

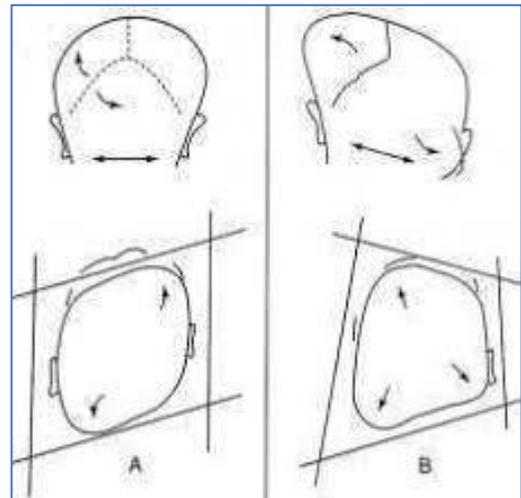
## Flat Heads in Babies

### Positional Plagiocephaly vs. Lambdoidal Synostosis

In 1992, the American Academy of Pediatrics recommended that infants should sleep on their backs to reduce the risk of SIDS (sudden infant death syndrome). This launched the "Back to Sleep Campaign" and a dramatic increase in the number of children presenting with positional plagiocephaly. Positional plagiocephaly can be confused with lambdoidal synostosis, which also causes flattening of the back of the head. Referrals for positional plagiocephaly and "rule-out craniosynostosis" are one of the most common referrals to a pediatric neurosurgeon or craniofacial plastic surgeon.

### Clinical Presentation of Positional Plagiocephaly vs. Lambdoidal Synostosis

Positional plagiocephaly can typically be diagnosed by an experienced practitioner with a thorough history and clinical exam without the need for X-rays or other imaging, such as CT<sup>1, 3</sup>. Infants with positional plagiocephaly typically have a normal head shape at birth. A small number of infants may have positional plagiocephaly at birth, typically caused by position in the womb, and it usually resolves itself by 6 weeks of age. In most cases of positional plagiocephaly, the flattening is a result of some infants' preference for sleeping on their backs with their heads turned consistently in the same position. Positional plagiocephaly is frequently found in infants with torticollis as they have difficulty turning their heads. The flat area may develop very quickly over several months, typically between 2 and 6 months of age, and typically is the most severe at about 4-5 months of age, before the child has started rolling consistently and is no longer sleeping on his or her back. The characteristic parallelogram head shape of positional plagiocephaly is easily identified. There is anterior displacement of the ipsilateral ear and ipsilateral frontal bossing. When looking at the infant's head from behind, the ears will appear level<sup>3</sup> (Figure 1A).



**Figure (1A)** Right positional plagiocephaly. Note the anterior displacement of the right ear with ipsilateral frontal bossing. The ears are level in the vertical plane.

**Figure (1B)** Right lambdoidal craniosynostosis. Note the inferior displacement of the right ear and contralateral parietal and frontal bossing. (Used by permission, Peter Sun, MD.)

Lambdoidal synostosis results from premature closure of the lambdoidal suture, in contrast to positional plagiocephaly, where all the cranial sutures are open<sup>4</sup>. The lambdoid suture runs bilaterally from the posterior fontanelle to the asterion, which is located just behind the ear. This is the least common type of craniosynostosis, representing less than 5% of all types of single-suture craniosynostoses<sup>5</sup>. While typically unilateral, bilateral lambdoidal synostosis can occur as well, causing bilateral occipital flattening. In contrast to positional plagiocephaly, the head shape is usually not normal at birth and gets progressively worse over time. In unilateral

lambdoidal synostosis, the affected side of the cranium is typically flat posteriorly, with inferior and posterior displacement of the ipsilateral ear and mastoid bone accompanied by bulging of the contralateral parietal region and frontal region resulting in a trapezoidal shape of the head<sup>3,5</sup> (Figure 1B).

## Treatment of Positional Plagiocephaly vs. Lambdoidal Synostosis

Positional Plagiocephaly: The risk of positional plagiocephaly can be reduced through a few simple measures<sup>4</sup>:

- Encourage plenty of supervised playtime on the baby's tummy. This helps build and strengthen neck, shoulder and arm muscles.
- Encourage parents to change the direction in which the baby is lying in the crib on a regular basis to ensure the baby is not always resting on the same part of the head.
- Encourage parents to change the location of the baby's crib in the room so that the baby must look in different directions to see the door or the window.
- Encourage parents to avoid having the baby spend too much time in car seats, carriers and bouncers while the baby is awake.

Once a child is able to roll and sit independently, the deformity typically begins to improve. Although it may not resolve completely, the remaining flattening is usually minor and covered with hair as the child grows. The frontal differences are often minimal and tend to resolve completely over time.

If the problem fails to resolve as the child develops, the parents or guardians will be given a referral to see a specialist, such as a pediatric neurosurgeon or craniofacial plastic surgeon. The specialist will review the infant's history, perform a thorough evaluation and discuss a treatment program, which may involve a positional molding helmet or band therapy<sup>2,6</sup>. Helmet therapy is typically most effective when done before 6-9 months of age because the bone of the skull is thin and responsive to external forces. Rapid head growth at this age also enhances the effectiveness of the helmet. After 1 year of age, helmet therapy is much less effective due to the thickness of the skull and the slowing of head growth<sup>6</sup>.

Lambdoidal synostosis is treated surgically by a specialized team of craniofacial plastic surgeons and pediatric neurosurgeons. Both open and minimally invasive or endoscopic techniques have been described<sup>5</sup>. Endoscopic surgery is typically done prior to 3 months of age and is followed by a course of helmet therapy. Many open surgical techniques have been described for correction of lambdoidal synostosis depending on the severity of the deformity. Open surgery is typically done around 6-9 months of age.

## Resources for Families

- [www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Positional-Plagiocephaly](http://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Positional-Plagiocephaly)
- [www.healthychildren.org/English/health-issues/conditions/Cleft-Craniofacial/Pages/Positional-Skull-Deformities-and-Torticollis.aspx](http://www.healthychildren.org/English/health-issues/conditions/Cleft-Craniofacial/Pages/Positional-Skull-Deformities-and-Torticollis.aspx)

Contact the CHLA Craniosynostosis Team for questions and more information:



**Susan Durham, MD, MS**

Chief, Division of Neurosurgery; Attending Surgeon,  
Children's Hospital Los Angeles  
Professor of Clinical Neurological Surgery,  
Keck School of Medicine of USC

**Division of Neurosurgery**

4650 Sunset Blvd. #102, Los Angeles, CA 90027  
Phone: 323-361-2169 | Fax: 323-361-3101

**CHLA.org/NEUROSURGERY**



**Mark Urata, MD, DDS**

Chief, Division of Plastic and Maxillofacial Surgery;  
Attending Surgeon, Children's Hospital Los Angeles  
Professor of Clinical Surgery; Audrey Skirball Kenis Endowed  
Chair and Chief, Division of Plastic and Reconstructive  
Surgery, Keck School of Medicine of USC  
Chair, Division of Oral and Maxillofacial Surgery, Ostrow School  
of Dentistry of USC

**Division of Plastic and Maxillofacial Surgery**

4650 Sunset Blvd. #96, Los Angeles, CA 90027  
Phone: 323-361-2169 | Fax: 323-361-3101

**CHLA.org/PlasticSurgery**

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**Referrals**

Phone: 888-631-2452 | Fax: 323-361-8988

Email: [md1@chla.usc.edu](mailto:md1@chla.usc.edu)

myCHLA Physician Portal: <https://myCHLA.CHLA.org>

## References:

1. Flannery AM, Tamber MS, Mazzola C, Klimo P Jr, Baird LC, Tyagi R, Bauer DF, Beier A, Durham S, Lin AY, McClung-Smith C, Mitchell L, Nikas D. Congress of Neurological Surgeons Systematic Review and Evidence-Based Guidelines for the Management of Patients with Positional Plagiocephaly: Executive Summary. *Neurosurgery*. Nov;79(5):623-624, 2016
2. Goh JL, Bauer DF, Durham SR, Stotland MA. Orthotic (helmet) therapy in the treatment of plagiocephaly. *Neurosurgical Focus*. Oct;35(4):E2, 2013
3. Huang MH, Gruss JS, Clarren SK, Mouradian WE, Cunningham ML, Roberts TS. The differential diagnosis of posterior plagiocephaly: true lambdoid synostosis versus positional molding. *Plast Reconstr Surg* 98:765-776, 1996
4. Klimo P Jr, Lingo PR, Baird LC, Bauer DF, Beier A, Durham S, Lin AY, McClung-Smith C, Mitchell L, Nikas D, Tamber MS, Tyagi R, Mazzola C, Flannery AM. Congress of Neurological Surgeons Systematic Review and Evidence-Based Guideline on the Management of Patients With Positional Plagiocephaly: The Role of Repositioning. Nov;79(5):E627-E629, 2016
5. Rhodes JL, Tye GW, Fearon JA: Craniosynostosis of the lambdoid suture. *Semin Plast Surg* 28:138-143, 2014
6. Tamber MS, Nikas D, Beier A, Baird LC, Bauer DF, Durham S, Klimo P Jr, Lin AY, Mazzola C, McClung-Smith C, Mitchell L, Tyagi R, Flannery AM. Congress of Neurological Surgeons Systematic Review and Evidence-Based Guideline on the Role of Cranial Molding Orthosis (Helmet) Therapy for Patients With Positional Plagiocephaly. *Neurosurgery*. Nov;79(5):E632-633, 2016