



Research Article

Volume 3 Issue 4 – March 2017
DOI: 10.19080/AJPN.2017.03.555618

Acad J Ped Neonatol

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It's Alright, Ma (I'm only Teething...) Dispelling the Myth from the Teeth



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Submission: February 05, 2017; **Published:** March 10, 2017

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Abstract

From time immemorial, teething has been blamed for all manner of childhood illnesses. In medieval times, an extensive folklore built up around teething, and the concept that teething was a major cause of infant fatality remained widely popular. By the 1970s, publications in major medical journals were seeking to dispel the notion of teething as a source of serious systemic illness. Attempts to identify the adverse effects of teething, both systemic and local, yielded varying results. The enrichment of the dental follicle with inflammatory mediators is assumed to be responsible for the local symptoms of teething. Regarding the most frequent general symptoms during primary tooth eruption, irritability and drooling are the most observed followed by decreased appetite, sleeping problems, rhinorrhea, fever, diarrhea, rash, and vomiting.

Conclusion: We summarized the folklore of teething babies followed by the current concepts of this phenomenon. We reviewed the published literature regarding teething symptoms, their physiology and treatment options. There are several local and systemic findings attributed to teething and although can result in marked discomfort, none are of clinical importance.

What is known: Tooth eruption can result in various signs and symptoms. Although in medieval times it was thought to be a major cause of infant fatality, today we know that only mild symptoms can be actually attributed to teething.

What is new: This review is a comprehensive summary of the literature on the chronicles of teething symptoms. We focused on folklore and past beliefs followed by present actual clinical presentation with treatment options.

Keywords: Teething symptoms; Tooth eruption; Teething myth

Introduction

It is not uncommon for the primary care physician, either a Family practitioner or a Pediatrician, to face the frustration of parents in distress. That is often the case with teething babies. What symptoms can be attributed to the erupting teeth and what other conditions should we seek and must not misdiagnose? These are key questions for the primary care physician when treating both babies and parents.

Quality of evidence

PubMed was searched, and articles relevant to teething symptoms, historical perspectives, clinical studies or scientific basis were reviewed. Articles were excluded when they specified symptoms in specific syndromes. This is not a systematic review,

and data collection was performed using studies of level II or III evidence.

Historical perspective

From time immemorial, teething has been blamed for all manner of childhood illnesses. References to teething pain appear as early as 3000 BC on Sumerian clay tablets. The Atharva Veda, a sacred Hindu text written around 1000 BC, included a prayer for the safe cutting of a child's teeth, and the Homeric hymns, dating from the ninth century BC, give mention to a "teething worm"[1]. The first known description of specific aspects of dentition may be found in the Indian treatise Kashyap Samhita [2]. Later texts, namely the AstangaSamgraha, written by the Ayurvedic scholar Vagbhata in the seventh century BC, list the symptoms and

complications of dentition as fever, headache, thirst, vertigo, inflammation of the eyes, vomiting, respiratory troubles, diarrhea, and skin disorders within a range of severity [3,4]. By the fourth century BC, Hippocrates understood that teeth developed in utero and wrote a short treatise, *De Dentitione*, which included 32 observations on teeth, seven of which refer to teething [5].

Early treatments for teething included boiled or roasted hare brain, recommended by Aetios of Amida in the sixth century AD, and olive oil spread along the gums, suggested by the Greek physician, Soranus of Ephesus, in 117 AD. Indeed, the application of olive oil for this purpose persisted until the seventeenth century. Galen (129-199 AD), physician to five Roman emperors, recommended camphor, chloroform, mustard baths, and local massage [1].

In medieval times, an extensive folklore built up around teething. The condition even acquired a Latin name, *DentitioDifficilis* [6], and the concept that teething was a major cause of infant fatality remained widely popular [7,8]. The practice of lancing babies' gums to treat teething was introduced in the sixteenth century by the French surgeon Ambroise Paré [9,10], and was advocated by Joseph Hurllock, who wrote a book on teething. Indeed, Hurllock suggested that gum lancing be applied for every disease irrespective of whether the teeth were evident [11]. In specific cultures, gum lancing is still considered an accepted custom, not to mention common practice. Olabu et al. [12] published a study at 2013 of more than 100 infants from the Akamba people in Kenya who underwent gum lancing and presented to the hospital with various complications from this procedure, including shock, severe infections, sepsis and death.

Approximately half of all infant deaths in eighteenth century France were attributed to teething [13]. In 1839, official registrars in England and Wales cited teething as the cause of infant death in 5016 cases [6]. Early Utah pioneer records list teething as a relatively common cause of childhood death, and from 1847 to 1881, a total of 521 deaths were documented as due to teething [14].

There were, however, some notable detractors from the widespread beliefs, such as the seventeenth century professor, Francois Ranchin [15]. In 1797, Johann Wichmann claimed that the diagnosis of teething was being used to hide physician ignorance. A French physician, Billard, described works that catalogued difficulties with teething as "an extended chapter of absurdities" [1].

The Modern era

By the 1970s, publications in major medical journals were seeking to dispel the notion of teething as a source of serious systemic illness. Illingworth proclaimed that "Teething produces nothing but teeth" [16], and a paper published in the *British Journal of Medicine* noted that "There can be no excuse for ascribing fever, fits, diarrhea, bronchitis, or rashes to teething" [17]. These efforts, backed by systematic studies, eventually led to

a shift in the approach to teething among both professionals and the general public [18]. However, opinions regarding the precise symptoms related to teething continued to diverge.

Surveys designed to identify the adverse effects of teething yielded varying results. In a 1960s study, 200 Finnish mothers were asked to list symptoms they thought were due to teething. The authors found that 90% believed teething causes gum rubbing and finger sucking, 77% believed it causes drooling, and 50% believed it leads to fever, sleep disturbances, and daytime restlessness [15]. More than two decades later, a survey of 92 Australian parents found that they continued to attribute a range of symptoms to teething. Most listed fever, pain, irritability, sleep disturbances, biting, drooling and red cheeks, followed by diaper rash, ear pulling, feeding problems, runny nose, loose stools, and infections; a few included smelly urine, constipation, colic, and convulsions. Only one parent believed that teething causes no problems [19]. In an opinion survey from Israel that included both parents (n=309) and medical personnel (45 pediatricians, 108 nurses), 76% of the responders, mostly parents and nurses, expressed the belief that teeth eruption in babies is associated with irritability, fever, and loose stools or diarrhea [20]. The symptoms attributed to teething in a similar study in the United States were swollen gums, drooling, irritability, inflamed gums, restlessness, sleeplessness, and fever [21]. Accordingly, a cross-sectional study limited to medical staff from Australia reported that the mean number of symptoms ascribed to teething was 2.8 for pediatricians, 4.4 for dentists, 6.5 for general practitioners, 8.4 for pharmacists, and 9.8 for nurses. All the professional groups claimed that parents experience at least as much distress as their infants [22].

The contemporary literature contains several prospective studies addressing this issue. Seward [23] noted that symptoms that were prevalent during the teething period were fever, infection, sleep disturbances, and diarrhea. According to other parental self-report studies, 74% of 124 infants suffered at least one local symptom during eruption of the front teeth, and 100% during eruption of the back teeth [24]. Teething infants demonstrated significantly more mouthing, sucking, and drooling than non-teething infants [24]. In contrast, in a study limited to physicians, the only symptom documented during teething was increased daytime restlessness [15].

Taking another approach, Israeli researchers asked 46 mothers to record their infant's daily temperature around the time of period of eruption of the first teeth. A mean rise of 0.5 °C was noted in the 3 days preceding teeth eruption, and 33% of the infants had a fever of 38 °C or higher on the day of eruption [25].

In a larger study of 475 tooth eruptions, Macknin et al. [18] asked parents to measure their babies' tympanic temperature twice daily and to complete a daily checklist of the presence or absence of 18 symptoms. They found that some symptoms occurred significantly more often in the 4 days before teeth emergence, on the day of teeth emergence, and 3 days after. They defined this

8-day window as the “teething period”. The main symptoms were increased biting, drooling, gum-rubbing and sucking, irritability, wakefulness, ear-rubbing, facial rash, decreased appetite for solid foods, and mild temperature elevation. However, no single symptom occurred in more than 35% of the teething babies, and no symptom was more than 20% more frequent in the teething babies than in non-teething controls. In no case did fever rise above 40 °C, and in no case a life-threatening event was described. The authors concluded that many mild symptoms traditionally attributed to teething were indeed associated with it, but no single symptom or cluster of symptoms could reliably predict teeth eruption [18].

Discrepant results were reported by Wake et al. [26] in a cohort study of 21 babies aged 6 to 24 months who underwent daily measurement of temperature and examination of the alveolar ridges by a dental therapist. In addition, medical staff and parents independently completed daily questionnaires on symptoms that had appeared during the preceding 24 hours. At the end of the study, the parents completed another questionnaire on beliefs/experiences related to teething. Data were collected for 90 teeth during 236 “tooth days”, defined as the 5 days preceding the eruption, and 895 “non-tooth days”, defined as more than 28 days clear of any eruption. The findings showed that temperatures were similar on “tooth days” and “non-tooth days”. The parents, but not the medical staff, reported loose stools during “tooth days”. Retrospectively, however, all the parents reported that their children had suffered from a range of teething symptoms. The authors concluded that teeth eruption appeared to be unrelated to a range of symptoms traditionally attributed to it [26].

A group from Finland recorded the daily appearance of the gums, temperature, and symptoms in 126 normal institutionalized infants [27]. They noted that teeth eruption was associated with restlessness, increased salivation, thumb sucking, gum rubbing, and refusal to eat, but not with infections, diarrhea, bronchitis, fever, rashes, convulsions, sleeplessness at night, or ear rubbing. However a study of 120 children revealed that 39% exhibited at least one of the following symptoms during eruption of the mandibular deciduous central incisors: fever, vomiting, diarrhea, drooling, irritability, facial rashes, and rhinorrhea [28]. The most frequent clinical manifestations found by Peretz et al. [29], in 145 children aged 4 to 36 months, using both parental questionnaires and independent clinical examination, were drooling (15%), diarrhea (13%), drooling and diarrhea (8%), fever (8%), and fever and diarrhea (8%). Most of the symptoms appeared during eruption of the primary incisors.

Cunha et al. [30] identified local and systemic manifestations in 95% of 1165 children aged up to 3 years. Gingival irritation was the most frequent (85%) and runny nose, the least frequent.

Shapira et al. [31] compared rates of adverse clinical manifestations between the teething and non-teething periods in 16 children. They found that behavioral problems rose from

16% in the non-teething period to 50% during teething, fever rose from 8% to 24%, and coughing from 2% to 12%. These differences were highly statistically significant.

In a prospective study by Feldens et al. [32], 500 children who were recruited at birth, were assessed via parental interviews, anthropometric measurements and dental examinations after birth, at 6 months and at 12 months of age. Teething symptoms were reported in 73% of the children followed, of which, irritability (40.5%), fever (38.9%), diarrhea (36%) and itching (33.6%) were the most common.

Ramos-Jorge et al. [33], evaluated 47 healthy Brazilian infants aged 5-15 months. Their daily fever measurements, oral examinations and maternal interviews addressed 13 common signs and symptoms that may have been observed in the 24 hours prior to the visit. The investigators showed that body temperature rise on the day of the eruption within normal range and could not have been defined as “fever”. On the other hand, irritability, increased salivation, runny nose, and loss of appetite were statistically significant associated with teething.

Memarpour et al. [34] studied more than 250 infants aged 8 – 24 months were evaluated during the 8 days period of teeth eruption. The researchers found that the most frequent teething symptoms were drooling (92%), sleep disturbances (82.3%) and irritability (75.6%). Canine eruption was more associated with loss of appetite than incisor ($p = 0.033$) or molars eruption ($p = 0.014$). Slight increases in body temperature were observed only on the day of eruption (36.70 ± 0.39 °C), while body temperature remained within its normal limits*.

In an Australian study performed by Amarasena & Lalloo [35], it was found that teething was the most common cause attributed to sleeping disturbance, nearly four times more common than the next most prevalent specific cause, i.e. ‘illness, difficulty breathing, or pain’ and more than 10 times higher than the more often cited reasons of nightmares or being afraid.

A recent review published by Massignan et al. [36] included 16 studies that met the inclusion criteria. They found that overall prevalence of signs and symptoms occurring during primary tooth eruption in children between 0 and 36 months was 70.5% (total sample=3506). Gingival irritation (86.81%), irritability (68.19%), and drooling (55.72%) were the most frequent ones.

Inflammation and tooth eruption

The last several decades have witnessed a growing investment in the search for an immunological basis to the clinical manifestations of teething and its associated gingival trauma. Studies have shown that teething induces the release of proinflammatory and immune regulatory cytokines, including interleukins (ILs), tumor necrosis factors (TNFs), interferons (IFNs), polypeptide growth factors (GFs), and colony-stimulating factors (CSFs) [37]. IL-1 β is a major “endogenous pyrogen” in inflammatory states, potentially contributing to tissue damage

by stimulating the release of neutral metalloproteases from fibroblasts and other mesenchymal cells; it can also induce the production of many other cytokines including the IL-1 β antagonist, IL-1RA [38,39]. Epithelial cells and macrophages, which are known to secrete IL-1 β , IL-6 and TNF α , make up a significant part of the periodontal tissue [40]. Furthermore, high levels of IL-1 β have been associated with fever and other clinical conditions, and systemic IL-1 β levels are directly correlated with the severity of inflammatory diseases [41,42]. TNF α , also termed cachexin, is a cytokine involved in systemic inflammation and acute phase reaction. It has a distinct role in the regulation of immune cells, and by performing as an endogenous pyrogen, it is able to induce fever, apoptosis, cachexia, inflammation and to inhibit tumorigenesis and viral replication and respond to sepsis via IL-1 & IL-6 producing cells.

Shapira et al. [31] found that inflammatory cytokine levels in tumors of the gingival crevice of the primary incisors, were directly associated with symptoms otherwise attributed to teething. The release of IL-1 correlated with fever, gastrointestinal disturbances, sleep disturbances, and anorexia; of IL-8 with gastrointestinal disturbances and of TNF α with sleep disturbances and fever. In the control period, 1 month after eruption of the teeth, IL-1 levels again correlated with fever, behavioral problems and sleep disturbances; IL-8 with fever and sleep disturbances; and TNF- α with coughing. This was the first study to directly demonstrate the possible role of local cytokines in inflammatory and irritative systemic disturbances during teething.

In a rat model [43], Landim et al investigated the gingival mucosa of infant rats at different days of postnatal life and showed an inflammatory reaction with progressive intensity that occurred during teething process, and was initiated by the release of IL-1 β .

Remedies for tooth eruption

Inconclusive findings arose from different studies regarding the symptoms related to teething, but there is no debate regarding the substantial discomfort it can cause to a young infant at the very least. As such, it brought the need for various remedies along the years, as discussed above. In a recent study, discussed above, Memarpour et al. [34] examined five methods used as remedies to reduce teething symptoms: cuddle therapy, ice, rubbing the gums, teething rings and food for chewing. Teething symptoms, the type of erupted teeth, symptoms of recovery and the mother's satisfaction with treatment were evaluated during the study. They found that the most favorable results for time to recovery and the mother's satisfaction were seen when teething rings were used, followed by cuddle therapy and rubbing the gums.

At present, pharmacological remedies are very limited. Topical pain relievers and medications are not recommended neither by the FDA (U.S. Food and Drug Administration), nor by the American Academy of Pediatrics. Moreover, the FDA issued a boxed warning against oral solutions that contain Lidocaine for the treatment of teething pain on 2014. Regarding systemic pain relievers, such as acetaminophen and ibuprofen, there is no

official reference to their use in teething pain, therefore they are not considered part of the formal recommendations for teething pain. The American Academy of Pediatrics recommendations for treating teething pain includes the use a teething ring chilled in the refrigerator (not frozen) and gentle rub or massage of the child's gums with a clean caregiver's finger. As pharmacological treatment is not considered an accepted management by Pediatric associations, then, non-pharmacological remedies are the next option. There are numerous suggestions for the child's caregivers in order to relieve the teething pain, but most are not discussed in any formal recommendation, and thus, it is hard to evaluate their effectiveness. One should remember that as in most alternative therapies, some of the non-pharmacological remedies for teething pain, are not screened or regulated by any authority and might be hazardous.

Conclusion

The improved understanding of medical disease and child development with time revolutionized the approach to teething. Though no longer considered a life-threatening event, parents and pediatricians generally agree that teething may be accompanied by pain and discomfort, leading to generally mild behavioral or clinical manifestations. Clinician awareness of the findings associated with teething is important, as the presence of more severe symptoms in children with teething should prompt in-depth investigations to rule out more serious causes. Researchers today assume that it is the enrichment of the dental follicle with inflammatory mediators that is responsible for the local symptoms of teething. It is widely agreed by primary care physicians that treatment for teething should be symptomatic, local or systemic, if at all needed.

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DOI: [10.19080/AJPN.2017.03.555618](https://doi.org/10.19080/AJPN.2017.03.555618)

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