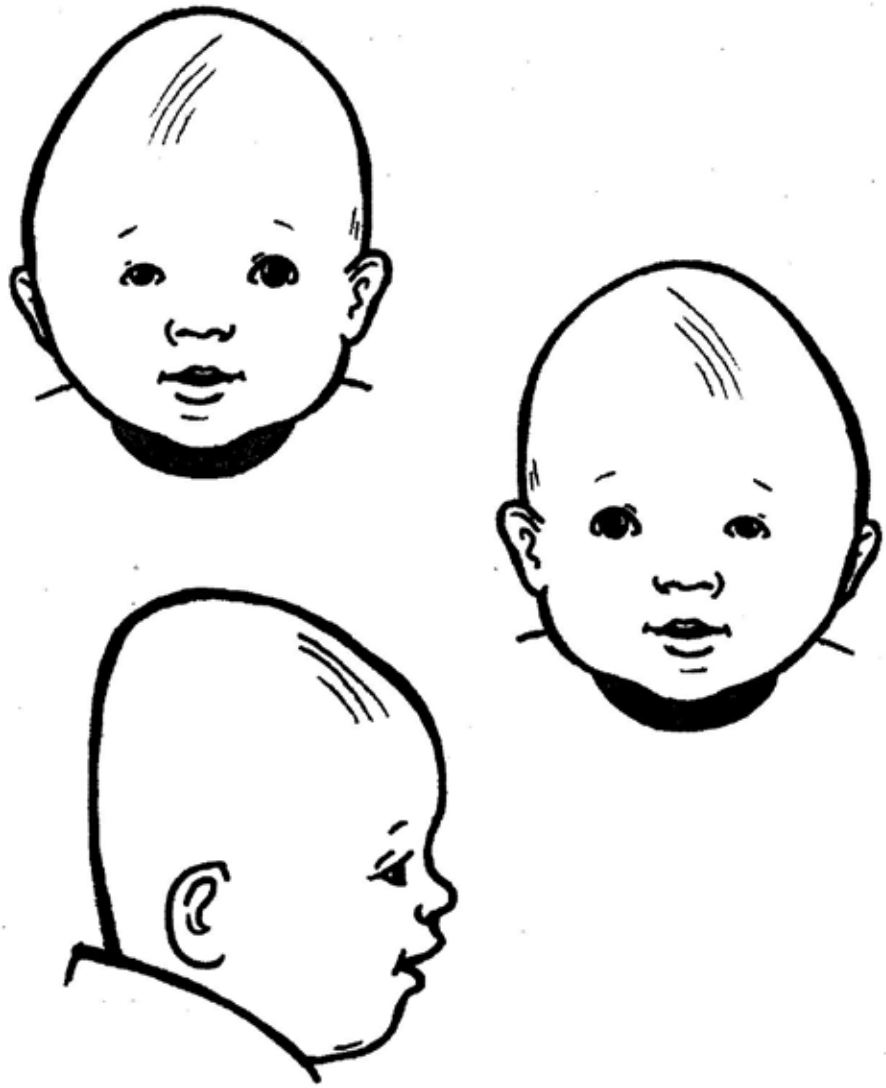
A Clinician's Guide to Positional Plagiocephaly



Everything you need to understand, prevent, identify and treat positional plagiocephaly

BC CHILDREN'S HOSPITAL
An agency of the Provincial Health Services Authority

Dear Colleagues,

Over the last decade at BC's Children's Hospital, we have seen a dramatic increase in the number of referrals and inquiries regarding positional plagiocephaly (flat heads in babies). This is consistent with reports from other paediatric centres, and is thought to be linked with infant positioning to prevent SIDS. Positional plagiocephaly is not thought to be associated with developmental delays or other medical issues, but the effect on cosmetic appearance can cause significant parental concern.

Fortunately, positional plagiocephaly is both preventable and treatable with simple caregiving measures, however, early education and treatment is critical.

This booklet has been written for all health care professionals who see newborns and infants in their practice. It contains information to help you:

- understand and detect plagiocephaly
- distinguish positional plagiocephaly from other anomalies requiring further investigation
- provide preventative caregiver education
- initiate treatment and provide referrals as necessary

We hope you find this information useful. Please contact us if you have comments.

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Table of Contents:

What is Positional Plagiocephaly?

Positional plagiocephaly is a deformation of the skull produced by extrinsic forces acting on an intrinsically normal skull. The greatest amount of deformation usually occurs in the first 3 months of life when the skull is most malleable and when an infant spends the majority of time lying on his or her back. Infants may also develop skull flattening in the prenatal period due to positioning in utero. Positional plagiocephaly may be present as one of three patterns: 1) right occiput, 2) left occiput and 3) central occipital flattening. While positional plagiocephaly does not affect brain development, parents may be concerned with the aesthetic appearance of their child's head.

Etiology of Positional Plagiocephaly

In the past, the reported incidence of positional plagiocephaly was estimated at 1 in 100 infants (0.3%).[1] However, over the last 10-15 years many centers, including BC's Children's Hospital, have experience large increases in the numbers of referrals for plagiocephaly.[2] It is likely this dramatic increase is due to supine positioning of infants during sleep as a result of the successful "Back to Sleep" campaign to reduce the incidence of Sudden Infant Death Syndrome (SIDS).[3] Research also suggests that there is a significant association between the influence of SIDS knowledge on infant positioning and avoidance of the prone position for play.[4] Other risk factors include for developing positional plagiocephaly include: multiple births or first-born birth rank, intrauterine constraint, premature birth, assisted delivery, torticollis, positional sleep preference, tummy <3x per day and slow motor development.[3,5,6]

Positional Plagiocephaly and Sleep Position

To reduce the risk of SIDS, infants should be placed on their backs to sleep. However, if an infant has a strong positional preference or skull flattening, early intervention using the strategies in this booklet will help prevent or minimize the severity of positional plagiocephaly.

Preventing Positional Plagiocephaly

If an infant spends much of his or her time on their back during wake time and there is a positional preference, skull flattening may occur or may be worsened. Communicating prevention strategies to parents, early screening and identification of positional plagiocephaly during well-baby visits is vital for prevention, management and treatment.

Parents often report that infants dislike tummy time. Here are some suggestions you can give to parents and other caregivers to gradually increase tummy time tolerance.

- ✓ Put the infant on his or her tummy after each diaper change. Add a minute of tummy time each day.
- ✓ Parents and caregivers should get down on the floor either in front of or beside the infant, depending on how much help the infant needs, to provide comfort and interaction.
- ✓ A caregiver's arm or rolled towel under the infant's chest with the infant's arms propped in front can give support. A caregivers hand can help support the infant's head under the chin until neck strength improves.
- ✓ Infants like lots of interesting things to look at. Put brightly coloured toys and/or a mirror in front of the infant to look at.

Other Positioning Tips

To reduce the chance of a positional preference occurring, here are some suggestions you can give to parents:

- ✓ Put the infant at a different end of the crib each time he or she goes to sleep. Infants usually like to face out into a room, so they will tend to turn their head in that direction.
- ✓ Place a colourful crib-safe toy or mirror on the crib to encourage the infant to look in the desired direction.
- ✓ Limit the amount of time that the infant sleeps in car seats, swings, bouncy chairs and other infant seats.

Diagnosing Positional Plagiocephaly

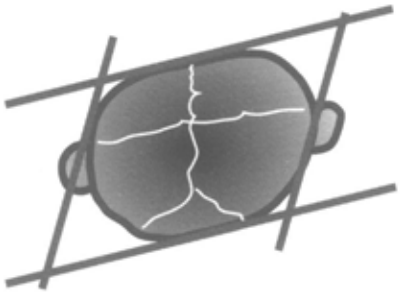
Diagnosing positional plagiocephaly is straightforward and established by clinical examination. Skull x-rays and CT scans are reserved for cases that do not fit the pattern of positional plagiocephaly.

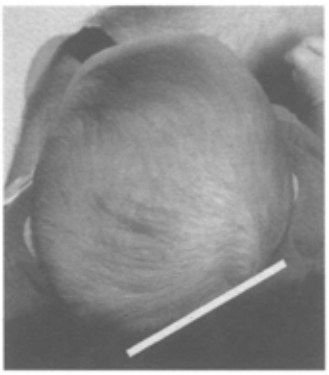
In right or left-sided positional plagiocephaly, the head looks as though one side has been pushed forward relative to the other. This results in a parallelogram appearance when viewed from above. To make the diagnosis, stand behind the infant as they are supported in the caregiver's lap and look down from above (Figure 1).

1. Identify the side of flattening.
2. Place your fingers in both of the infant's ear canals.
3. Identify if and which ear is anteriorly positioned.
4. Check the position of the infant's forehead to see if it corresponds with the ear position.

If the diagnosis is positional plagiocephaly, the flattened side corresponds with anterior positioning of the ipsilateral ear and forehead (Figure 2).

Figure 1. To diagnose positional plagiocephaly, stand behind the infant and look down from above.





2a **2b**

Figure 2a. In positional plagiocephaly the head shape is a parallelogram.
Figure 2b. Photograph of an infant with right positional plagiocephaly.

Differential Diagnosis

Positional plagiocephaly should be differentiated from four other conditions which result in plagiocephaly: congenital muscular torticollis (CMT), positional torticollis, unilateral lambdoid synostosis and unilateral coronal synostosis.

Congenital Muscular Torticollis (CMT), tightening of the sternocleidomastoid (SCM) muscle, can result in positional plagiocephaly characterized by occipital flattening on the opposite side of the tight muscle. A tight left sternocleidomastoid muscle and/or opposite neck muscle weakness prevents the head from turning fully to the left and results in a tendency to look to the right. An infant with a left CMT presents with right positional plagiocephaly. Facial symmetry is worsened by the pull of the SCM on the side of the face, creating flattening of the ipsilateral forhead, cheek and face. Children may also present with a positional torticollis, with a head turning preference and/or head tilt. Active and passive neck range of motion and head tilt should be checked in all patients with positional plagiocephaly to rule out CMT as the cause of the plagiocephaly. Children with CMT should be referred to physiotherapy early to restore cervical range of movement, correct a head tilt and prevent positional plagiocephaly.

Unilateral Lambdoid Synostosis or premature fusion of one lambdoid suture may also cause occipital flattening. However, lambdoid synostosis is very rare, occurring in 1 in 150,000 newborn children. The diagnosis is made by correlation of the occipital flattening with **retraction** of the ear and forehead on the same side due to the generalized growth restriction of the fused suture. This is unlike positional plagiocephaly where the ear is displaced anteriorly. In lambdoid synostosis the head viewed from above resembles a trapezoid shape (Figure 3a) compared with a parallelogram shape seen in positional plagiocephaly (Figure 3b). In lamboid synostosis the base of the skull is also angled (Figure 4a).

Unilateral Coronal Synostosis or premature fusion of a coronal suture causes forehead asymmetry and may also be present combined with positional plagiocephaly. When there is significant asymmetry of the forehead associated with occipital flattening, the possibility of unilateral coronal synostosis should be considered. The diagnosis is made by examining orbital symmetry. From the front view, the ipsilateral orbit tends to be higher and wider than the other orbit. The nose may also deviate away form the side of the forehead flattening. From an above view, the eyeball ipsilateral to the forehead flattening protrudes from the orbit compared to the other side. If there is no orbital asymmetry, there is no coronal craniosynostosis.

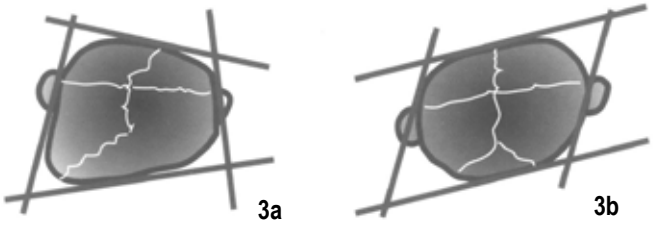


Figure 3a. In lambdoid synostosis, the head is a trapezoid shape unlike the parallelogram shape characteristic of positional plagiocephaly (figure 3b).

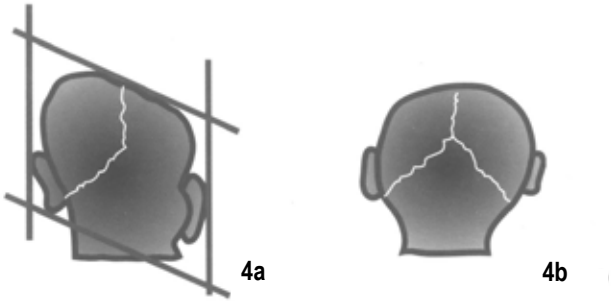


Figure 4a. The skull base is angled in craniosynostosis
Figure 4b. The skull base is even in positional plagiocephaly

Treating Positional Plagiocephaly

Sleep Positioning

If positional plagiocephaly is detected in an infant then the crib positional strategies described previously for prevention may be used for treatment. In accordance with the Canadian Paediatric Society position statement for safe sleeping environments (www.cps.ca/english/statements), infants with plagiocephaly should continue to be put on their backs for sleep on a firm mattress, without pillows or products to maintain a sleeping position.

Awake and Up

Infants with positional plagiocephaly should spend as little time as possible lying on the back of their heads when awake, and as much time as possible in supported upright positions. The following are play and positional options for caregivers:

- ✓ Continued emphasis on tummy time. Refer to strategies previously described.
- ✓ Limit time spent in infant car seats to time in the car only. The use of car seats in strollers should be avoided. Car seats should be left in the car at all times, and the infant moved out when no longer in the car.
- ✓ Promote the use of front or back infant carriers.
- ✓ Limit time spent in swings and bouncy seats. If caregivers need to put their infant down, and once the infant has established head control, upright positioning in exer-saucers and BUMBO™ seats is preferred (equipment providing support for non-sitters).
- ✓ Place visual distractions to the desired side of turning. Consider which side the car seat is placed in the car, which side the child is fed when in a highchair etc.
- ✓ Once a child is sitting with slight support, promote this along with tummy time as preferred supervised play positions, using breast-feeding pillows etc. for support and cushioning from falls.

Cranial Molding Headband

Where positional plagiocephaly has not responded sufficiently to conservative treatment, a custom-made molding headband or helmet may be considered as a cosmetic treatment option. The molding helmet acts as a protective cushion to prevent undo pressure on the affected parts of the skull and allows for better distribution of pressure. The headband is fitted in a way that promotes the bones of the skull to expand into the flat areas as the infant head grows.

Once an infant has been identified as an appropriate candidate for the headband, the final decision is up to the parents. The band is made by a certified orthotist and is most effective when initiated at or before the age of 6 months. Typically, the band is worn for a period of 3 to 6 months for 23 hours a day. As the child's head shape changes and grows, the orthotist will adjust the band as needed. The cost of the headband ($2,150.00*) is often a significant factor in deciding to proceed, however many private insurance companies provide coverage with a doctor's referral (MSP does not cover the cost).

* cost estimate at time of printing

Figure 6. Cranial molding headband

Long Term Outcomes

The incidence of plagiocephaly decreases at older ages[6], indicating improvement with normal growth and development. There is also evidence to suggest that repositioning and headbanding further improve skull asymmetries at young ages.[7] However, it is not known if these improvements are more than what would have occurred naturally in the long term as there have been no long term studies. While developmental impacts have been suggested, there is limited evidence to support these claims. Certainly children with pre-existing delays are at higher risk of developing plagiocephaly. The current consensus is that this is a cosmetic issue.

General Guidelines for Managing Positional Plagiocephaly

Under 5-6 Months: Repositioning is most effective for infants under the age of 6 months, and this point can be equally effective as headbanding in reversing skull flattening.

5-6 Months: Repositioning isn't as effective at this point as infants are moving more on their own, however, other aspects of conservative management, such as tummy time and the "awake and up" strategies are still beneficial. Infants at this age who present with a moderate to severe plagiocephaly who have not had improvements with repositioning, and present with ear and facial involvement may benefit from headbanding. Headbanding started at this age is most successful because the skull is still malleable and head growth still rapid.

12 Months and older: Repositiong strategies are not applicable and beneficial in the active toddler years. Headshape will continue to improve with normal growth and development, but further improvements with headbanding become less likely as the skull becomes progressively less malleable.

When to Refer for further Assessment and Management

1. If you are unsure of management for a particular child, referral can be made to the Occupational Therapy Department at BC's Children's Hospital for assessment and recommendation through a group format Plagiocephaly Clinic.
2. If the clinical presentation is not consistent with the clinical description of positional plagiocephaly you may want to refer to neurosurgery at BC's Children's Hosptial.
3. If a child has a torticollis, referral should be made to a physiotherapist for assessment and treatment.

Upon determining that a headband is appropriate, and the family wishes to proceed, you may refer to an orthotist directly. Be sure that the orthotist you refer to has specific knowledge and experience in making head bands for this population. Valley Orthocare is recommended. Follow-up with your patient is recommended to determine time of discharge of the head band in collaboration with the orthotist.

Referral Information

Occupational Therapy Plagiocephaly Clinic:

- Please send a Physician's faxed referral to: 604-875-3220
- Please mail a Physician's referral to:
  Occupational Therapy Dept
  BC's Children's Hospital
  4480 Oak St
  Vancouver BC V6H 3V4

Valley Orthocare:

- Phone: 604-597-4784; 1-800-406-2211
- 118 – 12414 82nd ave., Surrey BC V3W 3E9

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