

Effective radiation exposure in missed cases of developmental dysplasia of the hip.

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Introduction:

- Developmental dysplasia of the hip (DDH) is a common condition that can be managed conservatively if diagnosed early.
- If a diagnosis of DDH is missed there is often a need for surgical intervention and radiographic evaluation.
- There is currently no evaluation of radiation exposure in a DDH population available

Method:

- 74 missed cases of DDH (presenting >6 months of age) were identified and prospectively monitored for the first 5 years of life between 2007 and 2017.
- The radiation dose was calculated at the time of radiological evaluation in Gym-cm² for plain radiography, and intraoperative radiation, computed tomography, was recorded as DLP and covered to mSv effective dose at the time of analysis.
- These values were both recorded prospectively and re-validated by retrospective review. The effective dose (mSv) was estimated according to ICRP103 criteria.

Results:

- The 74 children were exposed to 989 radiation examinations.
- Conventional radiographs represented 80.0% of examinations whereas computed tomography accounted for 85.5% of all cumulative exposure.
- The overall median cumulative effective dose was 15.9 mSv (range 8.62 – 42.5).
- Mean dose per year of 5.3mSv however this demonstrated significant weighting in earlier life (figure 3, p<0.01)
- The gonadal exposure was likely significantly higher, with estimated the average ovary received 23.2 mSv of effective exposure and average testicle 51.1mSv

Conclusion:

- This study has established a significant impact of a missed case of DDH on radiation exposure in the paediatric patient. High levels of radiation exposure in such a young person are cause for concern, especially in areas of such high radiation sensitivity.
- This study highlights an often underappreciated risk of potentially avoidable cancer-risk secondary to a missed case of DDH and reinforces the need for improved screening processes to avoid it.
- We have not modelled cancer risk as this is difficult to do with accuracy using the current models available, however, we suggest the need for epidemiological studies in those with missed cases of DDH to evaluate the impact of radiation exposure on cancer risk.

Radiation exposure by six-monthly intervals until 36 months of age

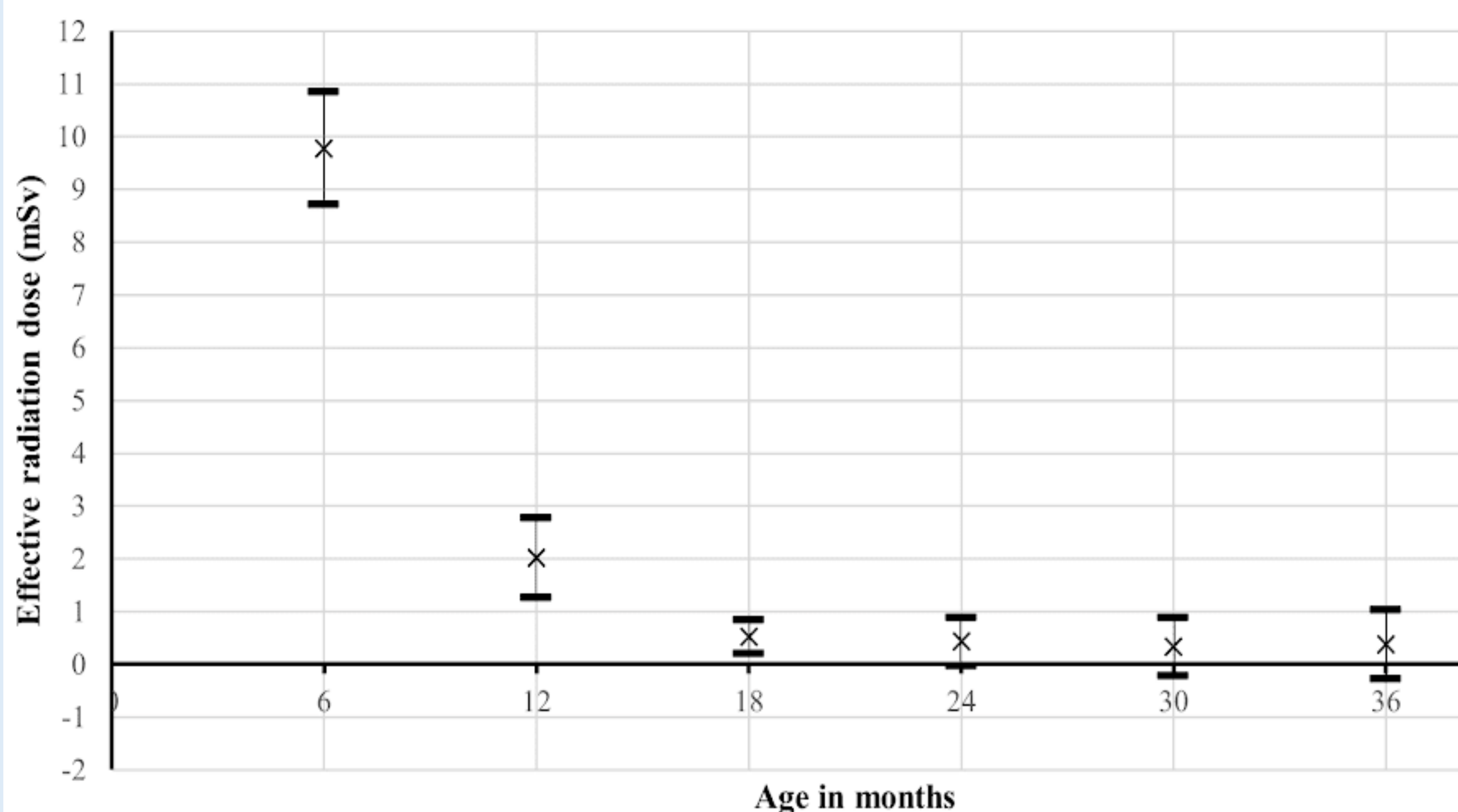


Figure 1. a graphical representation of the accumulation in total effective radiation exposure exposure in patients with a missed diagnosis of developmental dysplasia of the hip (those diagnosed by radiographic evaluation over the age of 6 months). It is clear that the majority of exposure is within the first 6 months following diagnosis (6-12 months of life) likely due to preoperative and postoperative evaluation of the dysplastic hip. DDH (developmental dysplasia of the hip), mSv millisieverts.

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