SHORT REPORT

Effect of sleeping position on nasal patency in newborns

O Olarinde, A R Banerjee, C O'Callaghan

Arch Dis Child Fetal Neonatal Ed 2006;91:F365–F366. doi: 10.1136/adc.2005.073833

Sleeping posture has been implicated in the pathophysiology of sudden infant death syndrome. The effect of supine and lateral sleeping positions on nasal patency was investigated using acoustic rhinometry in 11 healthy newborns. The implications of the findings in sudden infant death syndrome are discussed.

Sleeping posture has been implicated in the pathophysiology of sudden infant death syndrome (SIDS). The nasoaxillary reflex is the decreased ipsilateral nasal airway and increased contralateral airway in response to lying on one side. The aim of this study was to test the hypothesis that there is a nasoaxillary reflex in neonates.¹ We investigated the effect of supine and lateral sleeping positions on nasal patency using acoustic rhinometry in 11 healthy newborns. The implications of our findings in SIDS are discussed.

SUBJECTS AND METHODS

Eleven healthy term newborn infants were examined at 1–4 days of age. Babies with nasal symptoms, nasal or facial deformities, and those on medication were excluded.

Acoustic rhinometry was carried out with a RHIN 2000 miniprobe (Rhinometrics A/S, Lyngø, Denmark; software version 2.6), according to recommendations by Hilberg and Pederson.² Local research ethics committee approval and written consent from the babies' parents were obtained. Acoustic rhinometry measures cross sectional area/distance mapping of the nasal cavity, by emitting wide band noise into the nose, and analysing the reflected sound. The incident and reflected waves are recorded by a microphone and digitally analysed by the software, at a rate of 20 times per second. It provides a clear and objective cross sectional area at every point in the nasal cavity, both graphically and in figures. The use of wide band noise ensures unique high speed and stability. Acoustic rhinometry must be carried out in cooperative subjects, and therefore all measurements were carried out in babies in non-arousable states to ensure cooperation. Measurements were made in the following postures and after the following times: (a) when lying supine for 30 minutes; (b) after lying on one side for 15 minutes; (c) after lying supine again for 30 minutes; (d) after lying on the other side for 30 minutes. A plot of the nasal cross sectional area against distance (acoustic rhinogram) was generated using the RHIN 2000 software. A mean curve from three readings taken within one minute of each other was computed for each nasal cavity and for each of the postures. The software also computed the volume of the nasal cavity.

RESULTS

Three infants awoke during the examination, and their results were excluded. Mean gestational age was 39.8 weeks (range 38–41.6). Mean birth weight was 3200 g (range 1900–4800). Seven of the infants were female and one was male.

Mean (SD) age at which the measurements were taken was 37.1 (23.8) hours.

Table 1 shows the changes in acoustic rhinometry measurements. Repeatability, expressed as the coefficient of variation, was assessed from three measurements each from the 11 infants studied. The repeatability was 4.4%, 9.1%, 5.2%, and 8.3% for MCA₁₀, MCA_{10–40}, Vol₁₀, and Vol_{10–40} respectively.

DISCUSSION

We were unable to show a nasoaxillary reflex in healthy newborn infants. Indeed we found a significant decrease in the total minimum cross sectional area of the nasal cavity when newborns were turned from a supine to a lateral position, associated with a decrease in the total nasal volume.

In 1992 the American Academy of Paediatrics recommended non-prone—that is, supine and lateral—sleeping positions in an attempt to reduce the incidence of sudden infant death.³ In 1996⁴ this advice was modified to recommend that infants should sleep in the supine position only. This was due to reports from England⁵ that the risk of SIDS was slightly greater for infants placed on their sides compared with those placed supine. This advice has been associated with an appreciable decrease in the incidence of SIDS. In the latest policy statement published by the American Academy of Paediatrics,⁶ the supine position has unequivocally been recommended as being preferred to any other position to prevent SIDS.

Suggestions as to why the supine position confers protection against SIDS include simple suffocation by re-breathing, increased nasal bacterial load, increased respiratory work of breathing, and increased upper airway secretions associated with the prone position.⁷ Our study is the first to investigate the effect of sleeping posture on nasal patency and nasal volume. The nasoaxillary reflex as described in adults is congestion of the dependent nasal cavity and decongestion of the other cavity when lying on one side. This reflex has not been described in any paediatric age group. It is a protective reflex that ensures the uppermost nasal airway (when lying on one side) is patent when lying on that side. The fact that the nasoaxillary reflex could not be demonstrated opens the question as to when it actually develops between the newborn period and adulthood. Our results may be affected by the spontaneous change in nasal resistance over time in each nasal cavity—that is, the nasal cycle—although this has not been observed in neonates.⁸ The finding that the total minimal cross sectional area decreases when infants move from a supine to a lateral sleeping position is of interest. As newborns tend to be obligate nose breathers, a decrease in the minimal cross sectional area of the nasal cavity is likely to be linked to an increase in nasal resistance and in the work of breathing. Our study was performed in healthy newborns, and it is unclear whether similar results would be found in children later in infancy or in those suffering from an upper respiratory tract infection.

The effect of supine and prone sleeping position on nasal patency in infants within the age group most prone to SIDS—

Table 1 Changes in acoustic rhinometry variables with change in posture expressed as percentage changes

Acoustic rhinometry parameter	% change from supine to left side	% change from supine to right side
Right MCA ₁₀₋₄₀	-23 (18)***	-6 (18)
Right MCA ₀₋₄₀	-5 (13)	-16 (9)**
Right VOL ₁₀₋₄₀	-7 (20)	-12 (6)*
Right VOL ₀₋₄₀	-8 (18)	-11 (6)*
Left MCA ₁₀₋₄₀	-4 (16)	-16 (13)*
Left MCA ₀₋₄₀	-5 (13)	-16 (9)*
Left VOL ₁₀₋₄₀	-11 (6)	5 (27)
Left VOL ₀₋₄₀	-8 (6)	1 (23)
Total MCA	-8 (9)*	-10 (11)**
Total VOL	-8 (8)	-6 (11)

Values are mean (SD).

MCA₁₀₋₄₀, Minimum cross sectional area between 10 and 40 mm into the nasal cavity; MCA₀₋₄₀, minimum cross sectional area between 0 and 40 mm into the nasal cavity; Vol₁₀₋₄₀, volume of nasal cavity between 10 and 40 mm into the nasal cavity; Vol₀₋₄₀, volume of nasal cavity between 0 and 40 mm into the nasal cavity.

*p<0.05, **p<0.01, ***p<0.001.

that is, 3–6 months—merits investigation. This will be the subject of another study.

ACKNOWLEDGEMENTS

We thank Caroline Doré for the statistical analysis.

Authors' affiliations

O Olarinde, A R Banerjee, Department of Otolaryngology, Leicester Royal Infirmary, Leicester UK

C O'Callaghan, Division of Child Health, Department of Infection, Immunity and Inflammation, University of Leicester, Leicester, UK

Funding: Institute of Child Health, University of Leicester and Leicester Royal Infirmary.

Competing interests: none declared

Ethical approval: granted by the local research ethics committee.

Correspondence to: Professor O'Callaghan, Division of Child Health, Department of Infection, Immunity and Inflammation, University of Leicester, Leicester LE2 7LX, UK; christopher.o@virgin.net

Accepted 15 January 2006

REFERENCES

- 1 **Cole P**, Haight JS. Posture and nasal patency. *Am Rev Respir Dis* 1984;**129**:351–4.
- 2 **Hilberg O**, Pedersen OF. Acoustic rhinometry: recommendations for technical specifications and standard operating procedures. *Rhinol Suppl* 2000;**16**:3–17.
- 3 **American Academy of Pediatrics Task Force on Infant Positioning**, SIDS. Positioning and SIDS. *Pediatrics* 1992;**89**:1120–6.
- 4 **Anonymous**. Positioning and sudden infant death syndrome (SIDS): update. American Academy of Pediatrics Task Force on Infant Positioning and SIDS. *Pediatrics* 1996;**98**:1216–18.
- 5 **Fleming PJ**, Blair PS, *et al*. Environment of infants during sleep and risk of the sudden infant death syndrome: results of 1993–5 case-control study for confidential inquiry into stillbirths and deaths in infancy. Confidential Enquiry into Stillbirths and Deaths Regional Coordinators and Researchers. *BMJ* 1996;**313**:191–5.
- 6 **American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome**. The changing concept of sudden infant death syndrome: diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatrics* 2005;**116**:1245–55.
- 7 **Galland BC**, Taylor BJ, Bolton DP. Prone versus supine sleep position: a review of the physiological studies in SIDS research. *J Paediatr Child Health* 2002;**38**:332–8.
- 8 **Baczek M**, Hassmann E, Alifir M, *et al*. Acoustic rhinometry assessment of the nasal cycle in neonates. *Acta Otolaryngol* 2001;**121**:301–4.