

Erratum to: Risk of cancer incidence before the age of 15 years after exposure to ionising radiation from computed tomography: results from a German cohort study

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When performing an additional follow up of our cohort study [1], [2] we discovered two errors.

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First, Table 1 and Table 2 included 44,584 patients who were eligible for the study but did not fulfil all criteria for the analysis. However, for the final analysis only 39,184 persons and 63,214 CT examinations were included. Tables 1 and 2 with the numbers of persons included in the analysis are given below.

Secondly, we found one case of lymphoma which was wrongly included twice in the analysis as the child was treated in three hospitals. The total number of cases that

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Table 1 Number of individuals excluded and included into the analyses and characteristics of included individuals by sex, final exposure frequency and year of birth

| Characteristics | Individuals | |
|--------------------|-------------|---------|
| | Number | Percent |
| Recorded total | 82,971 | |
| Not included | 43,787 | |
| Included | 39,184 | 100.0 |
| Sex | | |
| Boys | 22,984 | 58.7 |
| Girls | 16,155 | 41.2 |
| Unknown | 45 | 0.1 |
| Exposure frequency | | |
| One CT | 27,534 | 70.3 |
| Two or more CTs | 11,650 | 29.7 |
| Birth cohort | | |
| 1966–1990 | 6790 | 17.3 |
| 1991–2000 | 22,672 | 57.9 |
| 2001–2008 | 9722 | 24.8 |

should be correctly included in the analysis is 38 (not 39), the corresponding number of lymphoma is 10 (not 11). Consequently the estimates for “all cancer” and “lymphoma” changed slightly, whereas results for leukaemia, CNS, and other solid tumours are not altered (new

Table 2 Number and proportion of individuals by exposed body regions and by final exposure frequency

| Individuals | Exposure frequency | |
|-----------------------------------|--------------------|------------------|
| | One CT | More than one CT |
| Individuals | 27,534 100.0% | 11,650 100.0% |
| Exposed body regions ^a | | |
| Head | 69.6% | 49.1% |
| Neck | 2.8% | 0.7% |
| Chest | 9.7% | 7.9% |
| Abdomen | 3.9% | 1.8% |
| Pelvis | 1.1% | 0.5% |
| Extremities | 4.7% | 1.7% |
| Multiple regions | 5.3% | 37.4% |
| Not classifiable | 2.8% | 0.9% |
| Missing | 0.2% | 0.0% |
| At least one head CT | 69.6% | 76.8% |

^a Based on all included CTs received by individual persons

tables are given below). Accordingly the numbers in Tables 3, 4, 5, 6 and 7 changed and the number of person years slightly decreased from 161,407.41 to 161,406.65.

Additionally we would like to correct the name of one author. It should be J. Schlick and not I. Schlick.

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Table 3 Availability of radiology reports or medical data from the German Childhood Registry for cancer cases and randomly drawn non-cases and distribution of persons with data indicating early cancers or higher risk for cancer after 2 years' latency

| Persons | Cancer cases by cancer type | | | | | Non-cases | | |
|---------------------------------|-----------------------------|--------|------------------------|-----------------------|--------------------------|----------------------------|---------------|--------|
| | All | | Leukaemia ^a | Lymphoma ^b | CNS tumours ^c | Solid cancers ^d | Random sample | |
| Total | 44 | | 12 | 11 | 8 | 13 | 138 | |
| Radiology reports not available | 9 | | 5 | 1 | 2 | 1 | 10 | |
| Radiology reports available | 35 | 100.0% | 7 | 10 | 6 | 12 | 128 | 100.0% |
| Cancer | 6 | 17.1% | 0 | 1 | 1 | 4 | 0 | 0.0% |
| PTLD | 4 | 11.4% | 0 | 4 | 0 | 0 | 0 | 0.0% |
| Symptoms | 1 | 2.9% | 0 | 0 | 0 | 1 | 2 | 1.6% |
| Syndromes | 3 | 8.6% | 0 | 1 | 1 | 1 | 0 | 0.0% |
| Suspicion | 0 | 0.0% | 0 | 0 | 0 | 0 | 4 | 3.1% |
| None of above | 22 | 60.0% | 7 | 4 | 4 | 6 | 122 | 95.3% |

The results are displayed hierarchically: a person being assigned in one group could not be assigned to any of the following. Cancer = a cancer disease was present at time of first examination, PTLN = a Post-Transplant Lymphoproliferative Disorder was diagnosed, Symptoms = Symptoms for a cancer disease were noted but did not necessarily imply the existence of cancer, Syndromes = diseases linked to elevated cancer risk were diagnosed, Suspicion = the CT was performed due to suspicion of cancer

^a ICCC3: Ia, Ib, Id; ^b ICCC3: IIa–IIc; ^c ICCC3: IIIb, IIIc, IIIe; ^d ICCC3: Iva, IXa, IXd, Xa, Xc, XIb, ICCC3 = International Classification of Childhood Cancer, 3rd edition (Steliarova-Foucher et al. 2005)

Table 4 Number of observed cancer cases by cancer type for inclusion based on the German Childhood Cancer Registry and after the use of additional medical data for 2 years' latency

| Observed cases | Cancer type | | | | |
|---------------------------|-------------|------------------------|-----------------------|--------------------------|----------------------------|
| | All | Leukaemia ^a | Lymphoma ^b | CNS tumours ^c | Solid cancers ^d |
| Identified through GCCR | 44 | 12 | 11 | 8 | 13 |
| Included in analyses | 38 | 12 | 10 | 7 | 9 |
| Excluding high risk group | 30 | 12 | 5 | 6 | 7 |

Identified through GCCR = all cases diagnosed at least two years after the first known CT, Included in analyses = included cases after review of the radiology reports and medical files from the GCCR, Excluding high risk group = included cases after review of the radiology reports and medical files from the GCCR except those at high risk

^a ICCC3: Ia, Ib, Id; ^b ICCC3: IIa–IIc; ^c ICCC3: IIIb, IIIc, IIIe; ^d ICCC3: Iva, IXa, IXd, Xa, Xc, XIb, ICCC3 = International Classification of Childhood Cancer, 3rd edition (Steliarova-Foucher et al. 2005)

Table 5 SIRs for all cancer, leukaemia, lymphoma, CNS tumours and solid cancer separately including and excluding persons at high risk for cancer after 2 years' latency

| Cancer type | All included cases ^a | | | Excluding persons at high risk ^b | | |
|---------------|---------------------------------|------|------------------|---|------|------------------|
| | Obs. | Exp. | SIR (95% CI) | Obs. | Exp. | SIR (95% CI) |
| All cancers | 38 | 20.9 | 1.82 (1.29–2.50) | 30 | 20.1 | 1.49 (1.01–2.13) |
| Leukaemia | 12 | 7.0 | 1.72 (0.89–3.01) | 12 | 6.7 | 1.79 (0.92–3.12) |
| Lymphomas | 10 | 3.4 | 2.96 (1.42–5.45) | 5 | 3.2 | 1.54 (0.50–3.59) |
| CNS tumours | 7 | 5.2 | 1.35 (0.54–2.78) | 6 | 5.0 | 1.20 (0.44–2.61) |
| Solid cancers | 9 | 5.4 | 1.68 (0.77–3.19) | 7 | 5.2 | 1.36 (0.55–2.80) |

Obs. observed, Exp. expected, SIR standardised incidence ratio, 95% CI 95% confidence interval

^a All included cases after review of the radiology reports and medical files from the GCCR

^b All included cases after review of the radiology reports and medical files from the GCCR except those at high risk

Table 6 SIRs by exposure frequency for all cancer, leukaemia, lymphoma, CNS tumours and solid cancer including persons at high risk for cancer after two years' latency

| Cancer type | Number of CTs | Obs. | Exp. | SIR | 95% CI |
|---------------|---------------|------|------|------|-------------|
| All cancers | One | 25 | 15.2 | 1.64 | (1.06–2.43) |
| | Two or more | 13 | 5.7 | 2.29 | (1.22–3.91) |
| Leukaemia | One | 6 | 5.1 | 1.18 | (0.43–2.57) |
| | Two or more | 6 | 1.9 | 3.17 | (1.16–6.90) |
| Lymphomas | One | 9 | 2.5 | 3.67 | (1.68–6.97) |
| | Two or more | 1 | 0.9 | 1.08 | (0.03–6.02) |
| CNS tumours | One | 4 | 3.8 | 1.06 | (0.29–2.71) |
| | Two or more | 3 | 1.4 | 2.12 | (0.44–6.18) |
| Solid cancers | One | 6 | 3.9 | 1.54 | (0.56–3.35) |
| | Two or more | 3 | 1.5 | 2.07 | (0.43–6.04) |

Obs. observed, *Exp.* expected, *SIR* standardised incidence ratio, *95% CI* 95% confidence interval

Table 7 Comparison of the cohort composition and the risk estimates for leukaemia and CNS or brain tumours for three published epidemiological cohort studies on cancer risk after CTs in childhood and the presented study from Germany

| | Epidemiological studies | | | |
|--------------------------|-------------------------|------------------|-------------------|----------------------|
| | Great Britain | Australia | Taiwan | Germany |
| Cohort | | | | |
| Size | 178,604 | 10,939,680 | 122,086 | 39,184 |
| Exposed | 178,604 | 680,211 | 24,418 (head CTs) | 39,184 |
| Age range | 0–<22 | 0–<20 | 0–<18 | 0–<15 |
| Follow-up period | 1985–2008 | 1985–2007 | 1998–2008 | 1983–2010 |
| Cases | 209 | 3150 | 122 | 38 (44) ^a |
| Of exposed: only one CT | 71% ^b | 82% | 93% | 70% |
| Head CTs | 57% ^c | 59% ^d | 100% | 72% ^e |
| Leukaemia | | | | |
| Cases | 74 | 211 | 17 | 12 |
| Risk estimate | RR: 3.18 | IRR: 1.23 | HR: 1.90 | SIR: 1.72 |
| 95% CI | 1.46–6.94 | 1.08–1.41 | 0.82–4.40 | 0.89–3.01 |
| Comparison | 0–5 vs. 30 mGy | CT vs. no CT | head CT vs. no CT | CT vs. no CT |
| Latency | 2 years | 1 year | 2 years | 2 years |
| Brain/CNS tumours | | | | |
| Cases | 135 | 283 | 30 | 7 |
| Risk estimate | RR: 2.82 | IRR: 2.13 | HR: 2.56 | SIR: 1.35 |
| 95% CI | 1.33–6.03 | 1.88–2.41 | 1.44–4.45 | 0.54–2.78 |
| Comparison | 0–5 vs. 50 mGy | CT vs. no CT | head CT vs. no CT | CT vs. no CT |
| Latency | 5 years | 1 year | 2 years | 2 years |

HR hazard ratio, *RR* relative risk, *SIR* standardised incidence ratio, *IRR* incidence rate ratio

^a (Before) and after review of the radiology reports

^b From all persons including cancer patients

^c From all CTs

^d From all first CT per person

^e Individuals receiving head CTs from all cohort members. Data on other studies derived from (Pearce et al. 2012; Pearce et al. 2012b; Mathews et al. 2013; Huang et al. 2014)

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