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Supine infant positioning—Yes, but there's more to it

The Back-to-Sleep campaign has helped reduce the incidence of SIDS, but a neglect of prone positioning during wakefulness has increased the risk of 3 complications.

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PRACTICE RECOMMENDATIONS

› *Continue to advise parents to place their infants on their backs for sleeping, to prevent sudden infant death.* (A)

› *Educate parents about the value of supervised prone positioning ("tummy time") during waking hours, which helps infants learn to raise their head, push up on their arms, and attain on-time milestones such as rolling over and unsupported sitting.* (A)

› *Tell parents that supervised abdominal positioning aids in preventing plagiocephaly and torticollis.* (B)

Strength of recommendation (SOR)

(A) Good-quality patient-oriented evidence
(B) Inconsistent or limited-quality patient-oriented evidence
(C) Consensus, usual practice, opinion, disease-oriented evidence, case series

As happens with many interventions, the Back-to-Sleep campaign[1] to prevent sudden infant death syndrome (SIDS) has led to unintended consequences. The campaign's primary recommendation—that infants be placed on their backs for sleeping instead of on their stomachs—has of course yielded tremendous benefits. The prevalence of SIDS among healthy infants has dropped to 0.57 children per 1000 live births, totaling 2200 deaths per year, compared with 1.2 children per 1000 births in 1997.[2-4] However, as the incidence of SIDS began to decline, it became apparent that children were experiencing delayed gross motor movement coincident with placement in the supine sleeping position[5-7]—or, more accurately, because parents following the Back-to-Sleep recommendation also generally avoided placing their infants in the prone position when they were awake.[7]

These delays become apparent as early as 2 to 3 months of age and manifest as the inability of an infant to raise his or her head when placed in the prone position.[8] Because of this finding, the American Academy of Pediatrics modified its original recommendation for healthy infants, in part stating, "A certain amount of tummy time while the infant is awake and observed is recommended for developmental reasons. . . ."[9]

In this article, I address the 3 most common unintended consequences for infants perpetually placed in the supine position: developmental motor delays, plagiocephaly (flattening of the occiput) and brachycephaly (widening of the skull), and congenital muscular torticollis (CMT) (a head tilt to one side). Each of these outcomes is preventable with vigilance in the care of newborns.

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Educate parents about the value of placing their infant in the prone position for brief periods when awake.

Prevent developmental motor delays with "tummy time"

The need for prone positioning, or "tummy time," while an infant is awake cannot be overestimated. Particularly for preterm infants, a delayed acquisition of the ability to lift and turn the head could result in upper airway compromise or rebreathing and, thus, asphyxia.[10] Infants who sleep in the supine position and exhibit delayed motor development by age 6 months very often are also found to have had their awake prone positioning restricted.[11] In one study, delays in gross motor skills persisted in some cases to 15 months of age, and fine motor skills were delayed in 6-month-old infants who had little prone positioning.[11] Infants who sleep in the side or supine position roll over later than those who sleep in the prone position.[5] The **TABLE** compares mean age differences for milestone achievements with varying sleep positions.

On multiple regression analyses, awake prone positioning has consistently emerged as the most significant predictor of early motor development.[11] For babies regularly placed in the prone position, the average Peabody Development Motor Scales-2 locomotion score has been significantly higher than that of babies not placed in the prone position when tested at 6 and 18 months.[12] For infants routinely sleeping supine, supervised "prone to play" during waking hours enables them to practice prone-related motor skills such as head control.[13]

Infants with prone experience have attained the milestone of crawling on the abdomen significantly earlier than those without prone experience, leading to a higher 6-month gross motor development quotient.[14] For children with just over an hour of daily prone positioning, an advantage in motor skill development has revealed itself as early as 4 months of age.[15,16] Somewhat reassuring is evidence from one study that all infants, whether sleeping prone or supine, achieve all milestones within the accepted normal age range as long as prone positioning is initiated.[7]

What you'll need to do. Stress to parents the importance of tummy time, or prone to play, in enabling normal developmental progression. Encourage this practice even if parents report that their infant cries or otherwise appears not to tolerate the prone position.[15] In general, sleeping in the supine position does not negatively impact motor development as long as there is awake time with supervised prone positioning.[17]

Plagiocephaly and brachycephaly: Vary position for feeding, sleeping

Plagiocephaly and brachycephaly may occur as a consequence of prolonged supine positioning. Indeed, the incidence of plagiocephaly has increased since 1992, due largely to widespread adoption of the supine sleeping position.[18] Plagiocephaly and/or brachycephaly is also more likely to occur in the first 4 months of life in infants who are male, firstborn, or who exhibit limited head rotation or low activity levels.[19] Feeding with a bottle only and with the child's head persistently placed to one side can lead to plagiocephaly.[20]

Delayed achievement of motor milestones is also associated with plagiocephaly, and tummy time to facilitate motor skill de-

Did you know?

- Newer evidence indicates that the rebreathing of exhaled gases in the face-down position and the inability of the infant to reflexively lift his or her head may play a role in sudden infant death syndrome.[28]
- Nearly 13% of infants are still placed prone for sleep, according to an estimate from the National Infant Sleep Survey.[29]
- Resources are available from Pathways Awareness (www.pathwaysawareness.org), a not-for-profit foundation, to educate parents (and healthcare professionals) about early detection and intervention of motor delays in children. (The author is a member of the foundation's Physicians' Roundtable.)

TABLE

Mean age (months) for milestone acquisition

Milestone	Prone sleepers	Mixed/side sleepers	Supine sleepers	*P* value* (linear regression)†
Rolls prone to supine	3.93 ± 1.2	4.48 ± 1.8	4.87 ± 1.33	.002 (.02)
Rolls supine to prone	4.9 ± 1.3	4.97 ± 1.9	5.0 ± 1.6	.95
Sits supported	4.7 ± 1.3	5.02 ± 1.4	5.13 ± 0.9	.003 (.03)
Sits unsupported	5.13 ± 1.1	5.17 ± 1.2	5.17 ± 1.0	.80
Transfers object	5.87 ± 1.2	5.99 ± 6.5	6.23 ± 1.1	.11
Creeps	6.07 ± 1.9	6.49 ± 1.9	7.23 ± 1.6	.0002 (.001)
Crawls	7.83 ± 2.0	8.47 ± 2.1	8.6 ± 1.7	.003 (.05)
Pulls to stand	8.1 ± 1.6	8.7 ± 1.5	8.77 ± 1.6	.01 (.04)
Walks alone	12.1 ± 2.0	12.2 ± 2.0	12.2 ± 1.7	.4

*Represents *P* value for prone sleepers vs supine sleepers.
†Multivariate regression analysis controlling for infant size, gender, ethnicity, presence of siblings, and maternal education.
Source: Davis BE, Moon RY, Sachs HC, et al. *Pediatrics*. 1998.[7] Reproduced with permission of American Academy of Pediatrics.

velopment helps protect against the deformity.[20] Varying the head position when laying the infant down for sleep is also protective.[21] One systematic review has shown considerable evidence that molding therapy with a helmet may reduce skull asymmetry more effectively than repositioning therapy.[22]

What you'll need to do. Ask parents about their infant's activity level, and encourage tummy time to protect against plagiocephaly. Also advise parents who bottle feed to alternate the feeding position between left and right arms.

Torticollis: Assess neck function in weeks after birth

Not only do infants with CMT display a head tilt to one side, but they also often have rotation of the head to the opposite side with the chin appearing to jut out.[23] This postural deformity—primarily resulting from unilateral shortening and fibrosis of the sternocleidomastoid muscle[24]—is detectable at birth or shortly thereafter. CMT occurs in 1 of every 300 live births.[25] Torticollis discovered at birth is likely related to a constrained intrauterine position. In one study, 1 in 6 newborns were born with torticollis, and mothers reported that the infants had felt "stuck" in the same position for several weeks before birth.[26] The consequent restricted neck range of motion puts infants at risk of developing cranial deformations that may be prevented by changing their sleeping positions.[26]

What you'll need to do. Check for limited neck function in the early weeks after birth and recommend neck motion exercises, if necessary, to encourage full head turning to both sides.[19] Both torticollis and plagiocephaly due to static supine positioning can be largely eliminated with early written instructions about the value of tummy time when a baby is awake and supervised and the value of changing sleep positions.[12] If repositioning or other forms of physical therapy fail to resolve the condition, surgical correction may be necessary.[27] JFP

Advise parents who bottle feed to alternate the feeding position to guard against plagiocephaly.

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