Welcome to your third and final portion of your intro to OCMM. In this lecture we'll be talking about motion of the PRM.
This is a very abstract and challenging concept so again remember that this is just an introduction and a lot of this will be better understood with time, playing with bones, palpating living beings in lab. So just for now, try to understand some of the terminology and begin to process some of these motions, but they will really become more clear as you use models in the lab and palpate your partners.

OBJECTIVES

- Describe how PRM influences inhalation/exhalation, flexion/extension, internal/external rotation, and how these are interrelated.
- Describe the physiologic PRM phasic motion of the sphenoid and occiput in a "freely mobile" cranium. This includes:
  - *Location and orientation of physiologic PRM axes of motion*
  - *Sphenobasilar Synchondrosis (SBS) PRM motion description*
  - *Vault contact palpatory "air head" perception of the sphenoid greater wings and occipital angles undergoing the physiologic phases of the PRM*

This will make more sense in lab
We will teach you how to use your air head made with your hands in lab to help understand these motions.

BONES WITH PRM MOTION

- Midline
  - Sphenoid
  - Occiput
  - Ethmoid (median plate)
  - Vomer
  - Sacrum

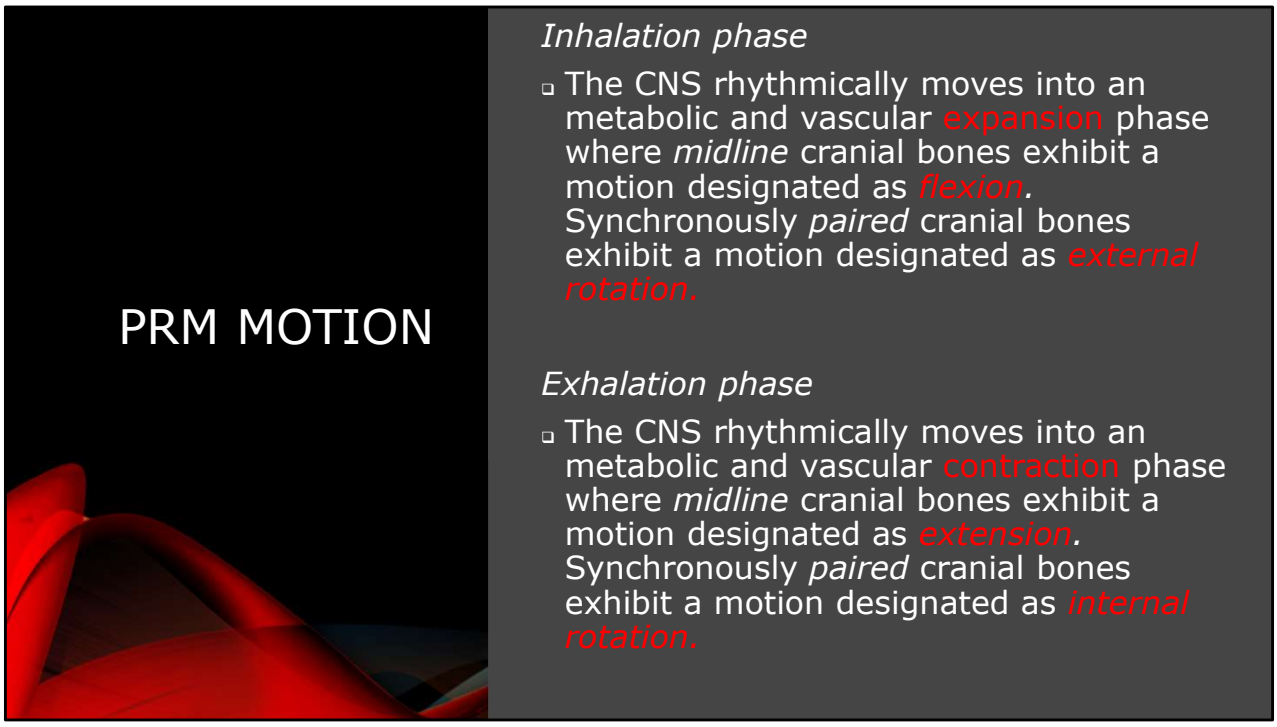
- Paired
  - Ethmoid (lateral masses)
  - Frontals
  - Inferior conchae
  - Lacrimals
  - Maxillae
  - Nasals
  - Palatines
  - Parietals
  - Temporals
  - Zygomae

The bones that we're talking about – two ways of thinking about them. Midlines and paired bones.

Midline bones include:
Paired bones include: remember 2 frontals at birth

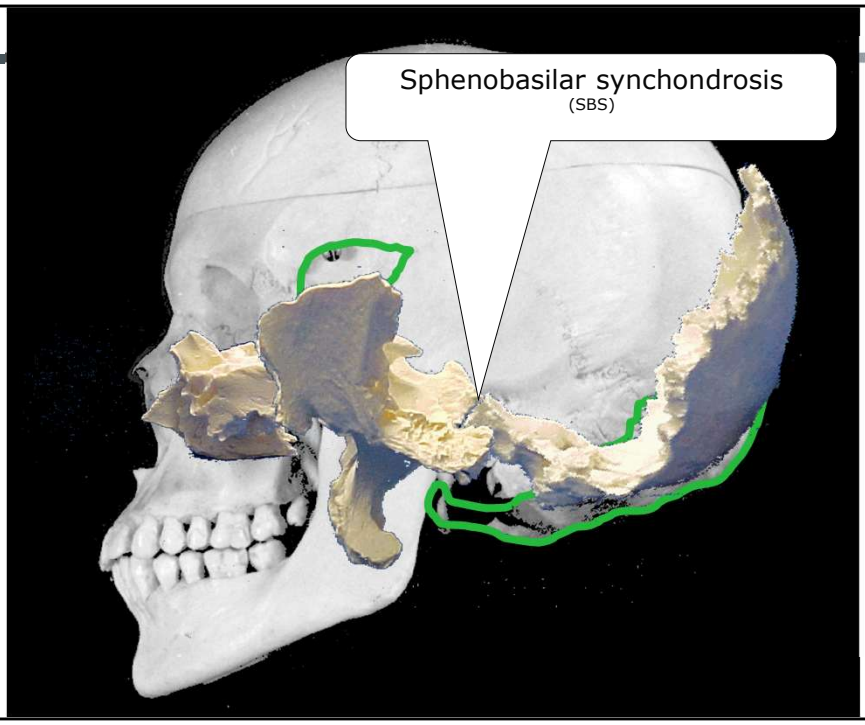
This bone here is the ethmoid bone. The median plate is right down the middle here and the lateral masses extend out on either side. This bone is special because it does have two different types of motion within one bone.

ethmoid has midline and paired motion

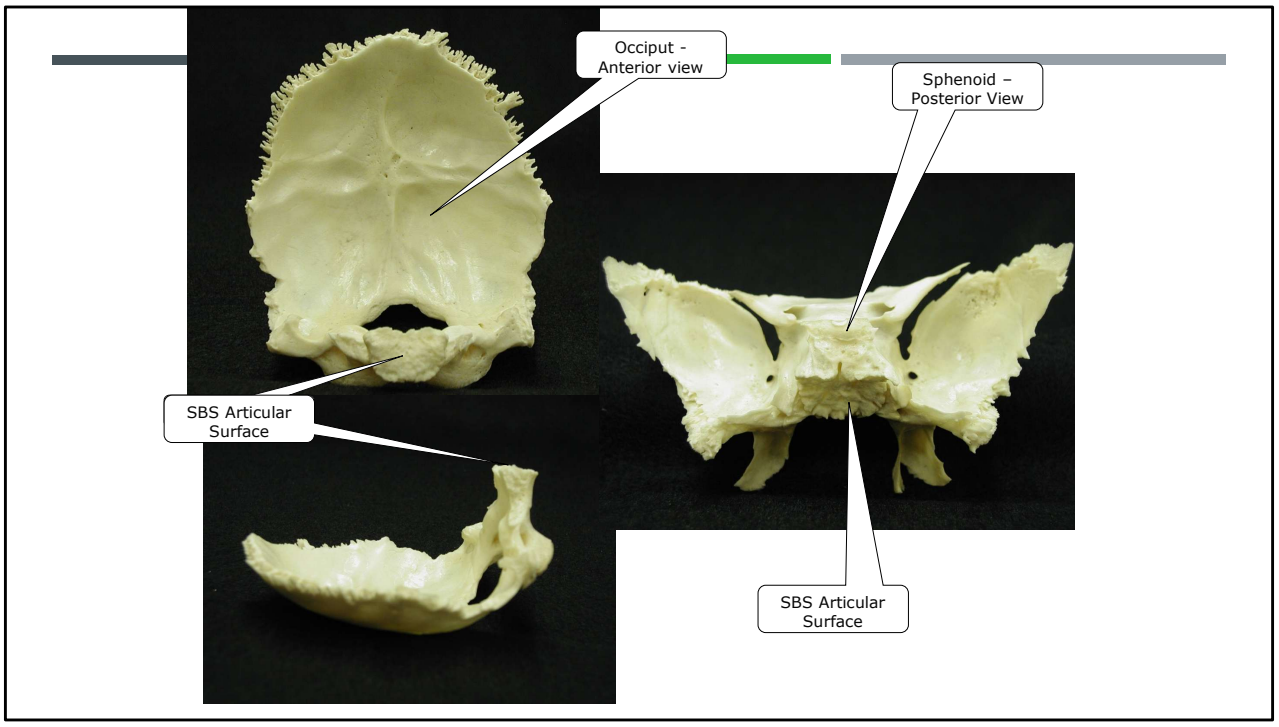


Do not get caught up on this terminology because there will be different variations of this slide throughout the powerpoint several times
This is to begin to introduce you to the terminology and get you to link the changes/motions that are happening

Talking about the inhalation phase – referring to PRM not thoracic inhalation so make sure to separate and understand this. During CNS inhalation phase…
We will be talking more in depth about what each of these means throughout this lecture but also in lab with palpatory experiences.

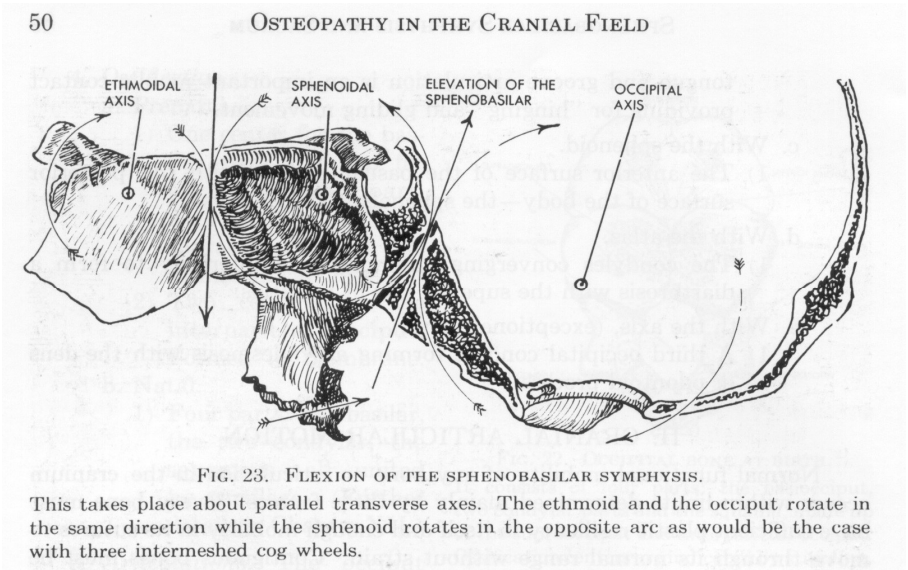


Two of your major midline bones are sphenoid and occiput.
Sphenoid is the anterior bone and occiput posterior
Can see ethmoid in place as well
Junction between then is SBS to orient where it is in the skull



We have already gone over these bones in the landmark lecture so review those as needed.
You will be getting more detail on sphenoid bone later on as well, but this is our sphenoid bone on the right.
You can see from the posterior view of it you can see the SBS articular surface which articulates with the anterior surface of the basilar portion of the occipital bone.

Cranial Midline Bone Respective Motion in the Primary Respiratory Mechanism - *Flexion*

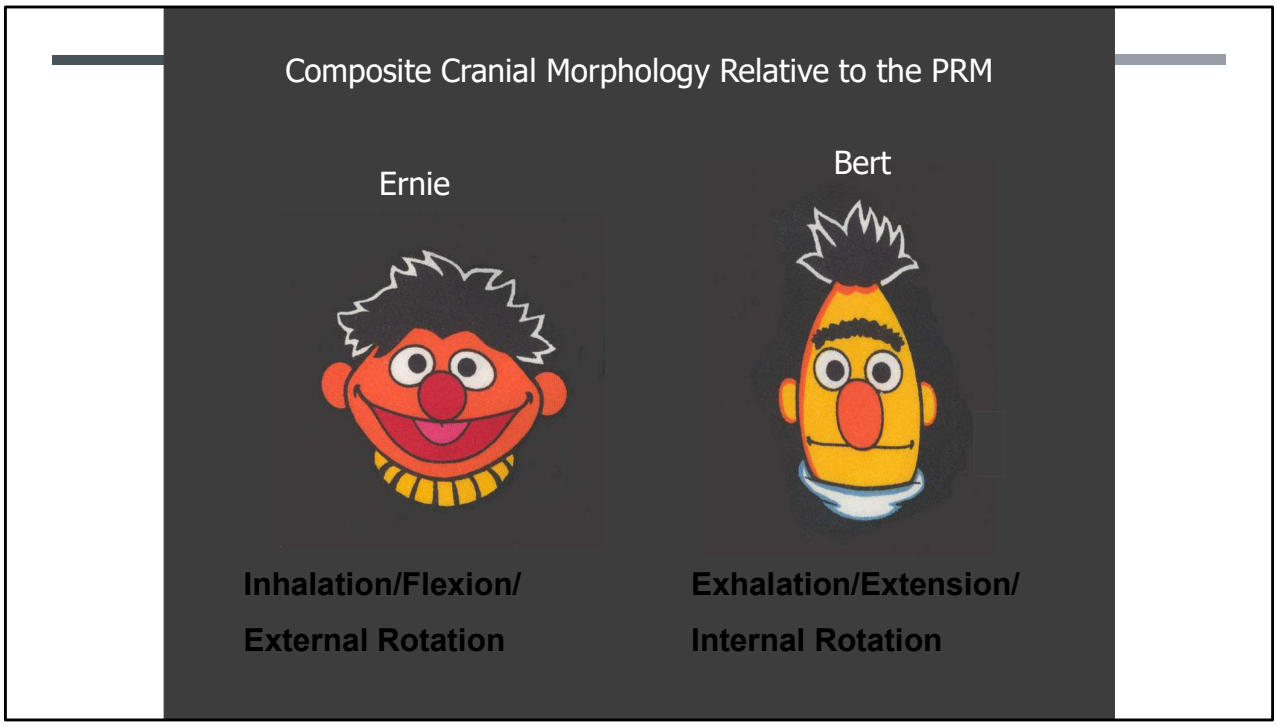


So what do we mean when we're talking about flexion and extension.
Here's ethmoid, sphenoid, and occiput.
This is the SBS – sphenobasilar synchondrosis right here.
There are two transverse axes – one through the body of the sphenoid (coming in and out of your computer screen) and the other is not through bone but through space within occipital bone
Motion is occurring about these axes
So when SBS is moving into flexion (videos coming) is that the SBS will rise and move slightly posteriorly.
The occiput will move in a clockwise rotation around the occipital transverse axis and the sphenoid will be moving counterclockwise about the sphenoid transverse axis.
This is much easier to understand with a video, palpatory experience, and bony models in your hands.

CRANIAL FLEXION AND EXTENSION

https://www.youtube.com/watch?v=LRaYKy58VRw

This is a video I found on YouTube that demonstrates this motion.
We will show some of it here, but feel free to watch it on your own and review it several times to help you comprehend it.
You can see with flexion – sphenoid moving in counterclockwise direction and occiput moving clockwise and vice versa with extension.
Now looking at this from a lateral view – flexion – rising and moving posteriorly vs extension falling and moving anteriorly.
Now bringing hands in – second digit on greater wings and fifth digits on lateral angles of occiput so as these motions are occurring you can see what is happening with your hands.
With flexion – feel a pull inferiorly towards patient's feet and widening of your fingers and with extension feel superior motion and narrowing of your fingers. The narrowing or widening of your fingers – this happens because of motion of the paired bones into external rotation and internal rotation. The widening that happens with flexion is the external rotation of the paired bones and narrowing is the internal rotation that is happening with paired bones when midline bones are in extension.



This is the joke in the osteopathic world. As you look around you can see different 'ernie and bert" heads representing relative inhaled or flexed heads vs relatively exhaled or extended heads.
As you walk around now you may begin to observe these – the same way that last year you started looking at people's posture or gaits differently after starting in OPP lab.

PRM MOTIONS

Inhalation phase: Present through CNS rhythmic expansion and uncoiling motility - the PRM integrates to manifest a *flexion* phase of midline bones and *external rotation* of paired bones. As an anatomical reference, the SBS (sphenobasilar synchondrosis) rises in a superior and slightly posterior direction

Exhalation phase: Present through CNS rhythmic contraction and coiling motility - the PRM integrates to manifest a *extension* phase of midline bones and *internal rotation* of paired bones. As an anatomical reference, the SBS (sphenobasilar synchondrosis) falls in an inferior and slightly anterior direction

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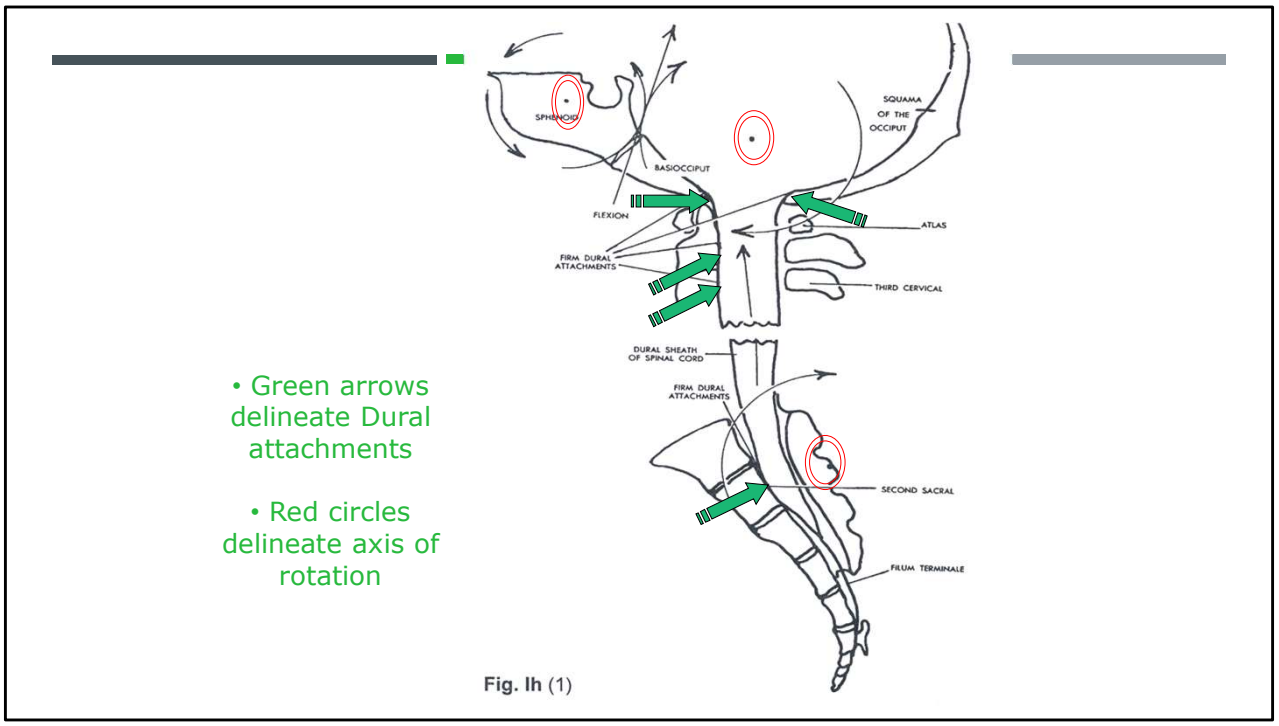
Similar slide to earlier but slightly different wording to help you continue linking these different phases/motions together.
The uncoiling/coiling – thinking about the ventricles or parenchyma of the brain looking like a ram's horn – that is where this imagery comes from.



This is another way at looking at these motions and pulling in the core link or dural attachments of the intracranial membranes to the intraspinal membranes down to sacrum.
Wherever a green arrow is a dural attachment.
Red circles represent axes of rotation – sphenoid, occiput, sacrum
With flexion – sphenoid moves counterclockwise and occiput moving into clockwise direction and because of their dural connections and the SBS rises, you'll get a simultaneous pull on the sacrum and it will move into its flexion which is a movement of the base posteriorly and superiorly so it almost looks more like what you thought of last year as extension from a postural mindset. Make sure to differentiate these and understand the difference between the motions you learned last year. Remember they occur about different axes and different mechanisms.

****talk about extension and what's happening there and add in terms nutation and counternutation

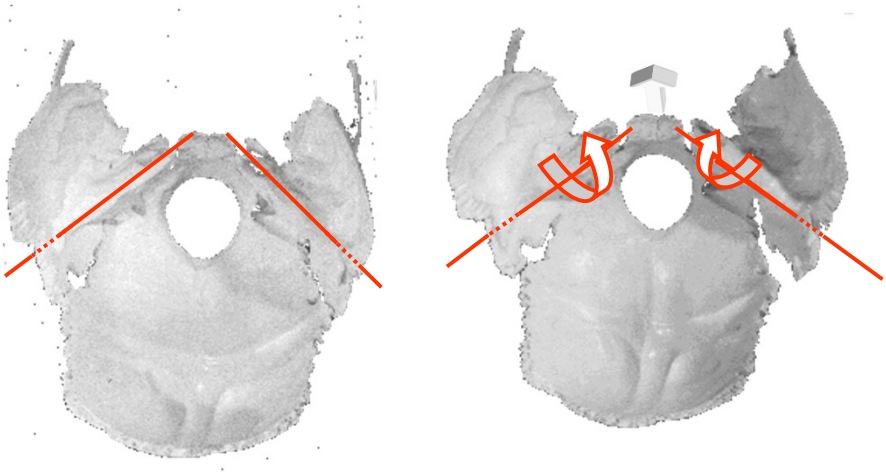
PRIMARY RESPIRATORY MECHANISM
PAIRED BONE MOTION

External Rotation: Physiologic motion of the paired bones as the SBS *rises,* corresponding to the *inhalation phase* of the primary respiratory mechanism.

Internal Rotation: Physiologic motion of the paired bones as the SBS *falls*, corresponding to the *exhalation phase* of the primary respiratory mechanism.

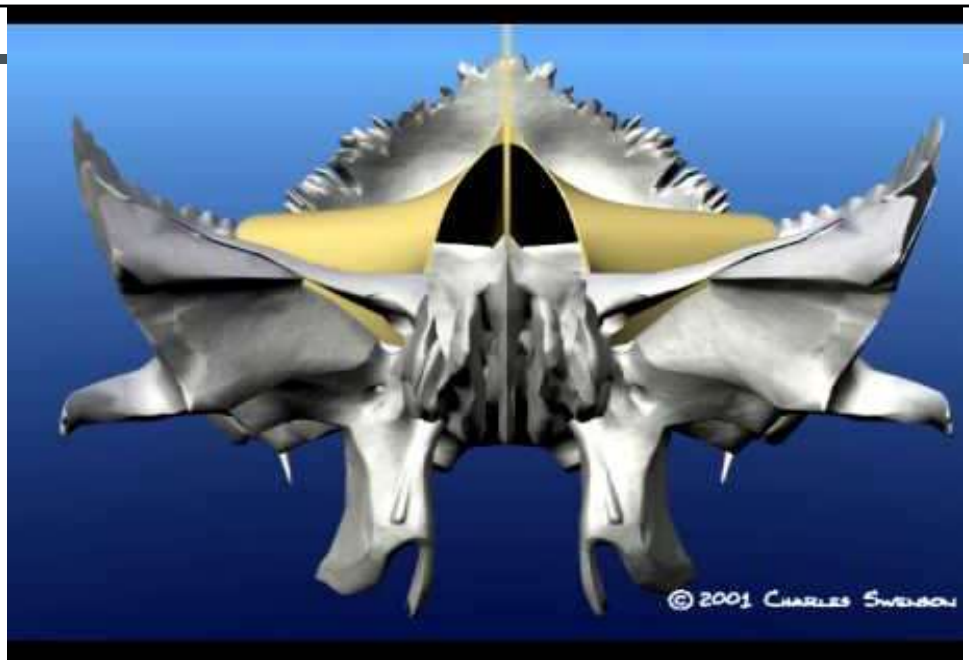
One more time revisiting this terminology.

TEMPORAL BONE MOTION



Looking at paired bones, we'll get into a lot of different axes of motion and specific motions for the paired bones in additional lectures and in labs as we're diagnosing and treating some of these bones, but to introduce these concepts let's start with the temporal bone.

Paired bones moving into internal and external rotation. The axis of rotation for the temporal bone is along the petrous portion of the temporal bone – the thick bony ridge. We have separate air hands for temporal bones. Axis of motion is along 4th digit if hands out in front of you and the move into internal and external rotation about that.

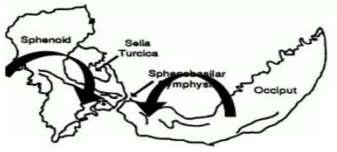


https://www.youtube.com/watch?v=J2oVjn2ALLE

This is another video of cranial motion with paired bones in place so you can see it as well.
You have sphenoid, occiput, and temporal bones in place
As move into flexion you get widening
Yellow is dura – so you can see how it moves and changes with these flexion and extension motions
When take away the temporal bone – looking at the SBS and the dural attachments – only showing intracranial membranes but remembering that these attach to intraspinal membranes down to sacrum
Flexion – rise of the SBS and paired bones moving into external rotation and extension – fall of the SBS and paired bones moving into internal rotation

SUMMARY OF PRM MOTIONS

- Exhalation
  - Midline bones move into extension
    - Sacrum into nutation (base moves anteriorly)
  - Paired bones move into internal rotation
  - Represents a contraction of the CNS



Extension

- Inhalation
  - Midline bones move into flexion
    - Sacrum into counternutation (base moves posteriorly)
  - Paired bones move into external rotation
  - Represents expansion of the CNS


Flexion

This is a summary

ACKNOWLEDGMENTS

- Special thanks to R. Mitchell Hiserote for assistance with slides and images