

‘Keller & Barnes’ after 5 years—*still* inadmissible as evidence

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Five years ago *Pediatric Radiology* published a commentary titled “Rickets vs. abuse: a national and international epidemic” by Keller and Barnes [1]. The “Keller & Barnes” commentary was carefully bracketed by three related commentaries [2–4].

In their commentary titled “Evaluating the data concerning vitamin D insufficiency/deficiency and child abuse,” Slovis and Chapman [2], then editors of this journal, examined the “Keller & Barnes” commentary in detail and concluded that “the connection made by Keller and Barnes between ‘rickets’ and fractures they consider to be similar in appearance to those seen in child abuse is not based on any scientific data” [2]. They noted in the commentary that radiologic rickets was “*not* present” on the images and that “none of the children had vitamin D levels reported at the time they were supposed to have rickets” [2]. A subsequent commentary authored by Feldman [5] appeared in the October 2009 issue of *Pediatric Radiology*. Dr. Feldman had personal knowledge of three of the four cases presented in “Keller & Barnes” and had communicated with physicians at Cincinnati Children’s Hospital, where the fourth patient was cared for [5]. His commentary noted misinterpretation or misrepresentation of radiologic findings and omission of key clinical and radiologic findings by Keller and Barnes [5]. Feldman noted that “neither Dr. Keller nor Dr. Barnes provided clinical care to these children” and identified a lack of disclosure by Keller and Barnes of the source of their cases from legal consultations rather than clinical care [5].

So what has happened in the 5 years since “Keller & Barnes” was published?

Since 2008, neither Keller nor Barnes has published an academic work on rickets, vitamin D deficiency or radiography of child abuse. Nothing.

Looking broadly beyond Keller and Barnes, since 2008 no study in the literature has shown that fractures considered to be highly specific for child abuse are caused by vitamin D insufficiency or deficiency. A call from this journal for such evidence has gone unanswered [6]. As previously noted [6], both child abuse and vitamin D deficiency are common, yet no studies have linked vitamin D deficiency to fractures considered to be highly specific for child abuse.

To the contrary, since 2008 there have been studies that serve to refute the hypotheses of “Keller & Barnes” [7–9]. A seminal paper by Schilling et al. [7] in *Pediatrics* found that vitamin D insufficiency is not associated with the presence of multiple fractures, metaphyseal fractures or rib fractures. Infants with fractures from child abuse were no more likely to demonstrate vitamin D insufficiency than other children [7]. They concluded that “a low 25(OH)D should not discourage consideration of abuse when a child presents with unexplained fractures” [7]. A study by Perez-Rossello et al. [8] in *Radiology* looked at 360 healthy infants, 44 of whom (12%) had vitamin D deficiency as defined by 25 OH-vitamin D < 20 ng/mL. There were no fractures [8]. A study by Chapman et al. [9] in this journal looked at fractures in infants and toddlers with rickets. Of the 45 children studied, 17.5% had fractures, but the fractures encountered did not resemble those seen in child abuse [9]. Fractures were seen in children with “more severe under-mineralization” and occurred in older infants who had gained some independent mobility [9]. A conspicuous absence of young infants presenting with rickets and fractures is noted [9].

The hypotheses set forth in “Keller & Barnes” thus remain hypothetical and unsubstantiated.

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Perhaps better stated, the hypotheses of “Keller & Barnes” have been disproved. Whether in legal proceedings or in medical literature, it is inexcusable and inappropriate to cite “Keller & Barnes,” particularly without simultaneously citing the accompanying commentary by Slovis and Chapman [2] and the subsequent commentary by Feldman [5]. To do so is deceptive. Moreover it is deceptive to cite “Keller & Barnes” without the context provided by the subsequent studies noted in the previous paragraph.

There is substantial evidence that rickets and other metabolic bone diseases do predispose children to fractures [9–12]. Pediatric radiologists who interpret radiographs experience these cases very commonly, often on a daily basis. These children have other overt changes on radiography, namely osteopenia or findings of rickets. They also come with clinical history indicating a risk of metabolic bone disease and laboratory data to confirm it. Moreover the fractures seen are not those considered to be highly or even moderately specific for child abuse [9, 12]. In rare instances, fractures may more closely mimic those seen in child abuse [13]. We are very well aware that disorders other than child abuse predispose children to fractures and consider it routinely.

Our understanding of metabolic bone disease in infants continues to improve. The commentary by Keller and Barnes made us pause to learn more. Otherwise, it changed nothing.

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