

Memo

Prevention of positional skull deformities and sudden infant death syndrome

February 2020

Key messages

It is recommended that infants always be placed flat on their backs to sleep to prevent sudden infant death syndrome (SIDS). The main risk factor for SIDS is a prone sleeping position;

Positional skull deformity (PSD) has a good prognosis. At present, there are no data in the literature enabling it to be concluded that there is a causal link between PSD and neurodevelopmental delay or specific ophthalmological, oculomotor or vestibular disorders;

The main risk factor for positional skull deformity (PSD) is limitation of the infant's free, spontaneous motricity due to a lack of own mobility or external environmental restriction;

Clinical examination is usually sufficient to reach a diagnosis of PSD. Imaging is rarely necessary;

It is possible to prevent the development of PSD by maintaining the infant's free and spontaneous mobility while continuing to comply with the recommendations for the prevention of SIDS. No preventive treatment intervention is necessary;

In established PSD associated with deficient neck mobility, the early combination of positional recommendations and paediatric physiotherapy is the intervention of choice.

Reminder of risk factors and prevention of sudden infant death syndrome

Risk factors

The main risk factor is sleeping on the stomach (risk of suffocation, hyperthermia and rebreathing) or side (risk of rolling over onto the stomach).

Restraining or supportive equipment (baby wedges, head supports, positioning pillows, baby nests, etc.) are unnecessary, detrimental and dangerous since they can encourage infants to roll onto their stomachs and increase the risk of death from asphyxia due to suffocation.

Objects such as comforters, soft toys, quilts or blankets that could cover up the head, suffocate or restrain the infant must not be used.

All cot or bed bumpers are dangerous since they contain the air inhaled by the infant and increase the risk of suffocation and hyperthermia.

Preventive measures

It is recommended that **infants systematically be put to sleep on their backs** in an appropriate bed:

- on a firm mattress in a cot with bars, placed in a suitable baby sleeping bag, without any pillows, quilts or blankets, with a moderate room temperature (18-20°C);
- ideally in the parents' bedroom for the first 6 months of life;
- without co-sleeping in their parents' bed;
- without exposure to tobacco smoke.

The recommendations for the prevention of SIDS are the subject of scientific consensus ^{1,2,3}.

Definition and diagnosis of positional skull deformities (PSD)

PSDs are acquired deformities of the skull without synostosis, secondary to external compression or traction-related biomechanical factors.

A complete clinical and neuromotor examination is sufficient to assess PSD (figure 1) and eliminate craniosynostosis (figure 2).

Imaging is rarely required and is not recommended as a first-line approach.

It is recommended that the practitioner observe the top of the head from above, examine the position of the ears and note the position of the cheekbones in order to look for typical forms of PSD.

Three main types of PSD are described when the skull contour is observed from above: frontal-occipital plagiocephalies and occipital plagiocephalies, which are asymmetrical deformities, and posterior brachycephalies, which are anteroposterior narrowing of the skull (figure 1).

In the typical form of positional plagiocephaly (figure 1), when viewed from above the skull forms a parallelogram, combining unilateral flattening of the occipital area, anterior ear displacement ipsilateral to the flattened occiput, ipsilateral frontal bossing and ipsilateral cheekbone prominence. From the front, the eye slit is more open on the side of the forehead bossing. The other form of positional plagiocephaly presents as occipital flattening without frontal deformity (figure 1).

If the occipital deformity is bilateral and symmetrical, with transverse widening of the skull, or even upward compensation of the vertex, then it is a posterior brachycephaly (figure 1).

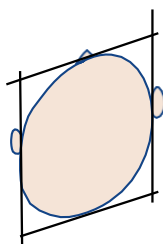
PCD combinations can exist.

1. American Academy of Pediatrics, Moon RY. SIDS and other sleep-related infant deaths: evidence base for 2016. Updated recommendations for a safe infant sleeping environment. *Pediatrics* 2016;138(5).

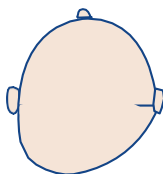
2. American Academy of Pediatrics Task Force on sudden infant death syndrome. SIDS and Other Sleep-Related Infant Deaths: Updated 2016 Recommendations for a Safe Infant Sleeping Environment. *Pediatrics*. 2016; 138(5).

3. Naitre et vivre, Briand-Huchet E. La prévention de la MIN et la plagiocéphalie. 2017. <http://naitre-et-vivre.org/plagiocéphalie-couchage-dos>.

Frontal-occipital
plagiocephaly



Occipital
plagiocephaly



Posterior
brachycephaly

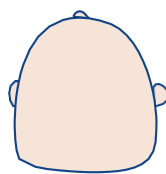


Figure 1

Craniosynostosis

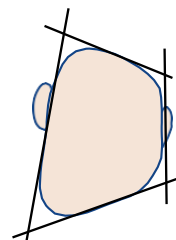


Figure 2

A diagnosis of cranial asymmetry in general, and of PCD in particular, should be looked for from the first examination after birth and then at each check-up visit until the age of 1 year, since PCD usually develops secondarily.

There is currently no consensus with respect to severity classifications; frontal-occipital plagiocephalies are the type with the highest risk of functional consequences.

An assessment of neck mobility should be made to confirm or rule out the presence of torticollis (lateral head tilt and rotation of the contralateral side).

There are two main types of torticollis:

- postural torticollis, intermittent **preferential posture** with lateral head tilt and rotation of the contralateral side, but without limitation on passive contralateral mobilisation;
- congenital muscular torticollis, **permanent posture** with lateral head tilt and rotation of the contralateral side, **with limitation** on passive contralateral mobilisation.

Sensory, visual, tactile and auditory stimulation can be used to test the symmetry and range of active neck rotation ("bull's eye" or contrasting target smooth pursuit test or chair test)⁴.

Risk factors for positional skull deformities

Risk factors should be looked for from birth.

Perinatal factors:

- obstetric situation at risk of PSD (oligoamnios, primigravidity, multiple pregnancy, breach presentation, instrument-assisted delivery);
- prolonged bed rest of mother during pregnancy.

Factors related to the infant's spontaneous mobility:

- prematurity, malformative syndromes, neurodevelopmental disorders, sensory deficits or muscular torticollis;
- imbalance in motor organisation: asymmetrical postures, asymmetrical tonic neck reflex (fencer's reflex), preferential head side, postural torticollis, axial tone disorders (hypotonia or hypertonia).

It is important to be particularly attentive to the development of infants. A PSD may be a sign of an underlying tone and motor disorder.

Environmental factors:

- inadequate interactions between the infant and the adults looking after him/her (parents and entourage);
- sensory stimulation inappropriate for the infant (for example, permanent visual fixation on a mobile, or sound, etc.);
- physical restraint using external methods: car seat, head support, baby wedge, cushion to prevent flat heads, cocoon, positioning pillow, memory foam mattress, baby nest, baby seat, baby swing, hammock, etc.

4. The chair test after the age of 2 months can help diagnose a torticollis. The health professional sits on a rotating chair or stool and holds the infant facing the parents. While the parents attempt to keep the infant interested, the health professional rotates through a quarter turn with the infant on the chair or stool, first to one side and then the other, and observes the infant's spontaneous head movements. In the absence of torticollis, the infant should be able to rotate his/her head and maintain eye contact with the parents.

Potential complications of positional skull deformity

There are no data in the literature enabling it to be concluded that there is a causal link between PSD and neurodevelopmental delay or specific ophthalmological; oculomotor or vestibular disorders.

Only bite disorders with lateral crossbite, or postural disorders (risk of muscle contractures) can be found in severe forms of frontal-occipital plagiocephaly.

In more pronounced forms and in the absence of appropriate early management, morphological or aesthetic effects may persist.

Primary prevention of positional skull deformities

Prevention is based on the principle of [respecting the infant's free, spontaneous motricity](#).

Preventive measures should be explained during the antenatal period, during the mother's stay in the maternity unit and during the first few months of life.

All professionals involved in the care of infants and their families should know these preventive measures.

During the antenatal period

- It is recommended that all professionals, particularly in the context of birth and parenthood preparation sessions, should encourage the creation of a risk-free environment for infants, promoting respect for the infant's spontaneous motor activity, while sleeping and when awake.
- It is necessary to explain to future parents the detrimental effects of all restraining devices (see risk factors), which promote the development of PSD by limiting the spontaneous motricity of infants, and increase the risks of SIDS due to suffocation.
- Breast-feeding should be encouraged. It is a factor that helps protect against SIDS and PSD.

After the birth

- An assessment of the symmetry of the infant's global neuromotor capacities and also of PSD risk factors should be performed before discharge from the maternity unit and at each clinical examination.
- It is recommended that personalised advice tailored to their infant be repeated to patients, particularly during the first 6 months of the infant's life when the skull is the most malleable, and at each subsequent discussion or consultation.
- It is recommended that a neutral head position be respected in all situations, avoiding any posture with hyperextension or hyperflexion of the neck.
- It is recommended that infants presenting postural or muscular torticollis be referred to a paediatric physiotherapist.

When the infant is awake

- It is recommended to encourage periods of good-quality interaction between adults and the infant.
- It is recommended to vary postures and encourage spontaneous head turning by the infant in response to sensory stimulations (tactile, visual, auditory), to be adapted to the infant's age. Positions on the stomach and side can be explored during close interactions with an adult. Due to the risk of suffocation, infants must be watched constantly during waking periods in the prone position.
- For the optimal development of infants, they should be placed on their back, without a pillow or blanket, in an environment facilitating spontaneous motor activity (firm mat on the floor, with toys positioned around them, avoiding play arches or mobiles which fix the infant's attention).
- It is recommended to encourage parents to carry their infant in their arms or in a sling, taking care to keep the airways clear at all times, and allow mobilisation of the pelvis and posture variation.
- In everyday routines, it is recommended that mobilisation of the pelvis and shoulders be encouraged.

When the infant is asleep

- * Infants must always be placed on their backs in a suitable bed to sleep.
- * It is recommended to regularly alternate the baby's position towards the head or foot of the bed, in order to encourage spontaneous head turning from one side to the other.

Management of established positional skull deformities (PSD)

Positional recommendations and physiotherapy are the interventions of choice in most infants with PSD associated with deficient neck mobility. These must be implemented as soon as possible.

In general, neck mobility improves more quickly than the PSD if appropriate measures are implemented at an early stage.

Simple anthropometric measurements are useful for monitoring the evolution of a PSD.

Positional recommendations

- * From the time that a PSD is diagnosed, it is necessary to avoid pressure on the flattened part of the head by encouraging the infant to be mobile.
- * Repositioning must always comply with SIDS prevention measures.
- * It is recommended to continue primary preventive measures for PSD or to implement them without delay.
- * When the infant is awake, it is recommended that adults accompany the infant (including on the floor) in active postures and sensory explorations on the side opposite the flattening, during interactions, via gentle, painless mobilisation.

Physiotherapy

- * Physiotherapy should be routinely prescribed **in the event of deficient neck mobility**, in addition to repositioning advice in infants with an established PSD.
- * A typical prescription for neuromotor physiotherapy for postural asymmetry should specify the following: medical indication, target organ, location, treatment objectives.
- * The earlier the treatment is prescribed (during the first month of life), the better the chances of normalisation.

Osteopathy

- * At present, the scientific data do not enable osteopathy to be recommended. A paediatric osteopathic approach may be combined with physiotherapy as a second-line approach in the context of multidisciplinary management.

Referral to a specialised team and use of cranial-remolding-orthosis

- * In the absence of an improvement in the skull deformity following appropriate management, early referral (end of the first 6 months) by the doctor caring for the infant to an expert or reference centre for craniofacial malformations⁵ is recommended.
- * These specialised centres for the management of craniofacial abnormalities include a paediatric neurosurgeon, maxillofacial surgeon or plastic surgeon.
- * The indication of a cranial orthotic is exceptional and can only be decided on by these teams, since they alone are capable of assessing the benefit-risk balance for the infant.

5. Head and Neck rare diseases health network. www.tete-cou.fr