Review Article

Sudden infant death syndrome: Myo-dynamic dysphagia hypothesis

Victor Penzer

Suggested Citation

Penzer, V. (1975). Sudden infant death syndrome: Myo-dynamic dysphagia hypothesis. *International Journal of Oral Myology*, 1(3), 114-117.

DOI: <https://doi.org/10.52010/ijom.1975.1.3.2>

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](#).

The views expressed in this article are those of the authors and do not necessarily reflect the policies or positions of the International Association of Orofacial Myology (IAOM). Identification of specific products, programs, or equipment does not constitute or imply endorsement by the authors or the IAOM. The journal in which this article appears is hosted on [Digital Commons](#), an Elsevier platform.

Forum

Sudden Infant Death Syndrome Myo-dynamic Dysphagia Hypothesis

Victor Penzer, D.M.D.

Newton, Massachusetts

Dr. Penzer is in private practice and has written and published several articles.

The etiology of SIDS (Cot Death) which is the major cause of infant mortality after the first month of life remains enigmatic. This mystery condition claims up to 10,000 lives each year in the United States alone. Typically an apparently normal and healthy baby is put to sleep as usually, although minor otherwise insignificant respiratory symptoms are quite common. Next the baby is discovered dead. There are no indications of struggle or pain. Death appears to take place during a lapse in alert supervision. Cases of "near miss" are not infrequent. The baby stops breathing and is observed turning blue. When shaken or otherwise handled the respiratory cycle returns. Subsequent examination reveals no cause.

Apnea then appears to be the common lethal mechanism. According to Beckwith autopsy reports "provide compelling evidence of high airway obstruction as the agonal episode in most cases". Concomitant mild "infection of the upper respiratory tract seemed to be the most frequent underlying disease in SIDS" according to Fitzgibbons et al. These infections however are not of sufficient severity to be considered a valid cause of death. Guntheroth first contemplated the possibility that apnea occurring during sleep could be related to SIDS. Steinschneider observed and monitored periods of prolonged apnea occurring during sleep. His study of the cardiac and respiratory functions during bottle feeding of infants shows that "the difficulty with breathing (apnea) takes place at the time of the last sucking burst" which coincides precisely with the infant's efforts to swallow a mouthful. He comments that "these data are interpreted as a demonstration that a relatively innocuous procedure, bottle-feeding, could initiate in a predisposed infant, cardiac and respiratory abnormalities of sufficient magnitude to threaten his very life." Is bottle-feeding perhaps the predisposing factor and not so innocuous? Steinschneider also observed that babies who developed a nasopharyngitis had more frequent prolonged apneic episodes. Naeye found evidence that many SIDS victims experienced hypoxia for some period of time prior to their death. Johnson believes that "chance interaction of a number of factors at one time could lead to a physiological suspension of effective breathing." Johnson and collaborators postulate "the possibility of abnormal development of the regulation of breathing." They consider "the successful interaction of swallowing and breathing to be the key to survival." Sumi demonstrated that there is a relationship between asphyxia and physiologically initiated swallowing in immature animals. Clark's study of mature sub-

jects revealed the physiological pause of deglutition to be less than 2.5 seconds. Lassrich demonstrated cineradiographically the closure of the respiratory passage during deglutition in bottle-fed infants to be of no more than 8/24 to 10/24th of a second. Halverson and Peiper independently studied the interrelation between sucking, deglutition and respiration. They reported that when sucking, swallowing and breathing occurred in perfect rhythm the ratio was 1:1:1 or 2:2:1. The sucking center in the CNS appeared to influence deglutition and respiration as well. Pierce investigated the temporal relationships between sucking, deglutition and respiration in infants and adults. Infants displayed mostly 1:1 ratio between these functions. She also studied the locus of inhibition of respiration by deglutition and reported that the largest number if IPS (Inhibitory Pause of Swallowing) occurred during the first half of expiration. Ogura's assertion that "normal deglutition requires a coordinated action with the respiratory system" has been confirmed by all investigators. A well synchronized neuromuscular activity is necessary to provide for efficiency and economy and for a trouble-free flow of traffic at the intersection of the respiratory and digestive pathways.

Fatalities due to an acute dysphagia episode among adults, although rare, have been reported. A suspicion that fatal dysphagia in adults during sleep can be easily misdiagnosed as cardiac arrest has been voiced. Case of adult "near misses" occur with greater frequency.

Respiration and deglutition are vital biological functions. The primitive functional reflexes begin in utero. The processes of post-natal maturation and organization of the neurological pathways and of the controlling centers are subject to genetic as well as environmental influences.

Breast-feeding is one of Nature's mechanisms to guide these innate reflexes toward optimal maturation. Bottle-feeding in contrast can differ significantly from natural nursing. It can be harmful for nutritional, immunological, allergenic, psychological and myo-dynamic reasons as claimed by Applebaum, Balters, Garliner, Müller, Penzer, Picard, Straub, Wade and others. It can interfere among others with the normal organization of the vital functional patterns and with the delicately balanced interaction between them. Bottle-fed children are considerably more prone to develop abnormal swallowing and respiratory patterns than their breast-fed counterparts. Myo-dynamic dysphagia in it's chronic manifestation can exert a variety of deleterious influences. It can inhibit and distort growth and development of the related anatomic structures with resulting dysgnathia, malocclusion or a combination of both; it can adversely affect mastication, digestion, phonation; it can disfigure physiognomy through hypertrophy of the mentalis muscle or chronic incompetence of the orbicularis oris as the most obvious examples.

Abnormal deglutition patterns in breast-fed children, although known, are rather rare. Straub and Garliner blamed it on the allegedly overabundant lactation and an excessively rapid milk flow which they observed in such instances. Reisinger confirms that "although SIDS is primarily a disease of the bottle-fed infant, it does occur in fully breast-fed infants. He claims however that "there is a great deal of evidence to indicate that the breast-fed baby is relatively healthier, suffers less allergy, respiratory, enteric and other disease, and less mortality than his bottle-fed counterpart. SIDS he states "is preponderantly a disease of the bottle-fed infant. The ratio of breast-fed SIDS cases in Czechoslovakia as given by Houstek almost exactly matches the ratio of bottle-fed abnormal swallows as found by Garliner in the United States. Statistics compiled in New Zealand by Tonkin allow the conclusion that "there is a statistically significant excess of artificial feeding in cot death.

There is a distinct possibility that bottle-feeding as well as occasional unfavorable variations in breast-feeding mechanism may adversely affect the organization and synchronization between the vital functions of sucking, swallowing and breathing. The resulting inefficiency can be aggravated by one or more of the following contributory factors:

- Increased secretion due to a mild respiratory infection.
- Respiratory center depressed physiologically during sleep.
- Neck flexed during sleep, narrowing the infant's airway.
- Tongue retracted or actually sucked in.

Under such circumstances an infant may be unable to cope with a combination of these adverse factors. Acute dysphagia leads to prolonged apnea, to hypoxia, to anoxia, to asphyxia and then to cardiac arrest. Possibly there are more cases of asphyxia due to acute dysphagia, however when the child has been observed ill prior to death, he will not be included in SIDS statistics.

Steinschneider monitored in his laboratory cardiac and respiratory functions of bottle-fed babies and he measured prolonged apneic episodes of susceptible children and related them to the different phases of physiological sleep. Pierce utilized sound waves to monitor deglutition of infants. A simultaneous monitoring of respiration and deglutition will certainly reveal such temporal relationships between these two all important functions as there exist. A significant breakthrough is quite possible.

REFERENCES

1. Applebaum, R.M.: The modern management of successful breast feeding. *Pediat Clin N Am* **17**: 203, 1970.
2. Applebaum, R.M.: A positive approach to breast feeding. *Med Digest*, **17**: 8, 1971.
3. Atkinson, M.P., et al.: The dynamics of swallowing: I. Normal pharyngeal mechanisms: II. Neuromuscular dysphagia of pharynx. *J Clin Invest*, **36**: 581, 1957.
4. Barnard, L.W., Early oral functions and their influence on structures for speech. *Child Study and Research*, Salt Lake City, Utah.
5. Barrett, R.H.: One approach to deviate swallowing. *Am J Orthod*, **47**: 726, 1961.
6. Barrett, R.H., and vonDedenrith, T.F.A.: Problems of deglutition. *Am J Clin Hyp*, **9**: 161, 1967.
7. Barrett, R.H., and Hanson, M.L.: *Oral Myofunctional Disorders*. The C. V. Mosby Co., St. Louis, 1974.
8. Beckwith, J.B., and Bergman, A.B.: The sudden death syndrome in infancy. *Hosp Pract*, **44**: 52, 1967.
9. Bergman, A.B., et al.: *Sudden Infant Death Syndrome*. Univ. of Washington Press, Seattle, 1969.
10. Bosma, J.F.: Maturation of function in the oral and pharyngeal region. *Am J. Orthod*, **49**: 94, 1963.
11. Doty, R.W.: Influence of stimulus pattern on reflex deglutition. *Am J Physiol*, **166**: 142, 1951.
12. Doty, R.W., and Bosma, J.F.: An electromyographic analysis of reflex deglutition. *J Neurophysiol*, **19**: 44, 1956.
13. Fbbecke, U.: Synergismus und Antagonismus bei menschlichen Atem und Schluckreflexen. *Klin Wocheschr*, **22**: 373, 1943.
14. Fitzgibbons, J.P., et al.: Sudden unexpected and unexplained death in infants. *Pediatrics*, **43**: 980, 1969.
15. Garliner, D.: *Myofunctional therapy in dental practice*. Bartel Dental Book Co., Brooklyn, 1971.
16. Guntheroth, W.G.: Primary apnea, hypoxic apnea and gasping. *Proceedings of the F. E. Camps International Symposium*, Tronto, 1974.
17. Halverson, H.M.: Infant sucking and tensional behavior. *J Genetic Psychol*, **53**: 365, 1938.
18. Houstek, J.: Sudden death syndromes in Czechoslovakia. In S.I.D.S. Bergman, A.B., et al., Univ. of Washington Press, Seattle, 1969.
19. Johnson, P.: Laryngeal induced apnea. S.I.D.S., U. S. Dept. Health, Educ. and Welf., Washington, D. C., 1971.
20. Johnson, P., et al.: *The onset and control of breathing after birth*. Cambridge Univ. Press, Cambridge, 1973.

21. Kawamura, Y.: *Frontiers of oral physiology*. S. Karger, A.G., Basel, 1974.
22. Kawasaki, M., et al.: Neurological observations of normal deglutition. It's relationship to the respiratory cycle. *The Laryngoscope*, **74**: 1747, 1964.
23. Lear, C.S.R., et al.: The frequency of deglutition in man. *Archiv Oral Biol*, **10**: 83, 1965.
24. Mackowiak, R.C., et al.: Acoustic profile of deglutition. *Proceedings Soc. Exper. Biol. Med.*, **125**: 1149, 1967.
25. Meyer, H.F.: Breast feeding in the United States. *Pediatr*, **22**: 116, 1968.
26. Mithoefer, J.C., et al.: A method of distinguishing death due to cardiac arrest from asphyxia. *Lancet*, **2**: 654, 1967.
27. Müller, A.: Bottle feeding with NUK Sauger for normal jaw development. *Zahnärztl Welt*, **6**: 24, 1951.
28. Naeye, R.: Pulmonary arterial abnormalities in the S.I.D.S. *N Eng J Med*, **289**: 1167, 1973.
29. Ogura, J.H., et al.: Neurophysiologic observations on the adaptive mechanism of deglutition. *Annals Oto-Rhino-Laryng*, **73**: 1062, 1964.
30. Peiper, A.: *Cerebral function in infancy and childhood*. Consultants Bureau, New York, 1963.
31. Penzer, V.: Chronic myodynamic dysphagia. 112th Annual Session A.D.A., Atlantic City, 1971.
32. Picard, P.: Bottle feeding as preventive orthodontics. *J Nevada Dent Soc*, **35**: 90, 1959.
33. Pierce, L.: *Mechanism of sucking and deglutition in infants and adults*. Jefferson Medical College, Philadelphia, 1969.
34. Reisinger, R.C.: A final mechanism of cardiac and respiratory failure. *SIDS 1974—Proceedings of the F. E. Camps International Symposium*, Tronto, 1974.
35. Shaw, F.B.: Sudden unexpected death in infancy syndrome. *Am J. Dis Child*, **116**: 115, 1968.
36. Steinschneider, A.: Prolonged apnea in the S.I.D.S. *Pediatrics*, **50**: 646, 1972.
37. Steinschneider, A.: Concept of sleep apnea. *SIDS 1974—Proceedings of the F. E. Camps International Symposium*, Tronto, 1974.
38. Straub, W.J.: Malfunctions of the tongue. *Am J Orthod*, **46**: 404, 1960, Part II **47**: 595, 1961, Part III **48**: 496, 1962.
39. Sumi, T.: The nature and postnatal development of reflex deglutition in the kitten. *Jap J Physiol*, **200**: 210, 1967.
40. Tonkin, S.: Epidemiology of S.I.D.S. in Auckland, New Zealand. *SIDS 1974—Proceedings of the F. E. Camps International Symposium*, Tronto, 1974.
41. Valdés-Dapena, M.: Sudden and unexpected death in infancy. *Pediatrics*, **39**: 123, 1967.
42. Valdés-Dapena, et al.: Sudden unexpected death in infancy. *J Pediatr*, **73**: 387, 1968.
43. Wade, N.: Bottle feeding: adverse effects of a Western Technology. *Science*, **184**: 45, 1974.