



## G37 Differential Identification of Three Young House Fire Victims: Methods When Statistics Fail

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After attending this presentation, attendees will be able to recognize how differential analysis of tooth maturity scores in dental age assessment can be used to graphically distinguish between child victims who are statistically the same age. Attendees will also be able to appreciate how radiographic and clinical presentation in childhood identical twins can elicit genetic versus acquired similarities and differences and can be used for exclusion of other victims.

This presentation will impact the forensic science community by discussing how forensic odontology provided a method to aid in the identification of three children, 4.4-year-old identical twins and a third unrelated 4.1-year-old child.

In July 2014, a fire consumed an urban row home in Philadelphia, PA. Four children perished in the fire. One of the victims was an infant and was identified by exclusion.

The medical examiner requested that odontology be employed to compare age estimations and dental uniqueness for the three remaining victims in order to corroborate the correct identity of each. This analysis was aided by the fact that two of the victims were presumed to be female identical twins with a birth date of January 25, 2010 (4 years, 5 months of age at death). For reference, they were designated as “Child A” and “Child B” in this study. The third child was male and had a birth date of May 24, 2010 (4 years, 1 month of age at death) and was designated as “Child C.” All three victims presumably had never had professional dental care, so antemortem/postmortem comparisons were not possible.

All three were badly charred, with intact craniofacial structures. Soft tissue resection was accomplished. A full series of radiographs, as well as photographic images, were made on each case.

In comparison of the radiographs obtained to a published graphical standard of dental development, the average maturation of tooth buds, calcification of tooth structure, and eruption pattern indicated an age estimation of 4.5 years ( $\pm 0.58$  year) for “Child A” and “Child B”.<sup>1</sup> According to the same standard, “Child C” presented with a slightly different estimation of 4.0 years ( $\pm 0.52$  year). These estimates via this atlas method were therefore not significantly different from each other.

Staging analysis was then performed on the three sets of radiographs, utilizing 14 permanent teeth, utilizing the unknown sex data set described by Moorees et. al.<sup>2</sup> As expected, the mean average dental ages of the three victims were also not statistically different at 95% confidence; however, a box plot of the 14 individual maturity scores clearly showed the difference between the two identical twins and the third unrelated child. “Child A” and “Child B” shared a strikingly similar growth pattern in their dentition as seen on the radiographs. Both cases exhibit a permanent dentition with the same stage of growth on each tooth, with one exception (tooth #19). Of particular interest is the same delayed calcification of the lower second bicuspsids, as compared to the advanced maturation stage of the permanent lower first molars. Based on this analysis, it was determined that “Child C” was, in fact, the non-twin victim and thus positively identified through exclusion.

Mostly due to the lack of antemortem evidence, positive identification between the two twins was not possible; however, it is of academic interest that there existed distinct acquired and developmental differences between them. Both twins exhibited evidence of a finger-sucking or pacifier habit with pre-maxillary protrusion, palatal constriction, and anterior open bite; however, the altered growth was more pronounced in “Child A” with an 8mm anterior open bite versus “Child B” with only a 5mm anterior open bite. Also, “Child A” had an erupted #19 clinically and “Child B” did not. Further, “Child A” presented with slightly advanced eruption of #25 compared to #24, whereas this was reversed in “Child B.” Lastly, “Child B” exhibited decay on two primary teeth whereas “Child A” appeared caries-free.

In conclusion, this case demonstrated that individual tooth staging can be useful when the difference in average mean dental age of victims who are close in actual age is not statistically significant. Further, it was shown that even identical twins can have definable differences in dental appearance.

### Reference(s):

1. AlQahtani S.H. (2010). Brief communication: The London Atlas of Human Tooth Development and Eruption. *Am. J. Phys. Anthropol.* 142: 481–490.
2. Moorrees C.F., Fanning E.A., and Hunt Jr. E.E. (1963). Age Variation of Formation Stages for Ten Permanent Teeth. *J Dent Res.* 42; 1490-1502.

### Maturity Score, Dental Staging, Twins