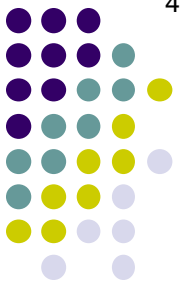
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Comitant Esotropia



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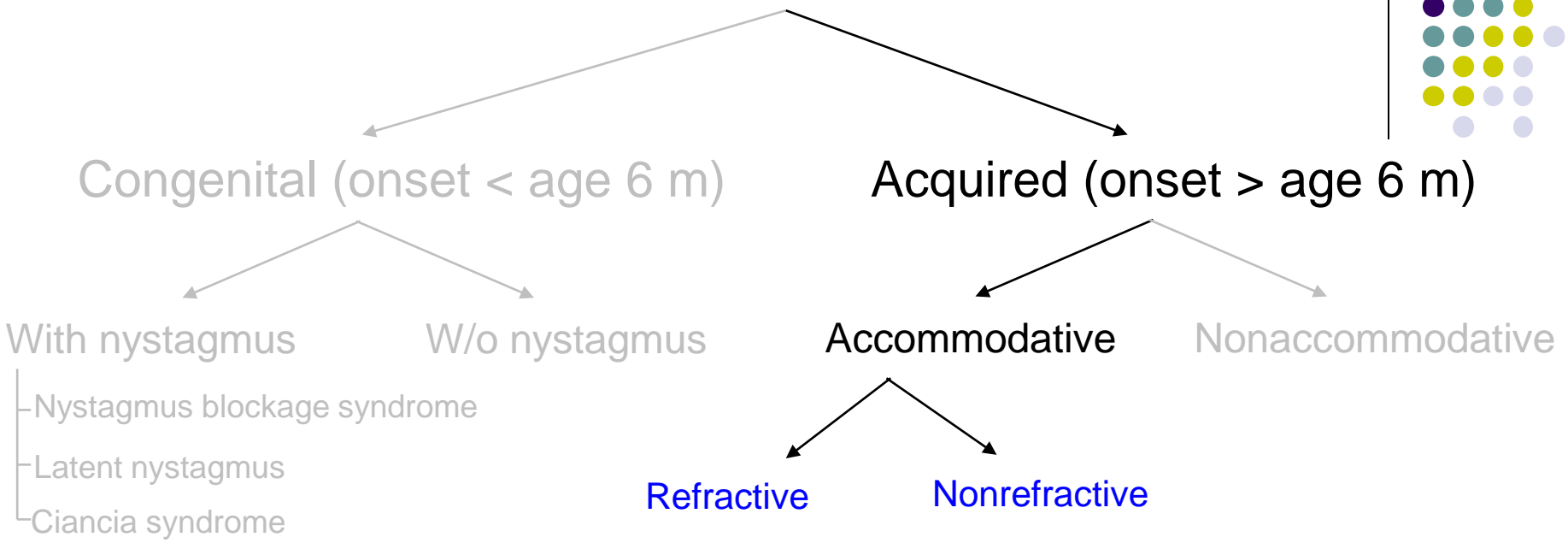
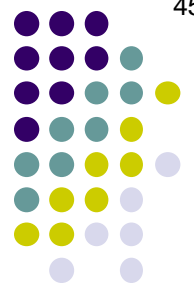
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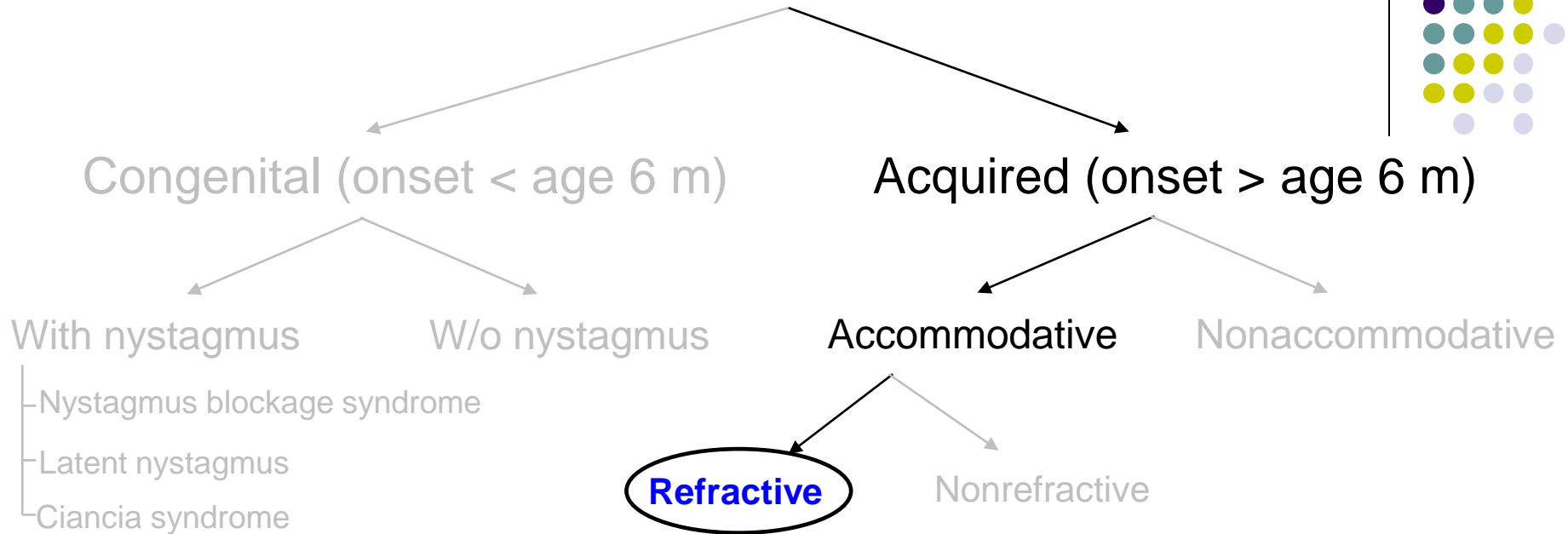
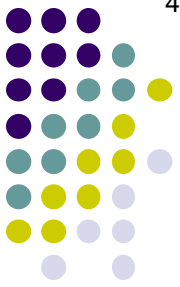
Accommodative ET typically arises around age 2-3 years. It is intermittent initially, eventually progressing to become constant. The child will often complain of diplopia at first, but stops after developing a facultative suppression scotoma. (A *facultative* suppression scotoma is one that is active only while the eye is deviated.) Amblyopia is common.

Comitant Esotropia



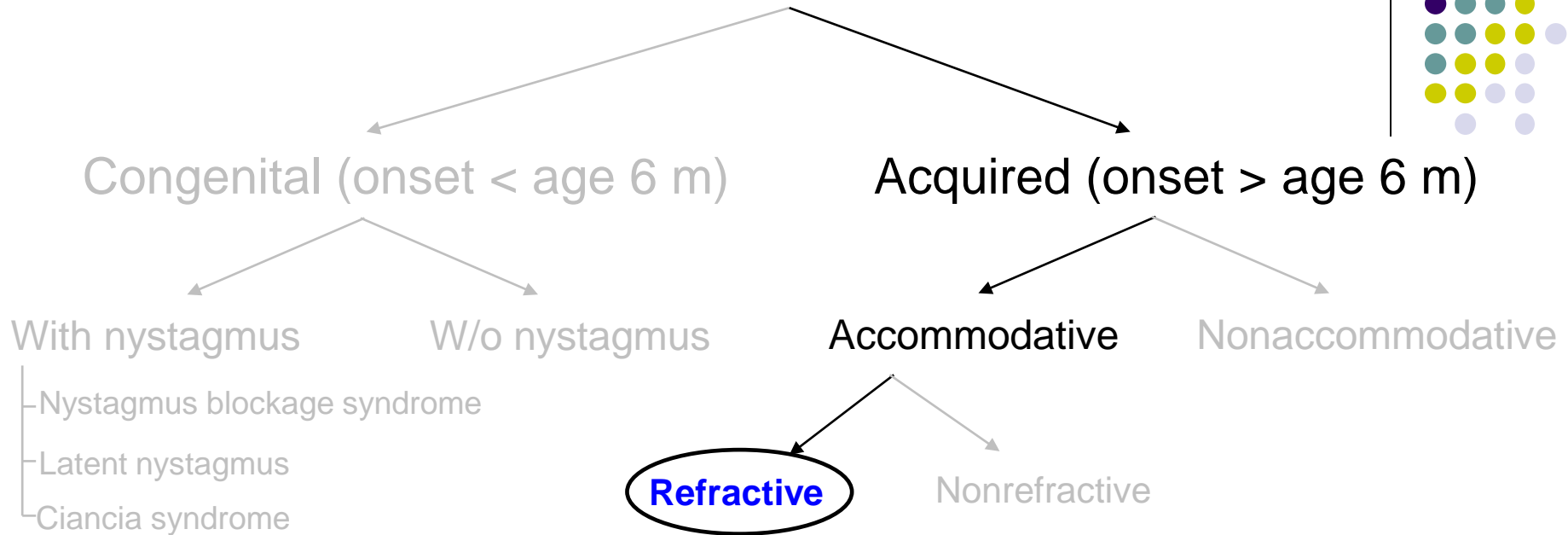
Accommodative ET is further divided into two forms: *Refractive*, and ***Nonrefractive***

Comitant Esotropia



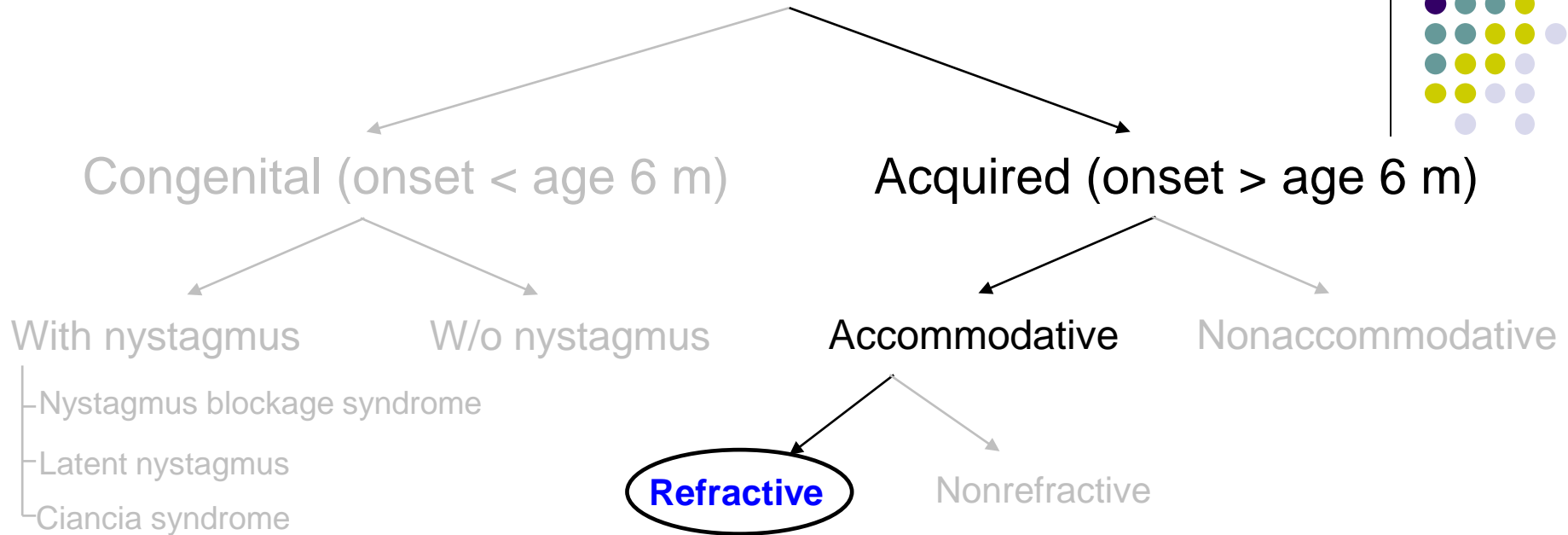
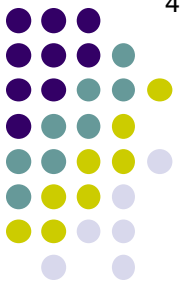
Refractive accommodative esotropia is pretty straightforward: It is due primarily to being a high hyperope (average ~4D). For these kids, the severe accommodative exertion required to overcome their hyperopia stimulates so much convergence (via the near reflex) that their divergence inputs get swamped, and their eyes turn in.

Comitant Esotropia



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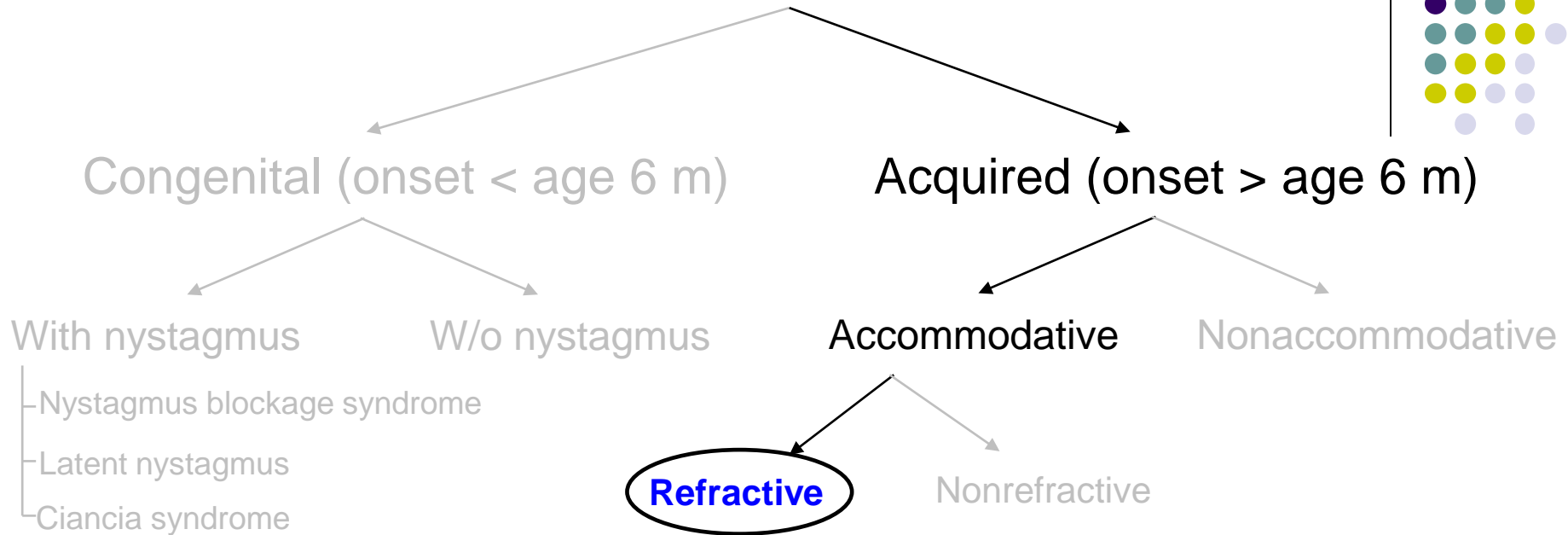
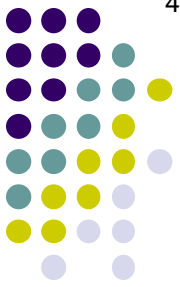
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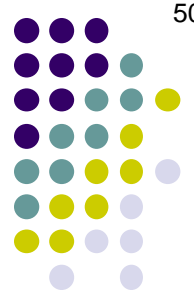
Refractive accommodative ET is managed by prescribing the full cycloplegic refraction, which should eliminate the accommodation→convergence→ET chain at the source. If residual ET' is present, a bifocal should be employed.

Comitant Esotropia

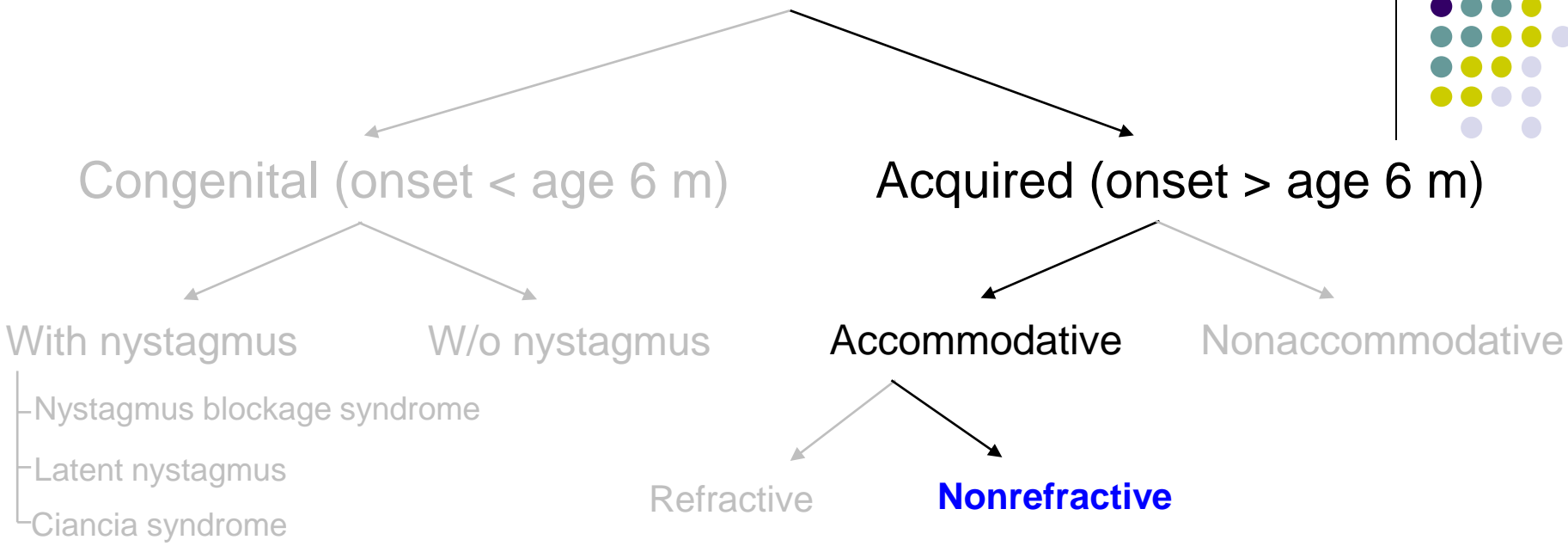


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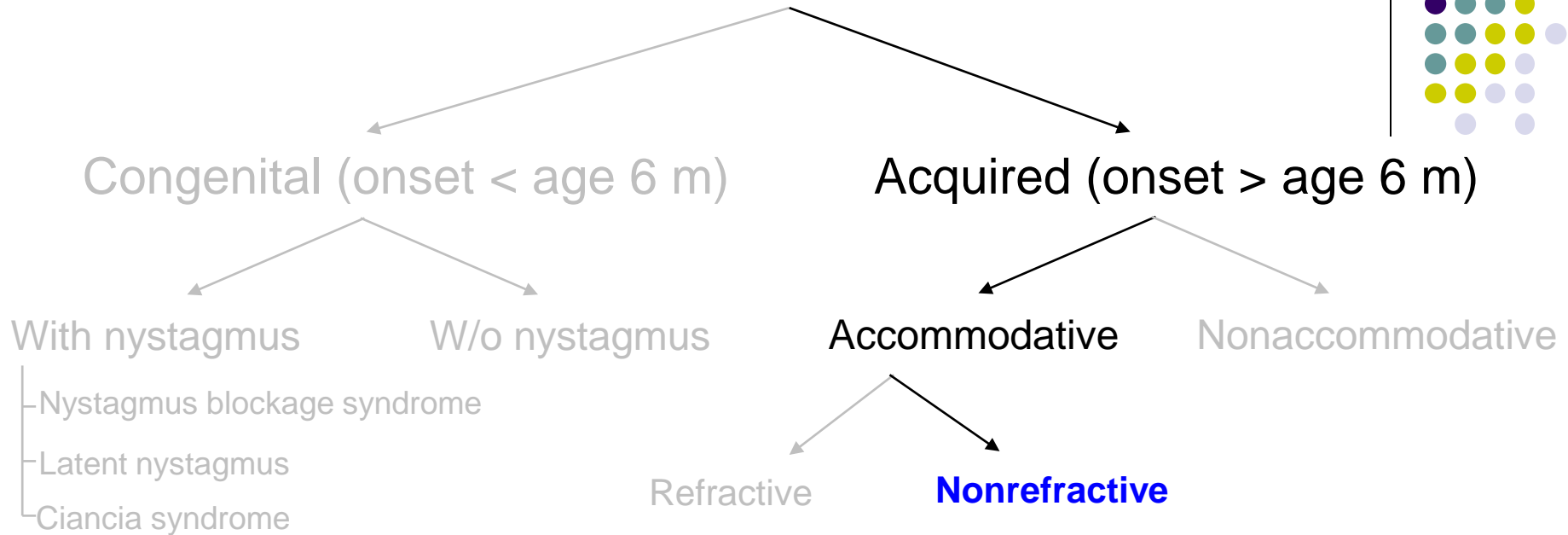


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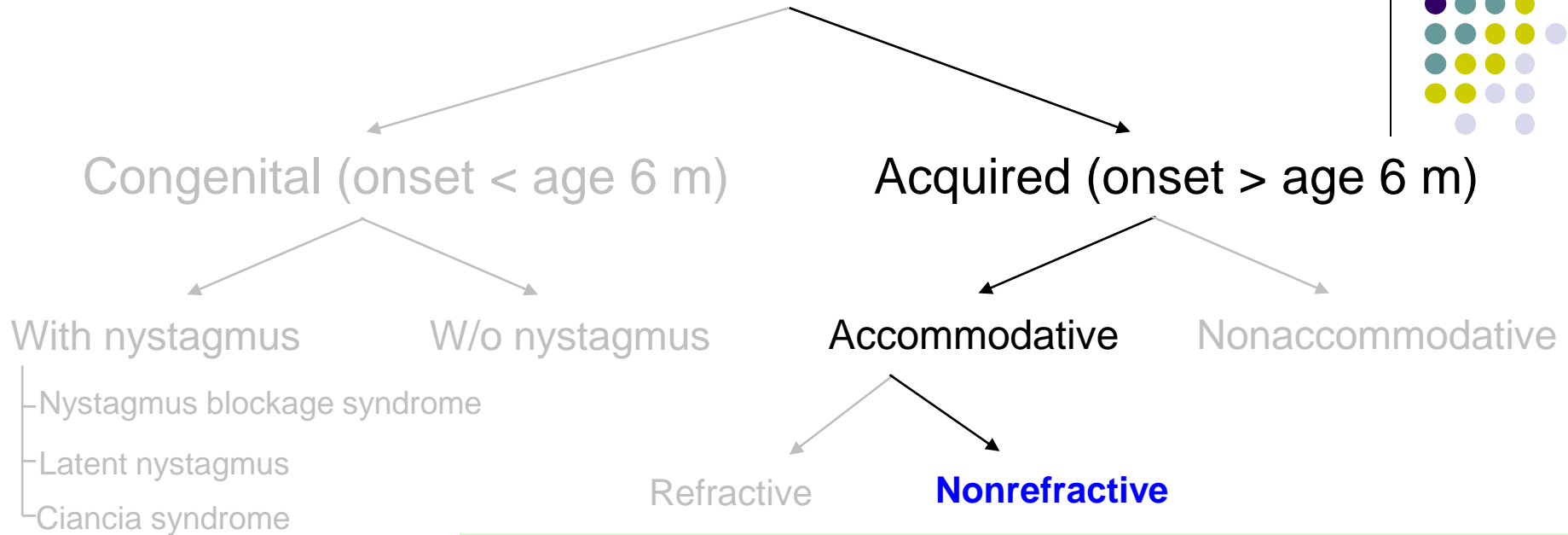
The mechanism underlying **nonrefractive accommodative esotropia** is less straightforward. As in its refractive cousin, nonrefractive accommodative esotropia is secondary to convergence induced by accommodation for which divergence inputs are insufficient to keep the eyes straight.

Comitant Esotropia



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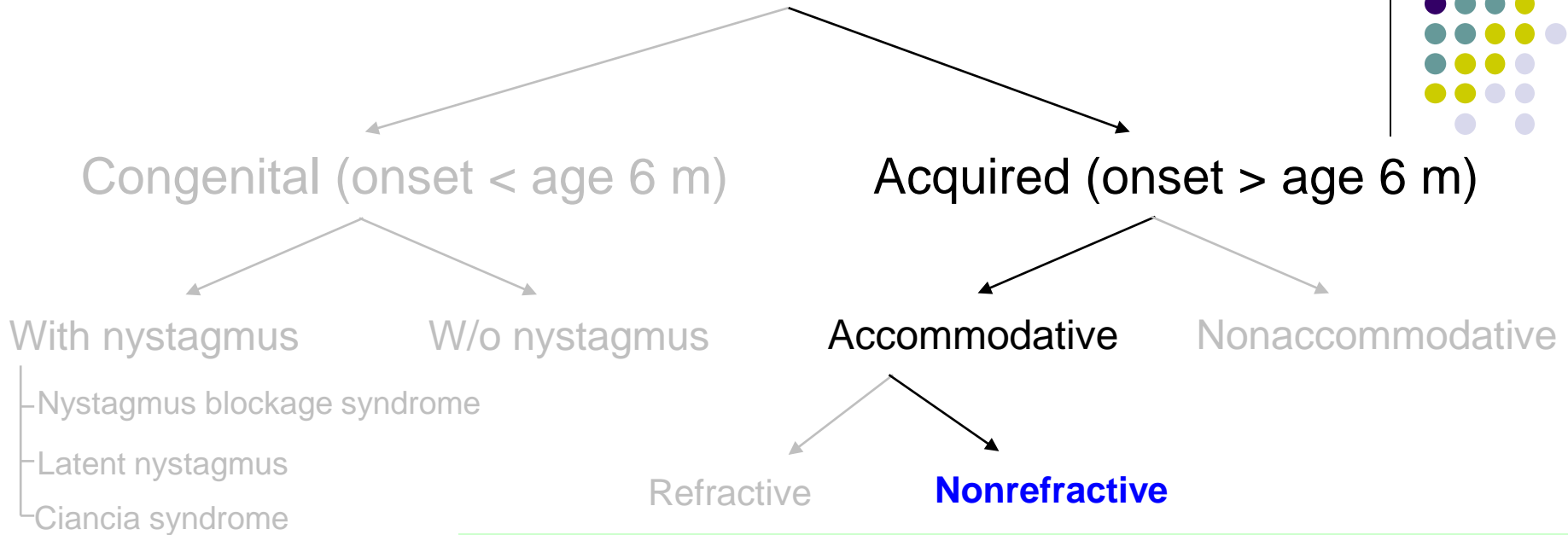
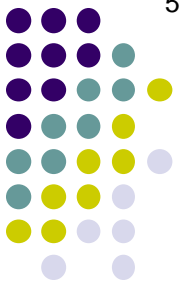
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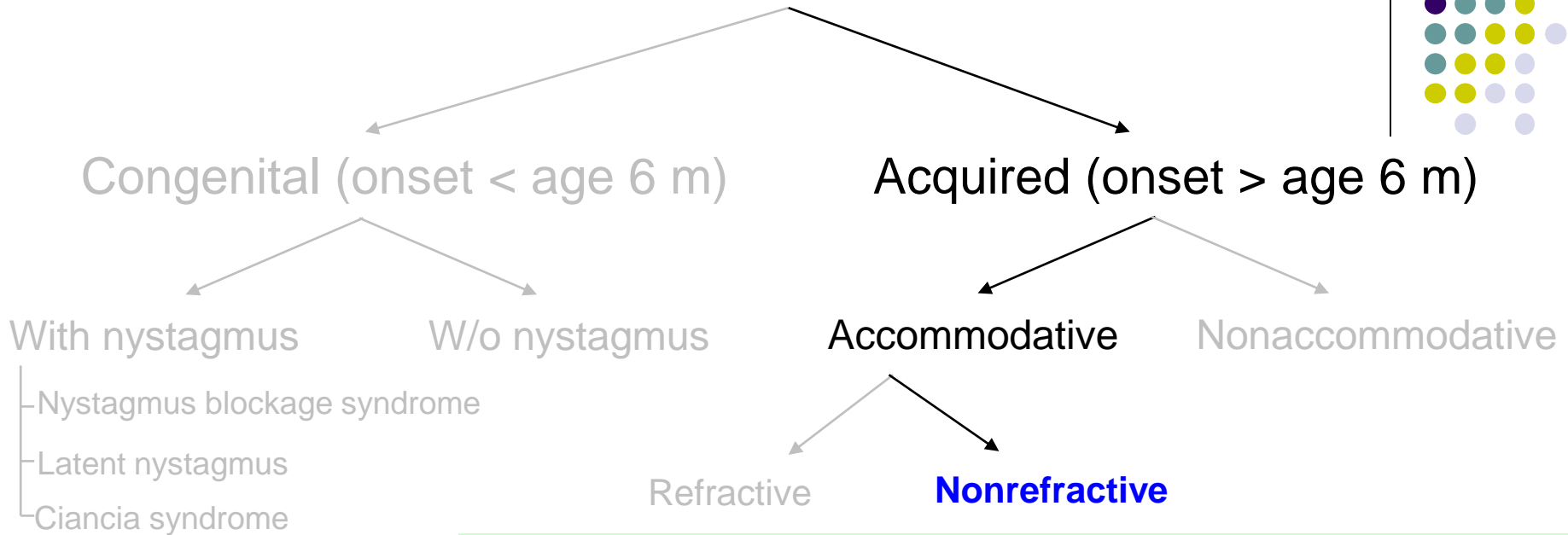
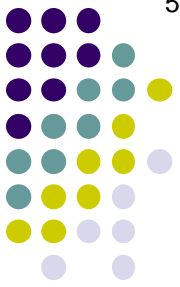
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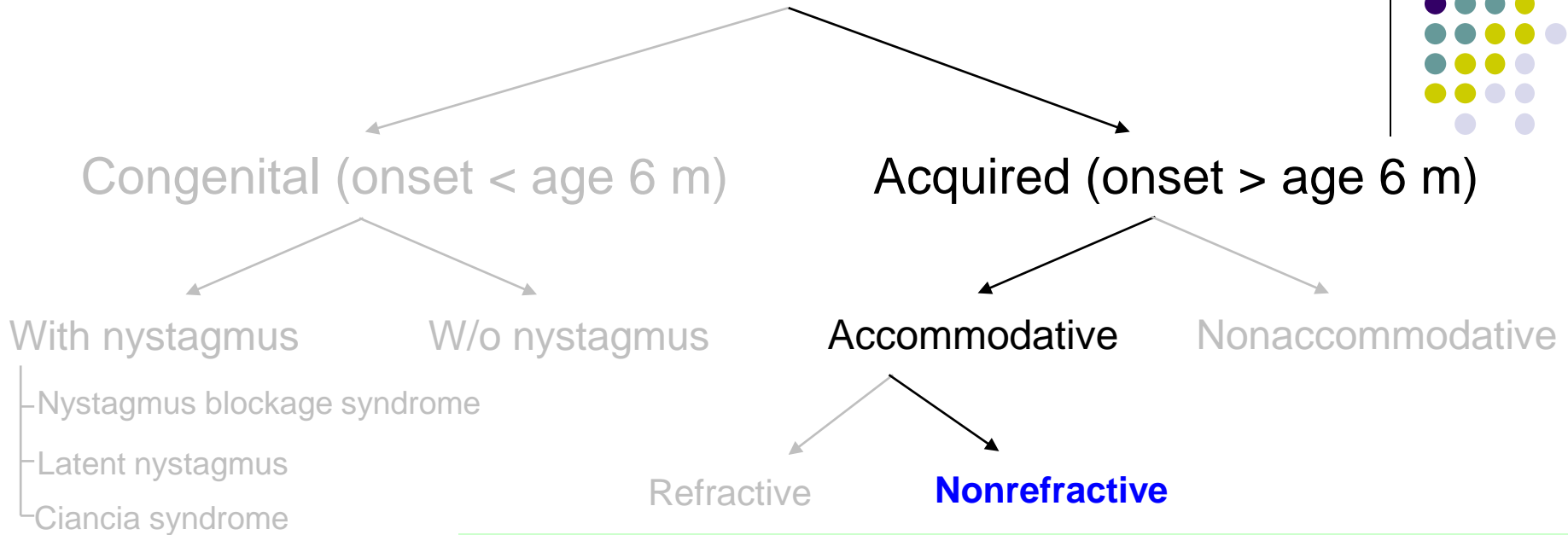
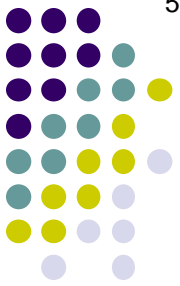
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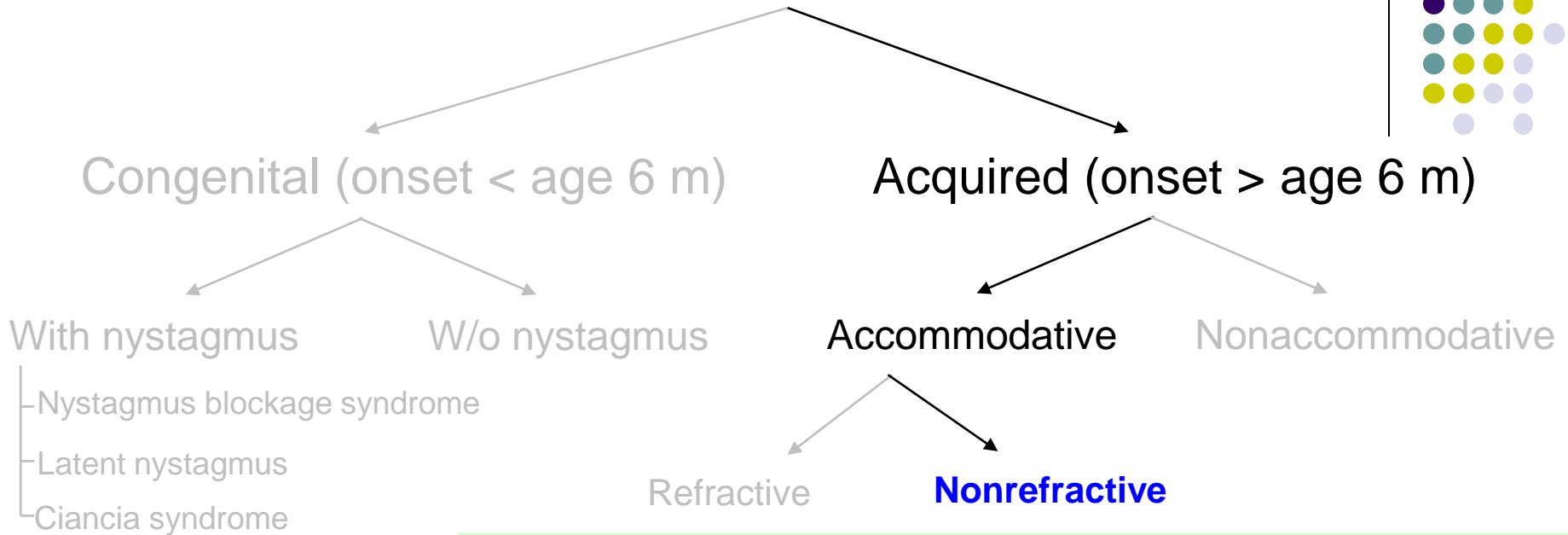
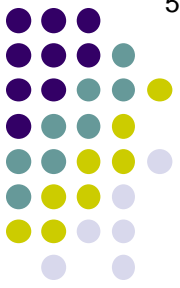
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Comitant Esotropia



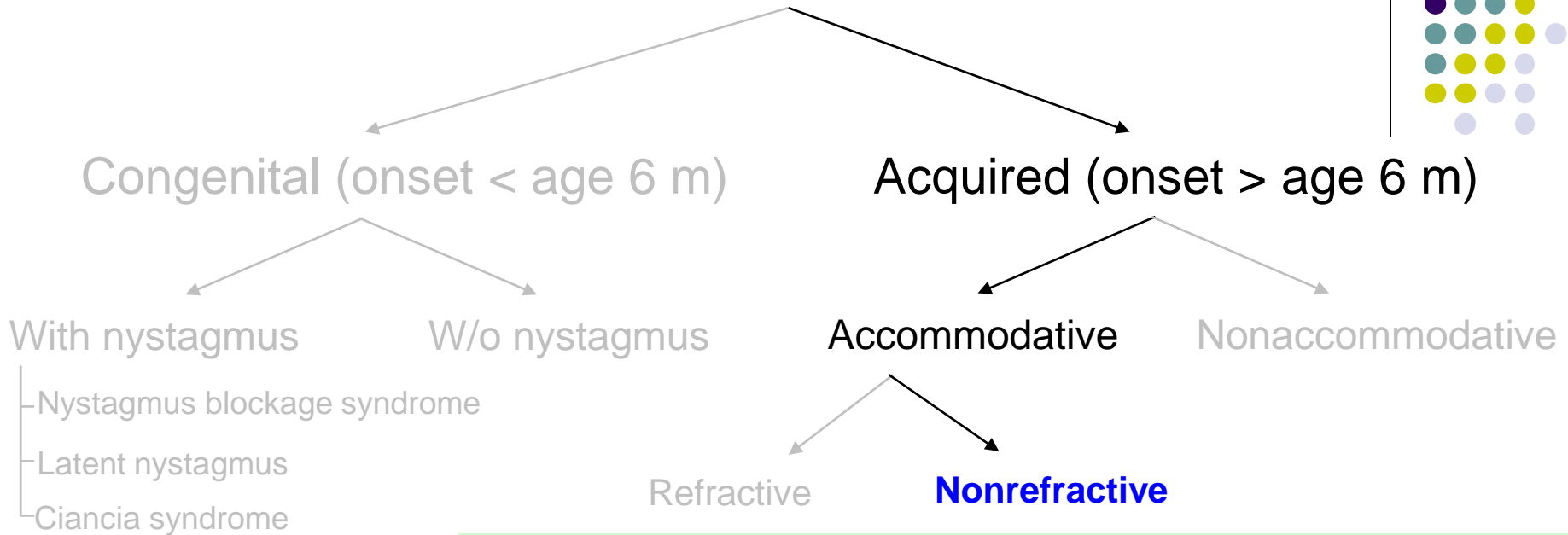
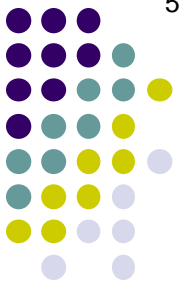
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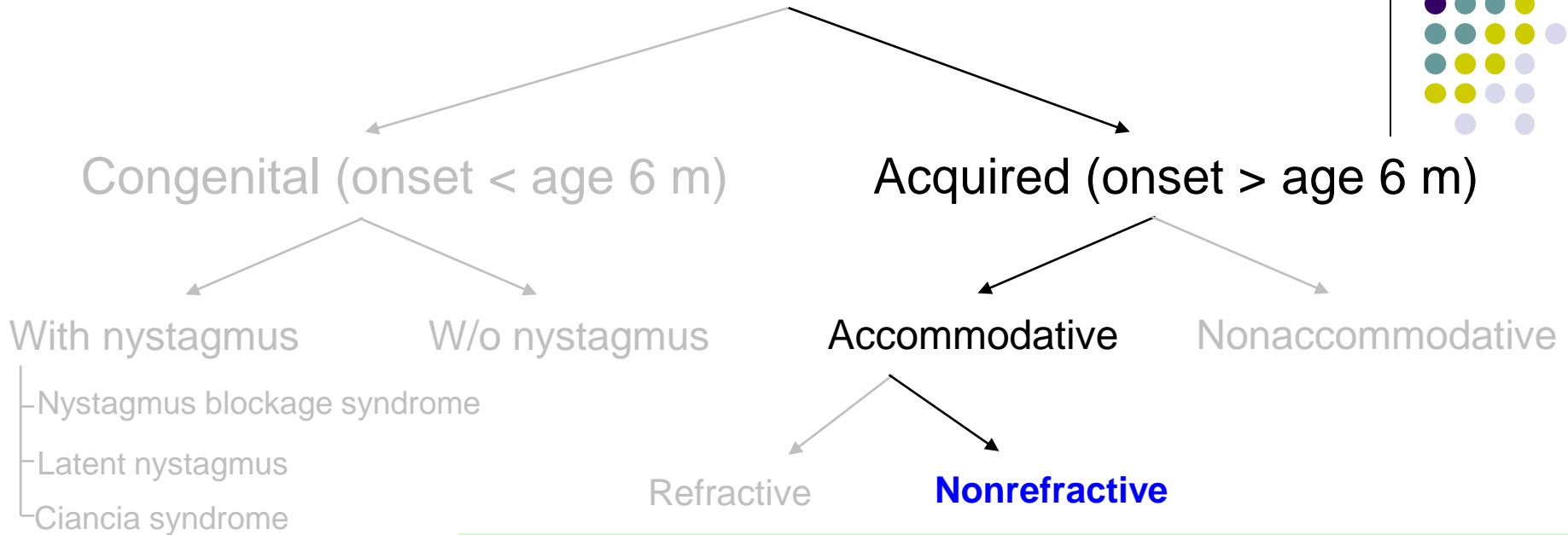
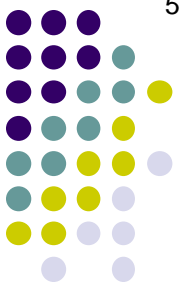
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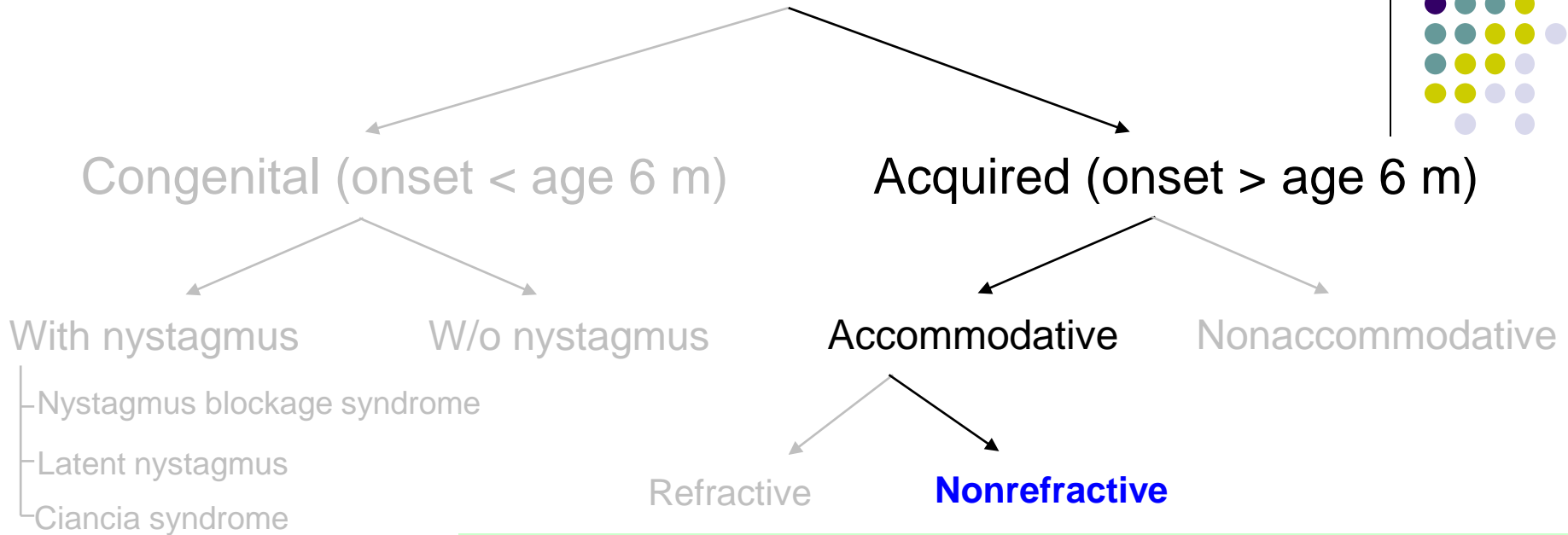
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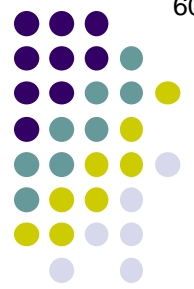


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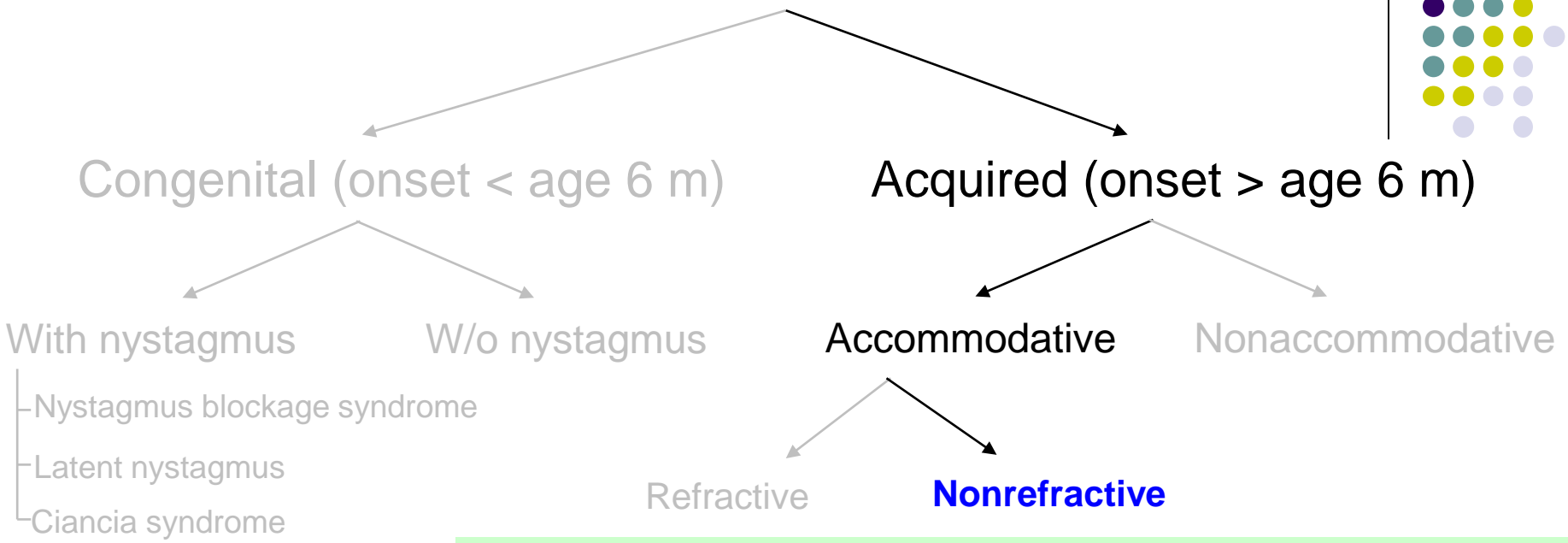
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How best to manage high AC/A ratio accommodative esotropia is unsettled as of this writing. Some specialists elect observation so long as the child's eyes are pretty straight at distance. Others argue that bifocals are worth a try, provided you ensure the kid actually uses the add appropriately. Surgical correction can be countenanced, but is labeled "controversial" by the *Peds* book.

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Comitant Esotropia

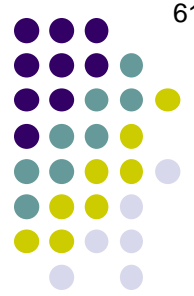


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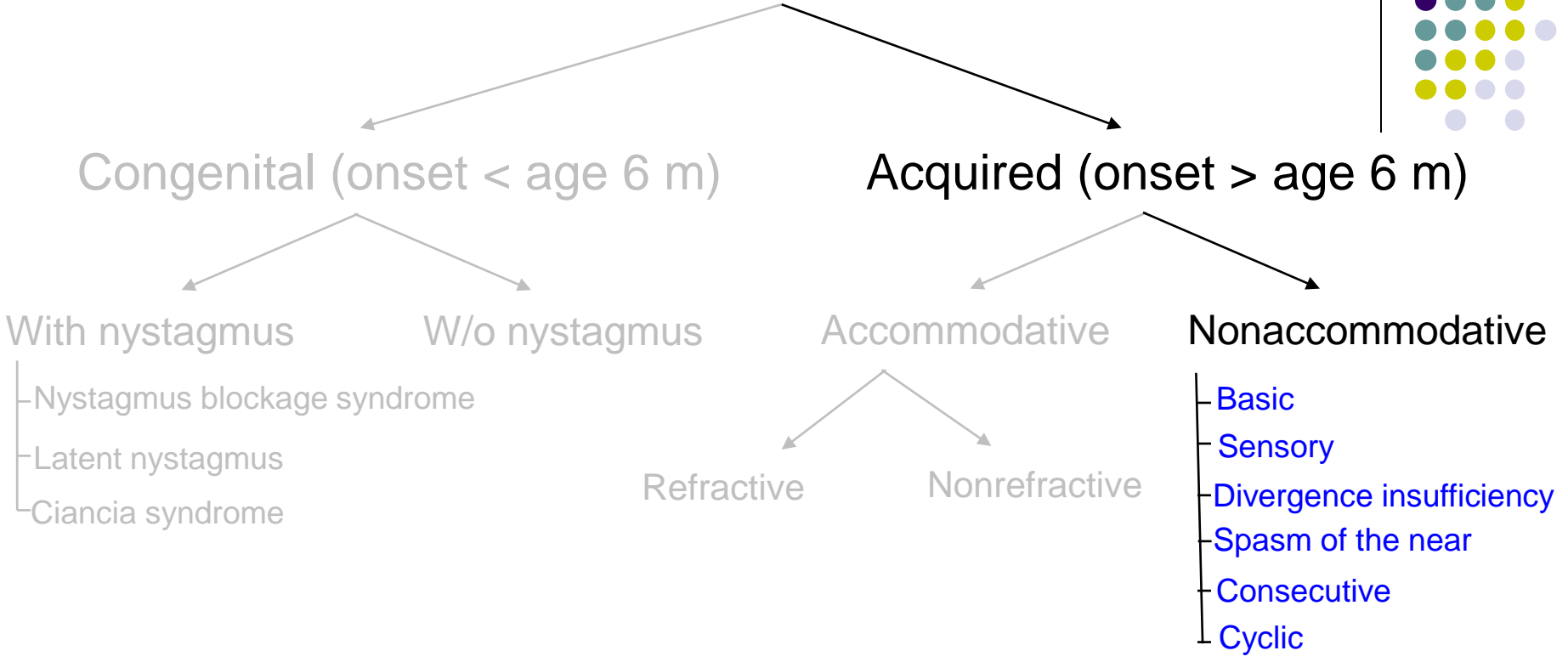
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Recall that a key feature of high AC/A ratio accommodative esotropia is that the magnitude of the ET was secondary to a high AC/A ratio. As the child accommodates, the greater their ET will be. It follows that, because near vision requires more accommodation than does distance, ET < ET' in high AC/A ratio esotropia. (Rule of thumb: ET' will be at least 10Δ greater than ET.)

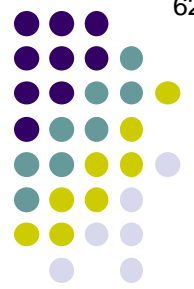
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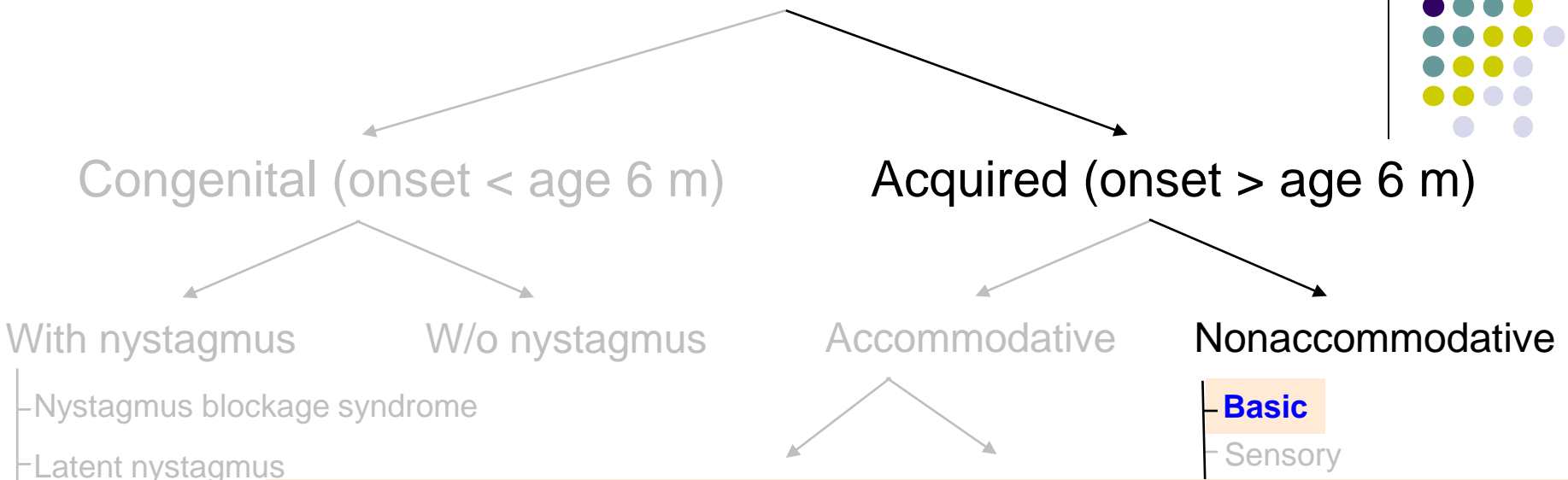
Comitant Esotropia



The *Peds* book discusses several forms of **acquired nonaccommodative esotropia**.

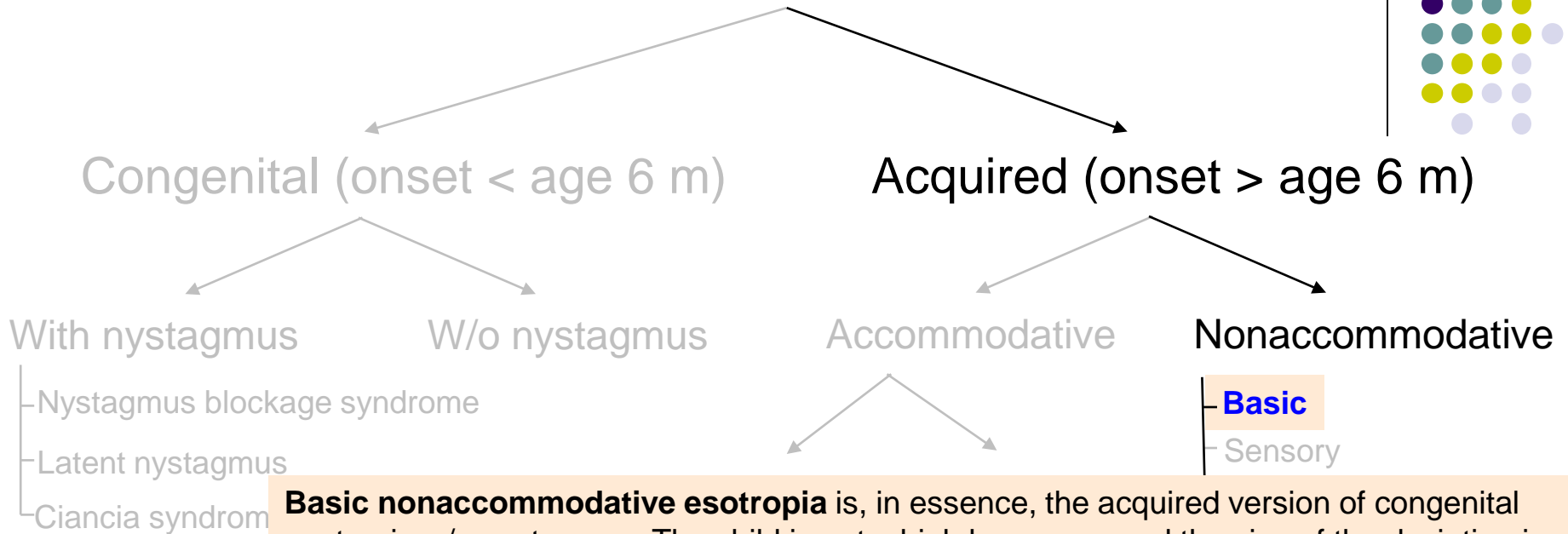
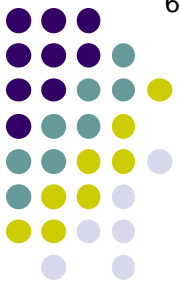


Comitant Esotropia

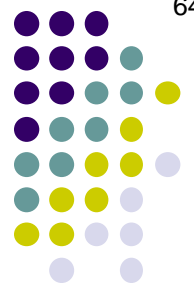


Basic nonaccommodative esotropia is, in essence, the acquired version of congenital esotropia w/o nystagmus: The child is not a high hyperope, and the size of the deviation is similar distance and near.

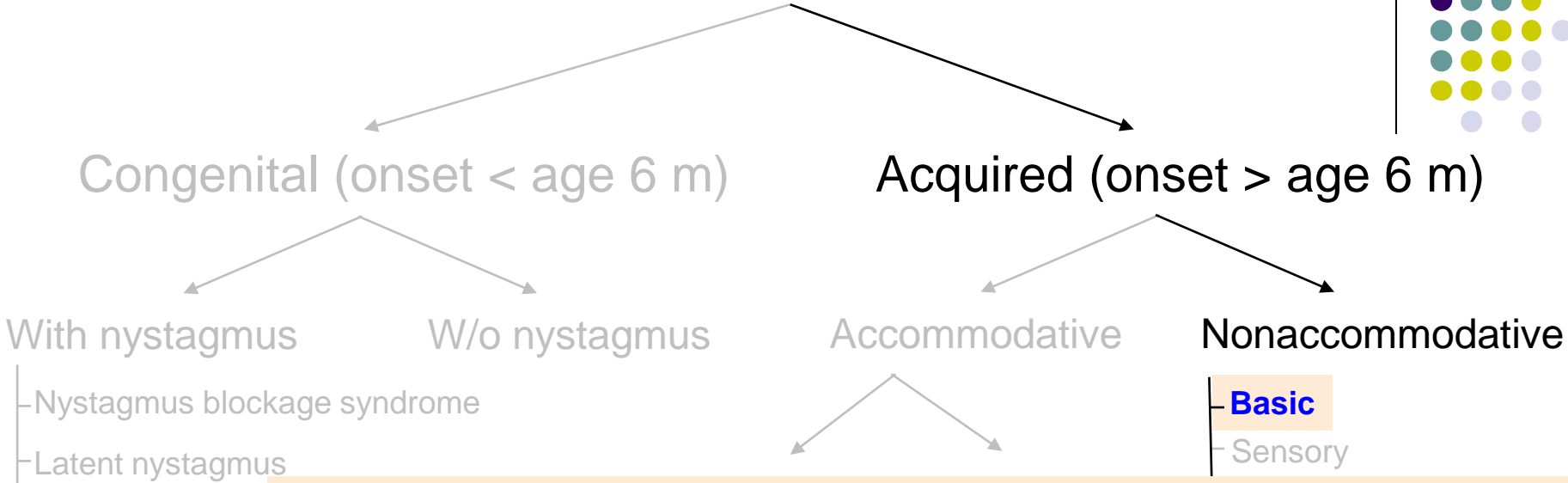
Comitant Esotropia



Basic nonaccommodative esotropia is, in essence, the acquired version of congenital esotropia w/o nystagmus: The child is not a high hyperope, and the size of the deviation is similar distance and near. Management consists of patching (if needed, to sweeten up VA if amblyopia has set in), followed by surgical intervention for the full prism-adapted deviation.



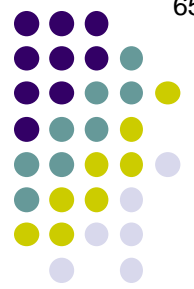
Comitant Esotropia



Prism adaptation is a process in which the pt is prescribed the full prism needed to nullify their ET, then re-evaluated periodically to determine whether additional ET has been 'uncovered.' If it has, the prescription is updated to nullify the additional ET.

Basic nonaccommodative esotropia is, in essence, the acquired version of congenital. The size of the deviation is needed, to sweeten up VA if prism-adapted deviation.

Comitant Esotropia



Congenital (onset < age 6 m)

Acquired (onset > age 6 m)

With nystagmus

W/o nystagmus

Accommodative

Nonaccommodative

-Nystagmus blockage syndrome

-Latent nystagmus

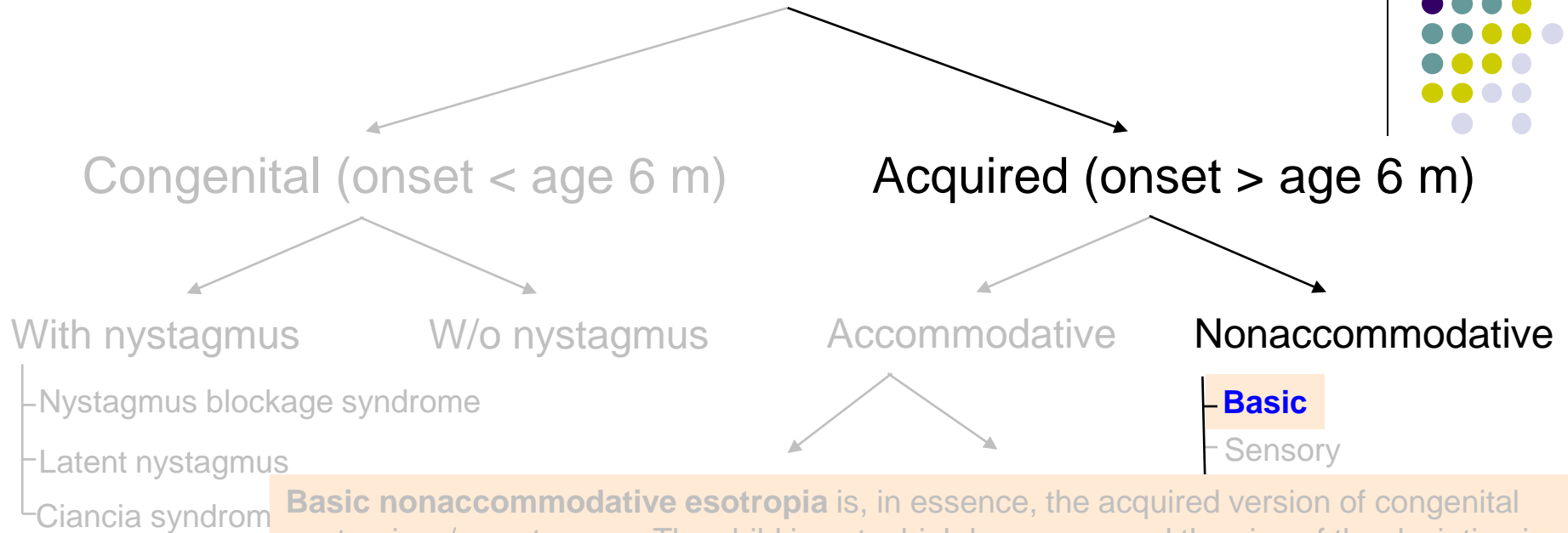
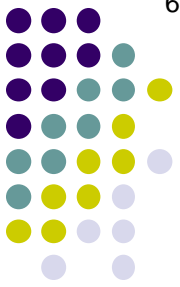
-Basic

-Sensory

Prism adaptation is a process in which the pt is prescribed the full prism needed to nullify their ET, then re-evaluated periodically to determine whether additional ET has been 'uncovered.' If it has, the prescription is updated to nullify the additional ET. This is repeated until the prism prescription is stable, at which time surgery is performed to correct the full final prism prescription.

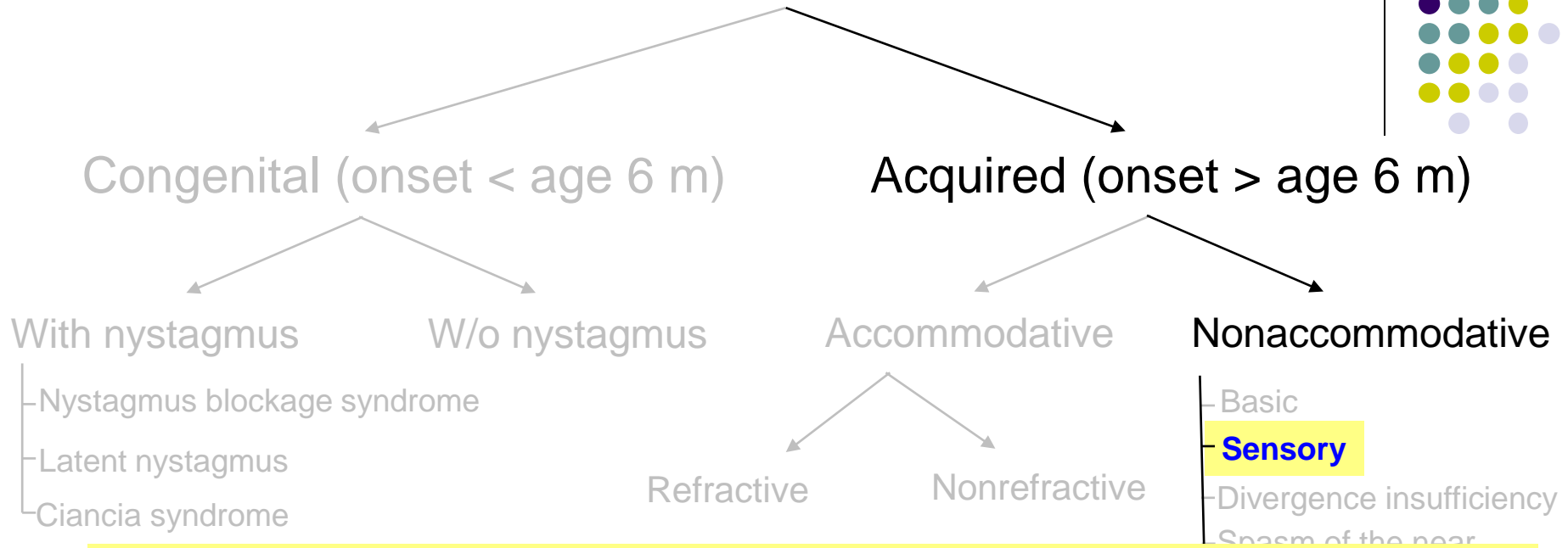
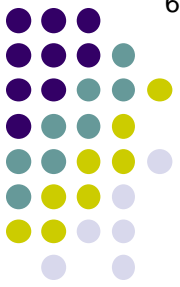
prism-adapted deviation.

Comitant Esotropia



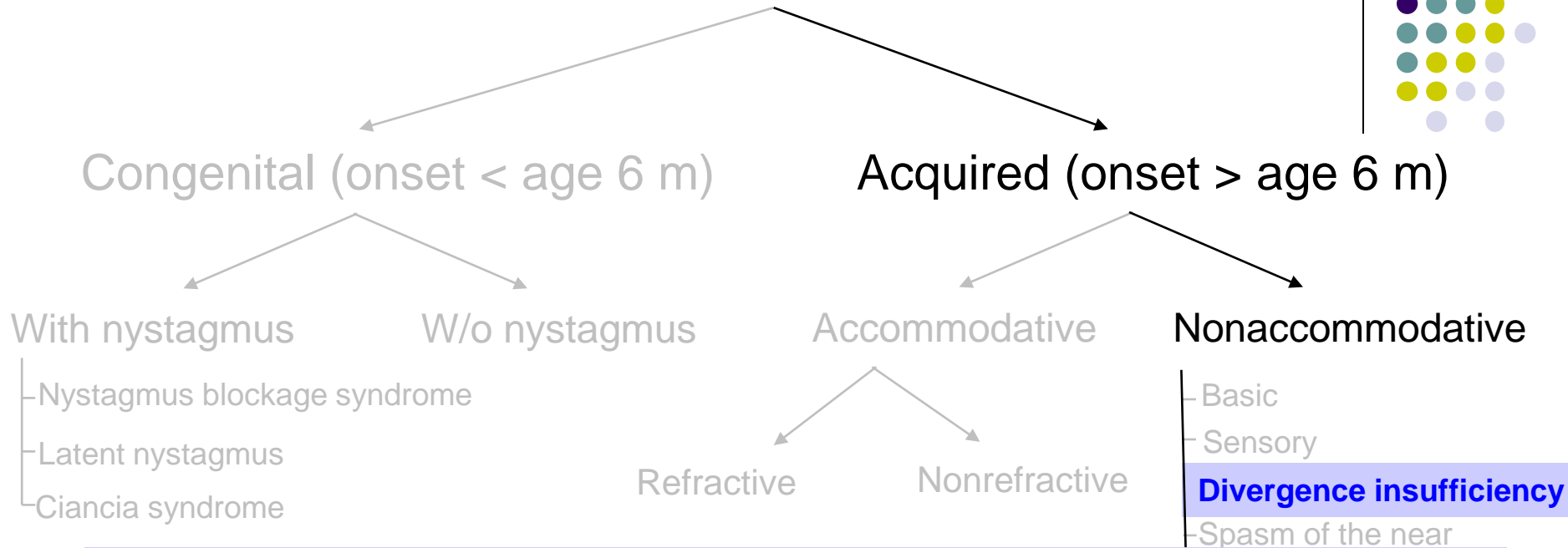
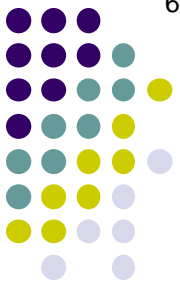
Basic nonaccommodative esotropia is, in essence, the acquired version of congenital esotropia w/o nystagmus: The child is not a high hyperope, and the size of the deviation is similar distance and near. Management consists of patching (if needed, to sweeten up VA if amblyopia has set in), followed by surgical intervention for the full prism-adapted deviation. If there is anything hinky about the presentation (eg, any neuro signs/symptoms; face turn; c/o HA), imaging should be obtained.

Comitant Esotropia



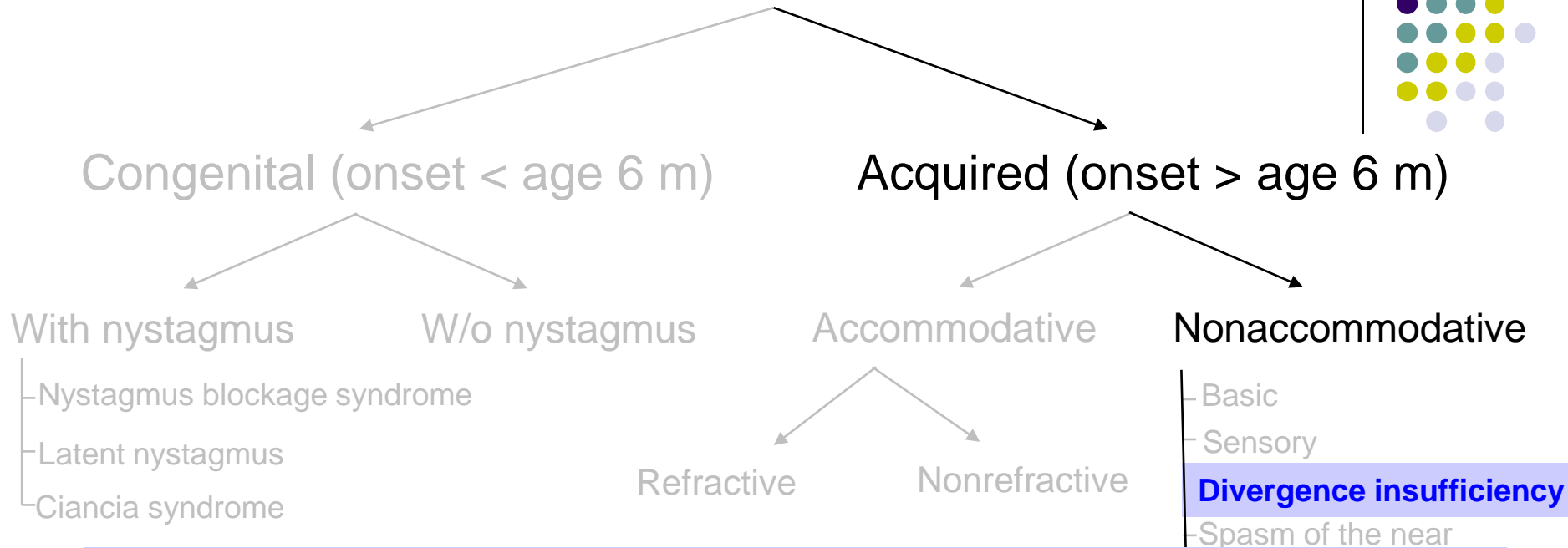
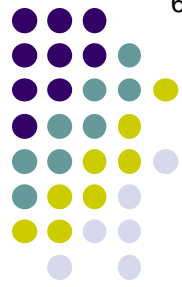
Sensory (aka *deprivational*) **nonaccommodative esotropia** develops in response to monocular vision loss. Common causes include cataracts, corneal clouding, and retinal or optic nerve disorders. The lack of symmetric visual stimulation leads to amblyopia, followed by a breakdown in fusion.

Comitant Esotropia



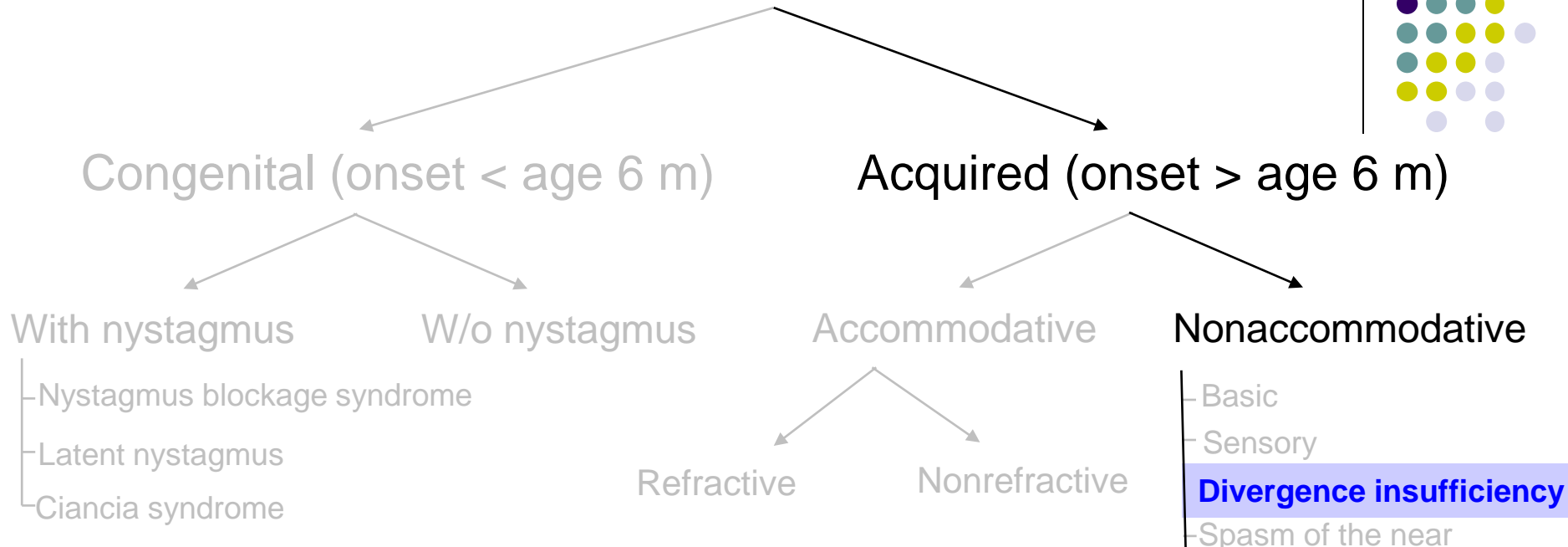
Earlier in this slide-set we mentioned supranuclear divergence inputs that prevent overconvergence. In **divergence insufficiency**, a lack of robustness on the part of these inputs allows the eyes to turn in a bit, resulting in a modest esotropia.

Comitant Esotropia



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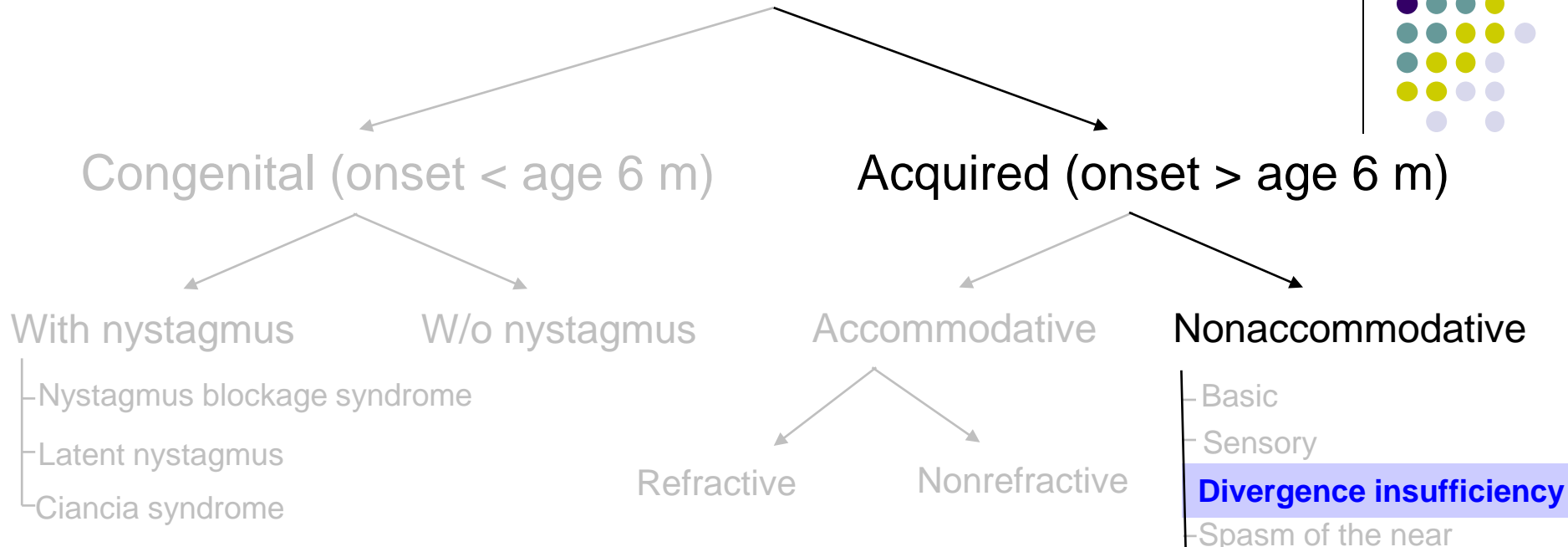
Note that these conditions can be differentiated on the basis of the relative magnitude of the esotropia as a function of whether it is measured at distance vs near:

Accommodative refractive esotropia: $ET \approx ET'$

Accommodative nonrefractive (high AC/A ratio) esotropia: $ET < ET'$

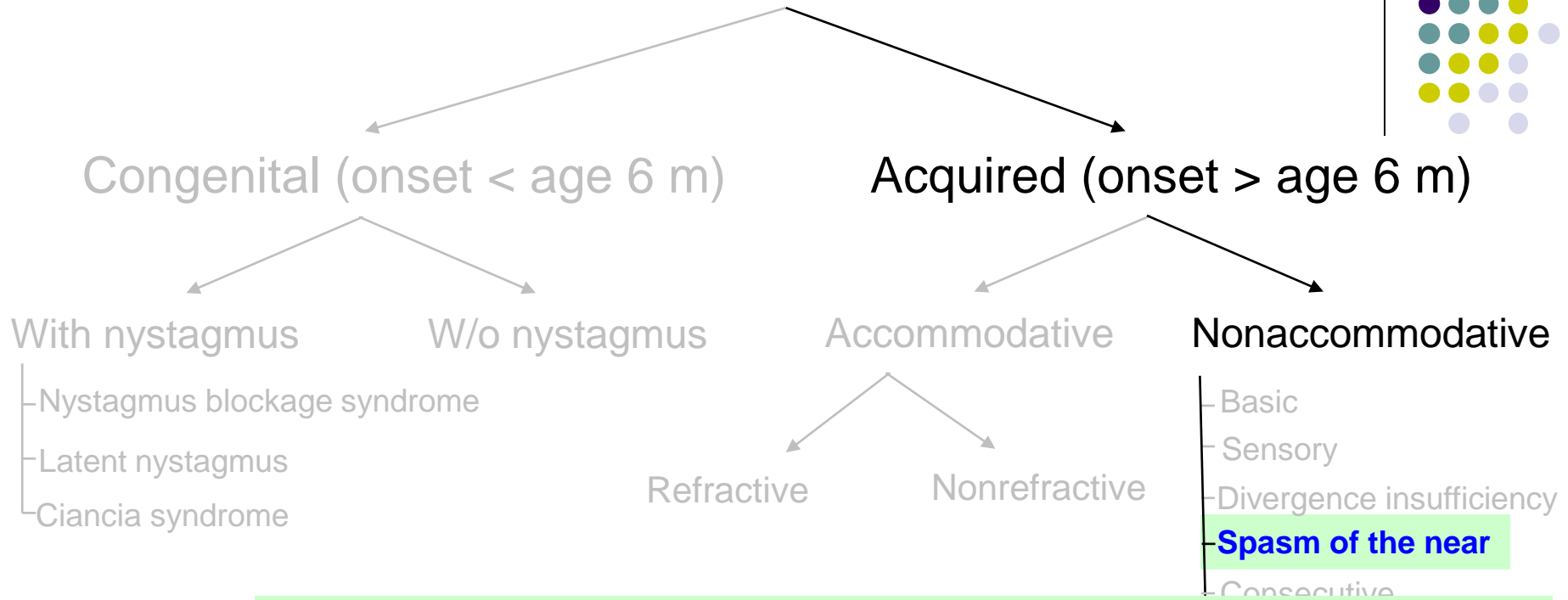
Divergence insufficiency: $ET > ET'$

Comitant Esotropia



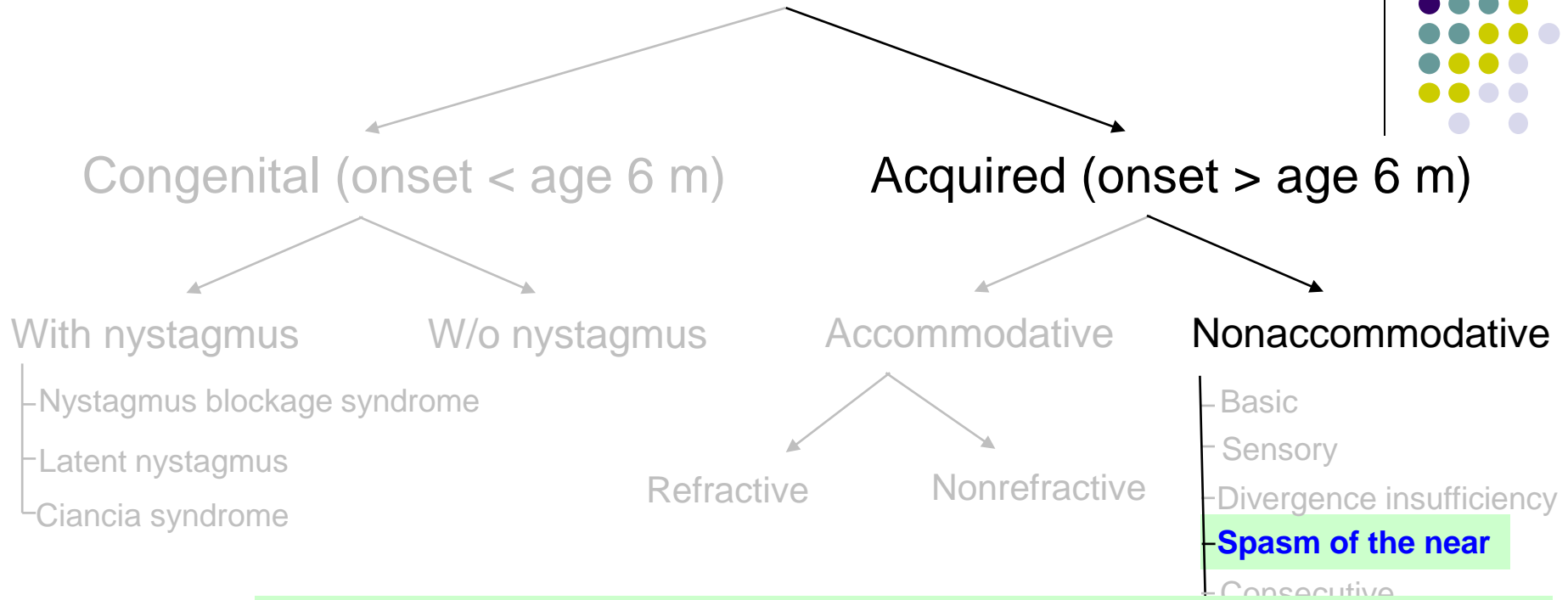
Earlier in this slide-set we mentioned supranuclear divergence inputs that prevent overconvergence. In **divergence insufficiency**, a lack of robustness on the part of these inputs allows the eyes to turn in a bit, resulting in a modest esotropia. The classic presentation is that of an esotropia that is present at distance, but not at near. The most common form of this develops in older individuals—hence its alternative name, *age-related distance esotropia*. In some pts, imaging reveals age-related structural changes to the EOMs or orbital ligamentous support structures. Prisms, Botox injection, and surgery have all proven safe and effective interventions.

Comitant Esotropia



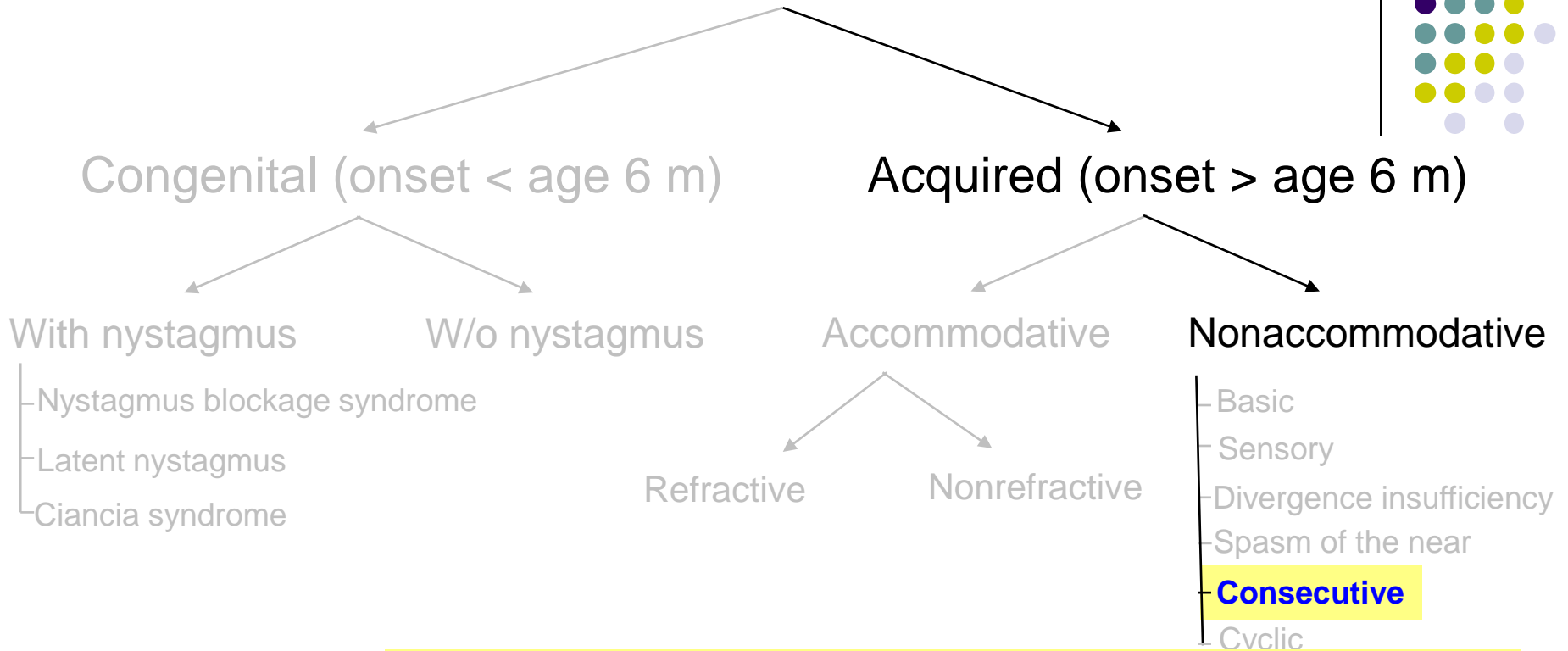
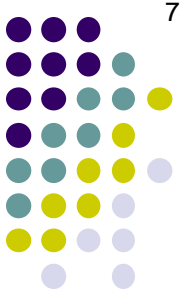
Spasm of the near (aka *convergence spasm*) is almost always a functional response to psychosocial stressors. All three components of the near triad (convergence, miosis and accommodation) can usually be demonstrated. The esotropia may alternate with periods of orthotropia. Abduction will be poor or absent when the eyes are tested simultaneously, but full when tested monocularly.

Comitant Esotropia

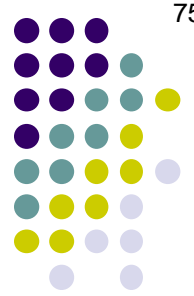


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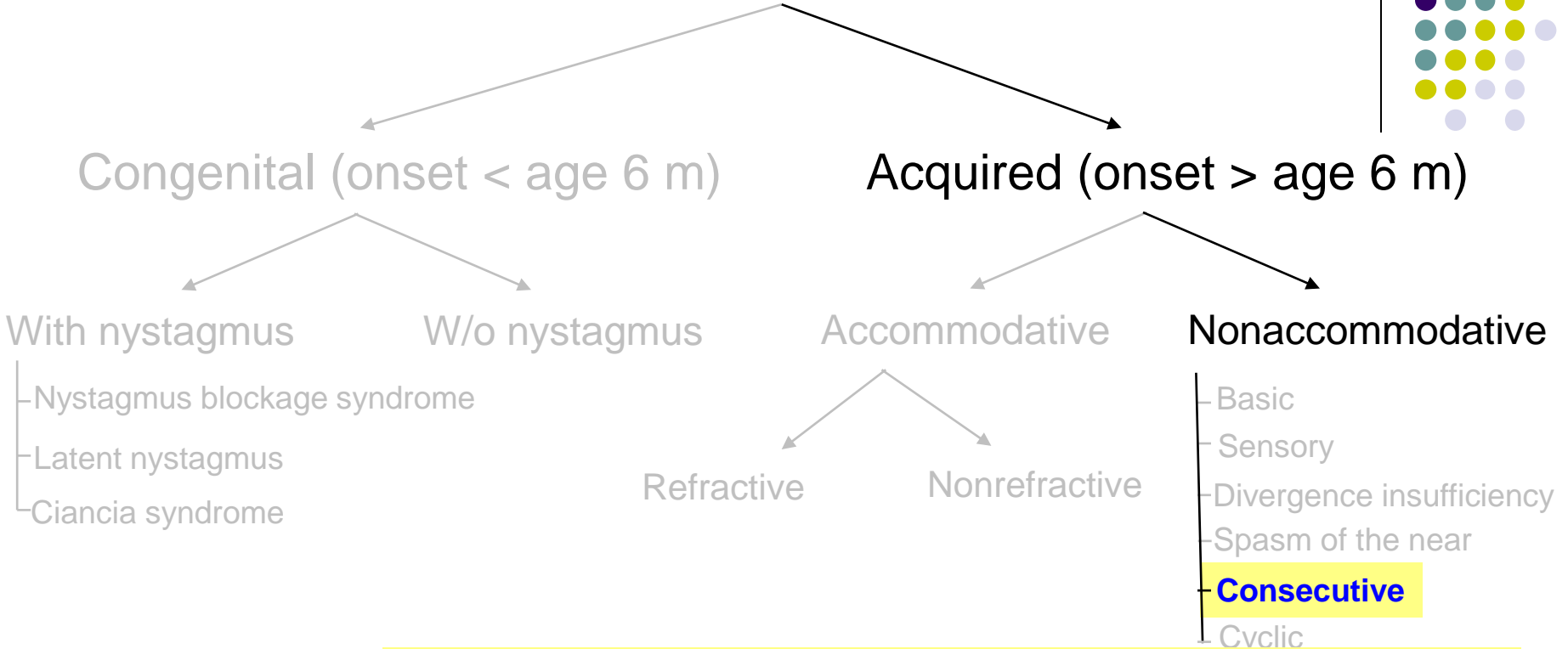
Comitant Esotropia



Consecutive esotropia refers to esotropia that develops in someone with a history of exotropia. In almost all cases, consecutive esotropia is post-surgical, ie, it represents an apparent overcorrection in someone who underwent strab surgery for exotropia.

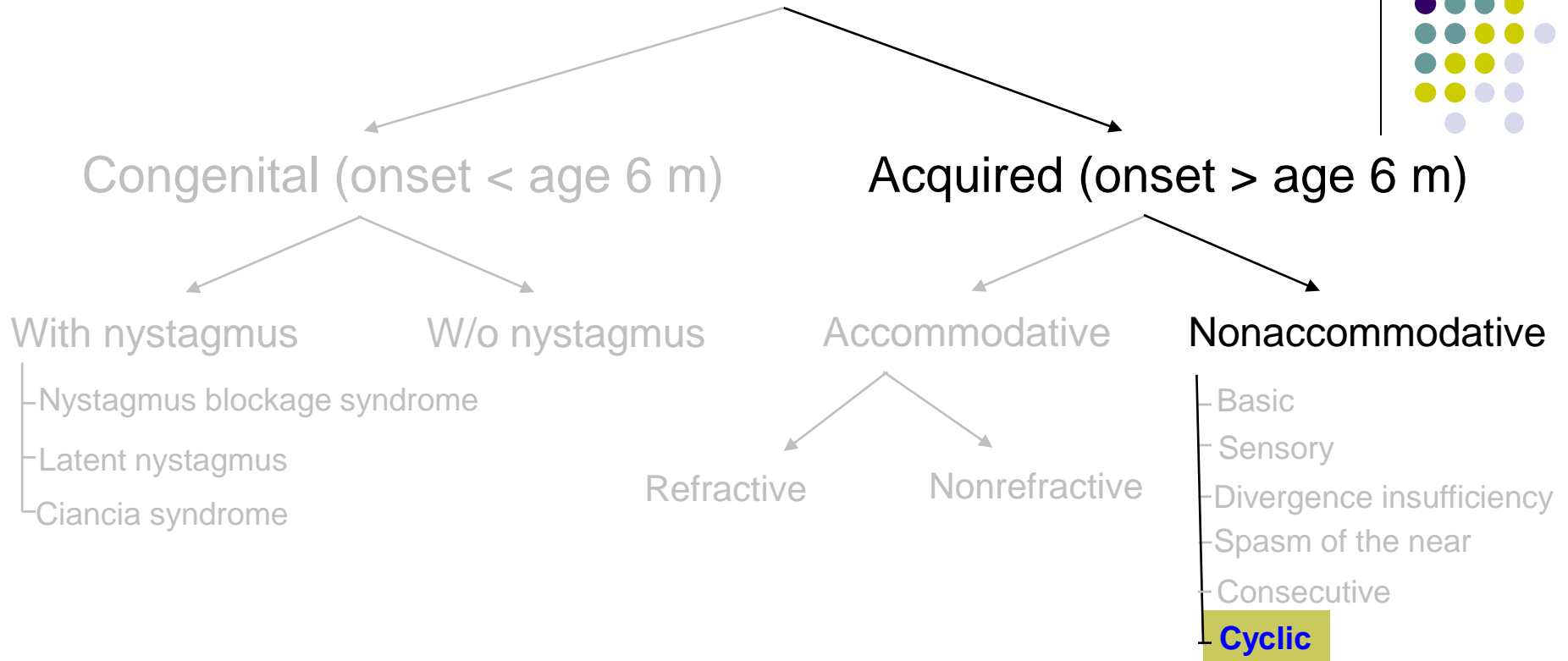


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Consecutive esotropia refers to esotropia that develops in someone with a history of exotropia. In almost all cases, consecutive esotropia is post-surgical, ie, it represents an apparent overcorrection in someone who underwent strab surgery for exotropia. That said, consecutive esotropia often resolves spontaneously, so unless it is very large (in which case it likely represents a slipped/lost muscle), observation is usually the preferred management option.

Comitant Esotropia



Cyclic esotropia is a rare disorder in which a comitant ET is present intermittently, usually every other day. The typical pt is pre-school age. Surgical correction of the maximum observed ET is the treatment of choice.