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ORIGINAL ARTICLE

Postmortem CT compared to autopsy in children; concordance in a forensic setting

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Abstract
Objectives The aim of this study is to assess the accuracy of postmortem CT (PMCT) in determining the cause of death in children who underwent a forensic autopsy because of a suspected nonnatural death.
Methods We selected forensic pediatric autopsies at the Netherlands Forensic Institute, whereby the subject underwent PMCT between 1-1-2008 and 31-12-2012. Cause of death was independently scored by a radiologist and a pathologist. Cause of death was classified (1) in categories being natural, unnatural, and unknown; (2) according to the ICD-10; and (3) according to institutional classification.
Results In the study period, 189 pediatric forensic autopsies were performed. Fifteen were excluded because of putrefaction. Of the remaining 174 autopsies, 98 (56 %) underwent PMCT. PMCT and autopsy identified the same category in 69/98 cases (70 %, kappa 0.49). They identified the same cause of death in 66/98 cases (67 %, kappa 0.5) using ICD-10; in 71/98 (72 %, kappa 0.62) using a forensic classification. PMCT performed better in unnatural deaths (59–67 % agreement) than in natural deaths (0 % agreement). If no cause of death was detected with autopsy, PMCT failed to identify a cause of death in 98 % (39/40).
Conclusions Pediatric PMCT does identify the majority of unnatural causes of death, but does not identify new diagnoses (true positives) if no cause of death is found during autopsy. Diagnostic accuracy in natural deaths is low.

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Key points • The case mix is an important predictor for the concordance between PMCT and autopsy.
• In case of an unnatural death, 72–-81 % of PMCT results matches autopsy results.
• In case of a natural death, 0 % of PMCT results matches autopsy results.
• If no cause of death is identified with autopsy, 98 % of PMCT results concurs.

Keywords Autopsy · Tomography · X-Ray Computed · Comparative Study · Cause of Death · Forensic Sciences

Abbreviations and acronyms

ICD-10	International Classification of Diseases, version 2010
NFI	Netherlands Forensic Institute
PMCT	Postmortem CT
SDH	Subdural hematoma

Introduction

Postmortem imaging to determine the cause of death is becoming increasingly popular in both a clinical and forensic setting. A reason for this is that autopsy rates are declining and postmortem imaging seems to be an acceptable alternative. Although the number of publications on the subject is rapidly expanding, the diagnostic accuracy of postmortem imaging compared to conventional autopsy has not yet been validated for all settings. In earlier studies, the majority of cases were fetuses and neonates [1, 2] or adults who died of traumatic causes [3–5]. Recently, two major validation studies in clinical/community samples have been published; one in adults [6] and one in fetuses and children [7]. In the study in

adults, both postmortem CT (PMCT) and postmortem MRI were performed; the study showed a concordance rate on cause of death (identifying the organ system involved) between postmortem imaging and autopsy of 70 % (n=127/182). In the study concerning children, only postmortem MRI was performed. This study demonstrated a concordance rate of 50 % in fetuses (n=137/272) and 69 % in children (n=85/123), which was much higher if MRI was combined with minimally invasive autopsy (MIA). MIA enhanced the concordance rate to 97 % in fetuses (n=263/272) and 76 % in children (n=94/123). Both studies were performed under ideal circumstances, with every effort being made to obtain optimum scanning and reporting conditions. In the study in adults, both PMCT and postmortem MRI were assessed by four general radiologists, two neuroradiologists, and two cardiac radiologists. Several consensus reports were written, resulting in 11 radiology reports per case. In the study in children, MRI was interpreted by four independent specialist pediatric radiologists. As mentioned by the authors, the results might therefore not reflect clinical practice.

Although PMCT resulted in better concordance than postmortem MRI in adults [6], little has been published on the use of PMCT in pediatric deaths. One PMCT study performed in children who died unexpectedly showed a concordance rate between PMCT and autopsy of 89 % (n=42/47) [8]. In order to determine the value of postmortem imaging, this technique needs to be validated in different settings. The aim of this study is to assess the accuracy of PMCT in determining the cause of death in children who underwent a forensic autopsy because of a suspected nonnatural death.

Materials and methods

Study population

We selected all consecutive pediatric autopsies that were performed at the Netherlands Forensic Institute (NFI, the Hague) in the period 1-1-2008 to 31-12-2012, whereby the subject underwent PMCT. The NFI is the national center for forensic autopsies, and according to Dutch law, all nonnatural deaths in which a crime is suspected have to have an autopsy performed at the NFI. We excluded cases with severe postmortem changes, scoring more than five points on the decomposition staging scale [9]. The study was not subject to institutional review board approval, as postmortem imaging was performed as part of the forensic work-up according to institutional NFI protocol [10].

Postmortem imaging

Total body PMCT was performed shortly before autopsy, using a clinical state-of-the-art scanner (Toshiba Aquilon, Toshiba Medical Systems Europe B.V, Zoetermeer, the Netherlands; Philips Brilliance 64, Philips Healthcare, Best, the Netherlands; or Siemens Sensation 64, Siemens, Erlangen, Germany). In all cases, maximum of 3.0-mm-thin slices, with sagittal and coronal reconstructions, were obtained. Field of view was adjusted to body size of the child. A PACS system (AGFA Impax 6.4, Mortsel, Belgium) was used to review the studies. The NFI does not have CT facilities; scans were therefore performed in the departments of radiology in the Groene Hart Ziekenhuis (Gouda) and the Academic Medical Center (Amsterdam). All PMCT scans were evaluated by a forensic pediatric radiologist (RR) with 10 years of experience in forensic pediatric radiology.

Autopsy

Median time between time of death and autopsy was 1 day, range 0–7 days; in 90 % of the cases, an autopsy was performed within 2 days. Autopsies were performed according to the local protocol of the NFI [10]. The NFI autopsy includes external and internal examination of the body (both macroscopically and microscopically), including the internal organs of the three body cavities and dissection of the skull, neck, and back. Additional investigations such as toxicology, microbiology, anthropology, DNA, and metabolic investigations are performed when indicated, depending on the case at hand. All findings (both normal and abnormal) are reported; the cause, or possible cause, of death is a central aspect in the conclusion of the report. All autopsies were performed by a forensic pediatric pathologist (VS or AM) with respectively 8 and 15 years experience in the pediatric forensic field.

Data evaluation

Both the radiologist (RR) and pathologist (VS) determined the cause of death based on their findings. They had access to limited patient data, namely age, gender, medical problems before death, and scene findings. The radiologist did not inspect the body, nor did he have access to postmortem photos of the victims. Cause of death was classified in three ways: (1) in three main groups comprising natural, unnatural, and no cause of death; (2) according to the ICD-10 [11]; and (3) according to the forensic classification developed by the NFI [10]. For the concordance between radiologist and pathologist, cause of death was scored based on autopsy or PMCT findings only. In other words, a case could only be classified as unnatural cause of death if something abnormal was found during PMCT or autopsy. To describe the baseline characteristics of the group and to compare the scanned versus not-scanned cases, cause of death was scored based on autopsy findings in combination with scene findings. As an example, a cause of death could be unnatural if two children were found dead while the parent was committing suicide. Based on scene

findings, this was classified as an unnatural death, although no specific pathology was detected with PMCT or autopsy. To determine the correlation between radiologist and pathologist, only causes of death they were sure of were scored for this study. Concomitant disease was not classified, as these data were obtained in a forensic evaluation and we aimed to score undoubted causes of death. The reference standard was cause of death identified by the pathologist. Both radiologist and pathologist were blinded for the information by the other rater.

Analysis

Data were analyzed using IBM SPSS Statistics 19. Medians with interquartile ranges (IQR) were calculated for numerical variables, as data were not normally distributed. Normality was assessed using the Kolmogorov-Smirnov test. Differences between subgroups were tested with a Mann-Whitney *U* test for numerical variables and Chi-square for categorical variables. Agreement was expressed as absolute concordance (number of cases correctly identified by radiologist divided by total numbers of autopsies). Furthermore, the kappa coefficient was calculated to describe the agreement between radiologist and pathologist, taking into account the agreement occurring by chance.

Results

Study group

In the 5-year study period, 189 pediatric forensic autopsies were performed at the NFI. Fifteen of these were excluded from this study because of severe putrefaction, these have been described in another paper [12]. Of the 174 autopsies with few postmortem changes, 98 (56 %) underwent PMCT (Fig. 1). The number of PMCTs increased over time, from 34 % in 2008 to 70 % in 2012. In the group with a PMCT scan, median age was 1 year and 1 month, IQR 3 months to 6 years. There were 52 boys (53 %) and 46 girls (47 %).

The case mix of the children who underwent PMCT was typical for the NFI [13]: based on both autopsy and scene findings, 51/98 (52 %) died from unnatural causes; in 35/98 (36 %), no cause of death was determined, i.e., classified as sudden infant death syndrome (SIDS) or sudden unexpected death in infancy (SUDI); and in 12/98 (12 %), a natural cause of death was established. In the children who died of unnatural causes, the cause of death was child abuse in 42/51 (82 %) of the cases; in 9/51 (18 %), the difference between accidental trauma and child abuse could not be determined based on autopsy and scene information. Children who did and did not undergo PMCT differed in age: children who were not scanned were significantly older (median age 2 years and 6 months versus 1 year and 1 month, p=0.004) (Table 1).

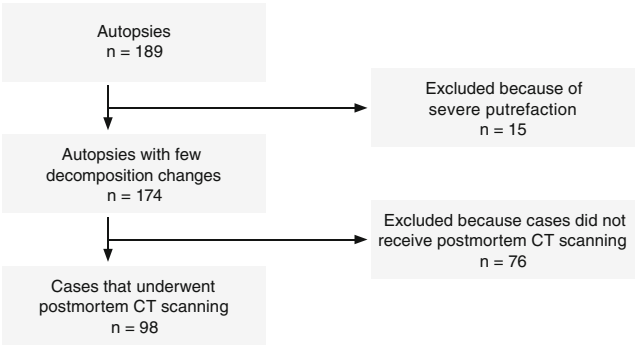

Fig. 1 Diagram of selected cases

Agreement on cause of death in three main groups

PMCT and autopsy identified the same category in 69/98 cases (70 %) (Table 2). The kappa coefficient was 0.49. Of the 49 children identified from autopsy as an unnatural death, 33 of these (67 %) were identified by PMCT as an unnatural death as well (Online Resource 1, 2); in 16, no cause of death could be identified with PMCT (Fig. 2 and Online Resource 3). Of the 40 children in whom no cause of death was identified with autopsy, one was identified as unnatural and 39 as no cause of death by PMCT (Online Resource 4). Of the nine children identified as natural death by autopsy, all were identified as no cause of death by PMCT (Fig. 3 and Online Resource 5–7). Overall, PMCT was not able to identify the cause of death in 64/98 (65 %) of the cases, 1.6 times more often compared to autopsy. PMCT identified one cause of death where

Table 1 Characteristics of children who underwent a forensic autopsy

Variable	PMCT	No PMCT	*P*
	n=98	*n*=76	
Age; Median (IQR)	1 year 1 month (3 months-6 years)	2 years 6 months (5 months-15 years 9 months)	0.004
Gender; *n* (%)			0.95
Male	52 (53)	40 (53)	
Female	46 (47)	36 (47)	
Conclusion including scene findings; *n* (%)			0.67
Natural death	12 (12)	12 (16)	
Unnatural death	51 (52)	41 (54)	
No cause of death	35 (36)	23 (30)	
	n=51	*n*=41	
Child abuse in unnatural death; *n* (%)			0.073
Yes	42 (82)	30 (73)	
No	0 (0)	4 (10)	
Undetermined	9 (18)	7 (17)	

Table 2 Agreement on cause of death using three main groups

		Radiologist			
		Unnatural	No cause of death	Natural	Total
Pathologist	Unnatural	**33**	16	0	49
	No cause of death	1	**39**	0	40
	Natural	0	9	**0**	9
	Total	34	64	0	98

Bold data display the causes of death on which the radiologist and pathologist agree

autopsy classified the case as no cause of death. A small subdural hematoma (SDH) over the convexity was seen on PMCT, which was not found during autopsy (Online resource 4).

Agreement on cause of death using ICD-10

Chapters ICD-10

PMCT and autopsy identified the same organ system related to the cause of death in 66/98 cases (67 %) (Table 3). The kappa coefficient was 0.50.

Of the 49 cases identified with autopsy as unnatural death, 31 cases were classified as injury cases; 25/31 (81 %) were classified with PMCT in the same category. Seventeen cases were identified with autopsy as external causes of death; 4/17 (24 %) were identified with PMCT in the same category. There was one case of malnutrition due to neglect, which was classified as endocrine, but was considered an unnatural death by the pathologist. PMCT identified this case as no cause of death.

Based on autopsy findings only, autopsy identified 40 children as unknown cause of death; 2 perinatal deaths and 38 not otherwise specified (NOS). Of these 38 NOS cases, 37 (97 %) were also identified by PMCT as unknown, and one was identified as injury. Both perinatal deaths were identified by PMCT.

The nine children identified as a natural cause of death were classified with autopsy as infectious (n=1), respiratory (n=4), and circulatory (n=4). All of these were identified with PMCT as no cause of death.

Subgroups ICD-10

The pathologist used 22 different ICD-10 subgroups to classify the causes of death. Overall, in 64/98 cases (65 %), PMCT classified in the same ICD-10 subgroup (Table 4). The kappa coefficient for the subgroups was 0.59.

In 26/49 (53 %) of the unnatural causes of death, PMCT identified the same subgroup. In 38/40 (95 %) of the unknown causes of death, PMCT identified the same subgroup. In 0/9 (0 %) of the natural causes of death, PMCT identified the same subgroup.

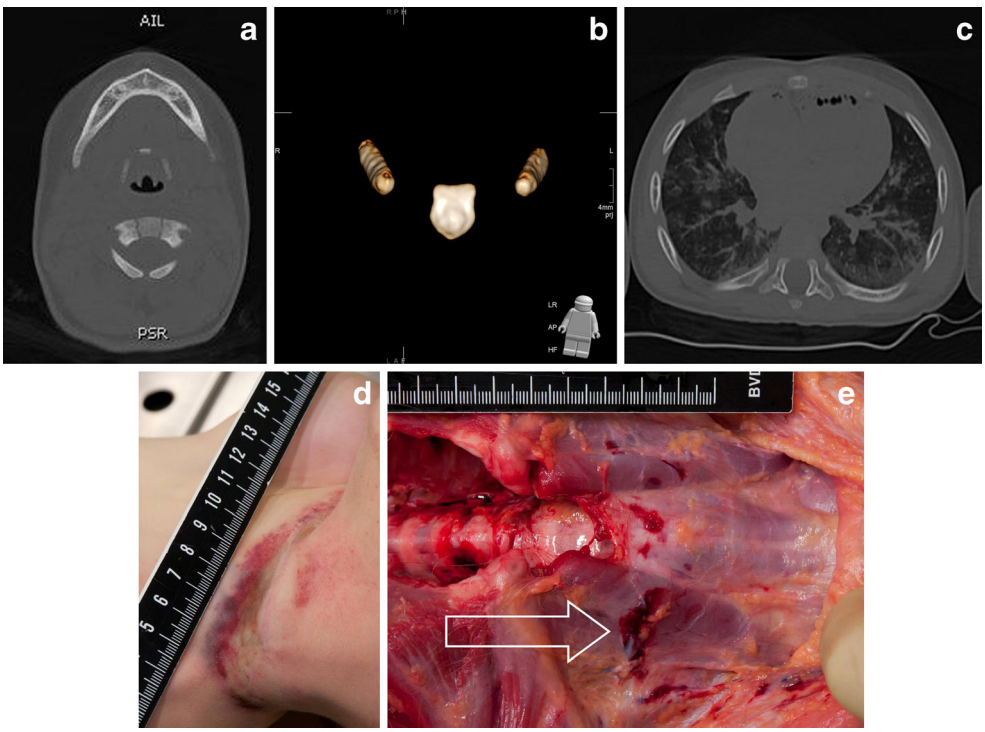

Fig. 2 One-and-a-half-year-old boy, found hanging on a rope positioned around his neck. PMCT showed an intact hyoid–larynx complex (**a**, **b**) and except for discrete signs of pulmonary edema (**c**), no other pathological findings were seen. Intracardiac air in the right atrium and ventricle is noted; this is a normal postmortem finding. Autopsy demonstrated external and internal neck injuries; there was a circular skin abrasion (**d**) and some hemorrhages in the superficial soft tissues above the sternocleidomastoid muscle (*arrow*) (**e**). There were no fractures of the hyoid–larynx complex or the cervical spine. Cause of death was suffocation resulting from trauma on the neck

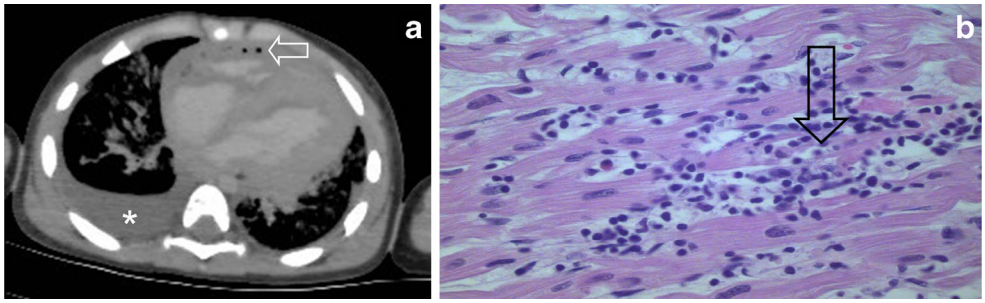

Fig. 3 One-year-and-three-month old boy found dead in an age-appropriate car seat, after a 2-h car trip. PMCT showed a right-sided pleural effusion (*asterisk*) and a minute amount of air in coronary arteries (*arrow*) (**a**). There were no signs of trauma. Autopsy demonstrated a lymphocytic myocarditis, characterized by infiltration of lymphocytes between the cardiomyocytes of the heart, with cardiomyocytolysis (*black arrow*) (**b**). Cause of death was cardiac dysfunction based on lymphocytic myocarditis

Agreement on cause of death using NFI classification

The pathologist used 11 different codes from the forensic classification. In 71/98 (72 %), PMCT identified the same forensic classification (Table 5). The kappa coefficient was 0.62.

In 32/49 (65 %) of the unnatural causes of death, PMCT identified the same diagnosis. In 39/40 (98 %) of the unknown causes of death, PMCT identified the same diagnosis. In 0/9 (0 %) of the natural causes of death, PMCT identified the same diagnosis.

Discussion

We determined the concordance between PMCT and autopsy in cause of death in children. To our knowledge, this is the first PMCT study performed in children in a forensic setting.

The case mix of the patients seems to be an important predictor for the concordance between PMCT and autopsy. In unnatural deaths, concordance between PMCT and autopsy was 67 %. A systematic review of this topic in adults showed a concordance in unnatural deaths between 46 and 100 % [14]. In natural deaths, PMCT did not identify any cause of death in our study. Another study found a concordance rate of 88 % for PMCT vs. autopsy (38/43) for natural pediatric deaths [8]. A pediatric MRI study, describing 88 % natural and 12 % unnatural deaths, found a concordance rate of 69 % for MRI vs. autopsy (85/123) [7]. We have no explanation for our poor results on natural deaths. Concordance rate on cases where autopsy did not identify a cause of death was 98 %, which is comparable with other publications [6–8].

False negatives

In the cases identified with autopsy as unnatural death (n=49), the number of false negatives was 39 % (16/49). Unnatural deaths most commonly missed with PMCT were injuries caused by hanging, strangulation or suffocation (n=7)

Table 3 Agreement on cause of death using ICD 10 chapters

			Radiologist									
			Injury	External	Endocrine	NOS	Perinatal	Infectious	Respiratory	Circulatory	Digestive	Total
Pathologist	Unnatural, N=49	Injury	**25**	0	0	5	0	0	0	0	1	31
		External	2	**4**	0	10	0	0	1	0	0	17
		Endocrine	0	0	**0**	1	0	0	0	0	0	1
	No cause of death, N=40	NOS	1	0	0	**37**	0	0	0	0	0	38
		Perinatal	0	0	0	2	**0**	0	0	0	0	2
	Natural, N=9	Infectious	0	0	0	1	0	**0**	0	0	0	1
		Respiratory	0	0	0	4	0	0	**0**	0	0	4
		Circulatory	0	0	0	4	0	0	0	**0**	0	4
		Total	28	4	0	64	0	0	1	0	1	98

Both radiologist and pathologist could score the same categories. If one of the raters did not score any abnormalities in a category, this category is not shown in order to reduce the table size

Bold data display the causes of death on which the radiologist and pathologist agree

Table 4 Agreement on cause of death using ICD 10 subgroups

				Radiologist															
				Crushing multiple body regions	Multiple injuries head	Intracranial unspecified	SDH	Open wound neck	Multiple injuries thorax	Smoke, fire, flames	Foreign body airway	Foreign body alimentary tract	Hanging, strangulation, suffocation	SIDS	Death NOS	Still birth	Pneumothorax	Peritonitis	Total
Pathologist	Unnatural, *N*=49	Injury, *N*=31	Crushing multiple body regions	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
			Multiple injuries head	0	**12**	0	2	0	0	0	0	0	0	1	0	0	0	0	15
			Intracranial unspecified	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	1
			SDH	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	1
			Multiple injuries of neck	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
			Open wound neck	0	0	0	0	**2**	0	0	0	0	0	0	0	0	0	0	2
			Multiple injuries thorax	0	0	0	0	0	**2**	0	0	0	0	0	0	0	0	0	2
			Multiple injuries abdomen	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	3
			Poisoning sedativa	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
		External, *N*=17	Smoke, fire, flames	0	0	0	0	0	0	**3**	0	0	0	0	4	0	1	0	8
			Foreign body airway	0	0	0	0	0	0	0	**0**	0	0	0	1	0	0	0	1
			Foreign body alimentary tract	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	1
			Hanging, strangulation, suffocation	0	0	0	0	0	0	0	1	0	**1**	0	6	0	0	0	8
		Endocrine, *N*=1	Malnutrition	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	No cause of death, *N*=40	NOS, *N*=38	SIDS	0	0	0	1	0	0	0	0	0	0	**25**	0	0	0	0	26
			Death NOS	0	0	0	0	0	0	0	0	0	0	0	**11**	0	0	0	11
			Gangrene	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
		Perinatal, *N*=2	Still birth	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0	0	2
	Natural, *N*=9	Infectious, *N*=1	Miliairy TBC	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
		Respiratory, *N*=4	Pneumonia	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	3
			Bronchiolitis	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
		Circulatory, *N*=4	Myocarditis	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	4
		Total		3	12	1	4	2	3	3	2	1	1	33	29	2	1	1	98

Both radiologist and pathologist could score the same categories. If one of the raters did not score any abnormalities in a category, this category is not shown in order to reduce the table size

Bold data display the causes of death on which the radiologist and pathologist agree

Table 5 Agreement on cause of death using forensic classification [9]

		Radiologist										
		Penetrating trauma	Blunt trauma	Acc. dec. Trauma	Asphyxia	Thermal injury	Toxicological	Neglect	No cause of death	Suspected neonaticide	Perinatal	Illness	Total
Pathologist	Unnatural, *N*=49	Penetrating trauma	**5**	0	0	0	0	0	0	0	0	0	5
		Blunt trauma	0	**7**	1	0	0	0	1	0	0	0	9
		Acc. dec. trauma	0	0	**12**	0	0	0	1	0	0	0	13
		Asphyxia	0	0	0	**3**	0	0	8	0	0	0	11
		Thermal injury	0	0	0	0	**3**	0	5	0	0	0	8
		Toxicological	0	0	0	0	0	**2**	0	0	0	0	2
		Neglect	0	0	0	0	0	0	**0**	0	0	0	1
	No cause of death, *N*=40	No cause of death	0	0	1	0	0	0	**30**	0	0	0	31
		Suspected neonaticide	0	0	0	0	0	0	0	**6**	0	0	6
		Perinatal	0	0	0	0	0	0	0	0	**3**	0	3
	Natural, *N*=9	Illness	0	0	0	0	0	0	8	1	0	**0**	9
		Total	5	7	14	3	3	2	0	54	7	3	0	98

Bold data display the causes of death on which the radiologist and pathologist agree

Acc. dec. trauma Acceleration deceleration trauma

(Fig. 2), injuries caused by smoke and fire (*n*=5) (Fig. 3), and head (*n*=3) and abdominal injuries (*n*=3).

In the cases identified with autopsy as natural death (*n*=9), all PMCT reports were false negatives. These were all infectious diseases: myocarditis (*n*=4) (Fig. 3 and Online Resource 5) pneumonia (*n*=3) (Online Resource 6 and 7), bronchiolitis (*n*=1) and miliairy TB (*n*=1). However, other pediatric studies identified infectious diseases correctly: in the study by Proisy et al., PMCT identified 79 % (11/14) natural causes of death, including pneumonia (*n*=7), pneumonia and gastroenteritis (*n*=1), pancarditis (*n*=1), metabolic disease (*n*=1), and bowel volvulus (*n*=1) [8]. The only false-negative causes of death were three cases of pneumonia. This low number of false negatives is surprising given that postmortem diagnosis of pulmonary disease is complex, since postmortem consolidation and livor mortis interfere with assessment of the lungs. Furthermore, radiological characteristics of pancarditis and metabolic disease are not described in the article, but in general, these are not demonstrated with CT. An explanation for the different results between their study and this one is the fact that we only scored causes of death if the radiologist was absolutely sure that these abnormalities had caused the death. Major or minor abnormalities were sometimes detected but not scored if it was not sure that these findings would have caused the death. We chose these strict criteria because all PMCTs were performed in a forensic setting; in court, a doubtful diagnosis is not acceptable. In the MRI study, 32/132 (26 %) of the MRI reports were false negatives [7]. Diagnoses most commonly missed were sepsis (*n*=24) and placental abnormalities (*n*=3).

False positives

Of all cases where autopsy did not identify a cause of death (*n*=40), PMCT identified a small SDH in one case (1 %). As it is unlikely that an SDH would be missed during a forensic autopsy, this was regarded as a false positive finding. Based on this one extra case, it seems unlikely that PMCT in children will identify many diagnoses that will be missed during autopsy. PMCT identified two cases of pneumonia (2/47 or 4 %) regarded to be false positives in another study [8]. In the MRI study, two false-positive diagnoses (2 %) were identified: ischemic brain injury and drowning [7].

Limitations

A limitation of our study is that not all autopsy cases underwent PMCT scanning, resulting in the inclusion of 59 % of the autopsies. The reason for this is that the NFI does not own its own CT scanner and practicalities can impede routine transportation of the body. In children under the age of 4 years, a skeletal survey is always performed to identify occult fractures. These cases are transported to a hospital where they also undergo PMCT. Another reason is that the

use of PMCT is a relatively new development and it takes time to implement new protocols. We do not expect that the selection of patients influenced our results, as distribution of causes of death was identical in the PMCT and the non-PMCT group.

Future perspective

Several adaptations to postmortem imaging are currently being developed. In adults, the results of postmortem angiography are promising [15–17]. As ischemic heart disease is uncommon in children, this will probably be of limited value in a pediatric setting. Postmortem ventilation, however, might improve the diagnostic value of postmortem imaging in children. Applying pressure to the lungs reduces livores, and small lung pathologies become more visible [18]. Minimally invasive autopsy increases the concordance rate between postmortem MRI and autopsy from 69 to 76 % in children and shows even better results in fetuses [7, 19]. The combination of PMCT and minimally invasive autopsy, or both PMCT and MRI with minimally invasive autopsy, is promising in adults [20, 21], but has not yet been validated in children. In 2011, the first case was published in which a cause of death established by PMCT, in combination with postmortem MRI and tissue biopsy, was accepted by the Swiss Department of Public Prosecution, without confirmation by a forensic autopsy [22]. In this case, a pedestrian crossing the street had been hit by a car. On postmortem imaging, extensive blunt trauma was demonstrated; among others, a vertebral fracture piercing the aorta and causing extensive internal hemorrhage. In many countries, e.g., the Netherlands, replacement of autopsy by postmortem imaging is currently not accepted in Court yet, as only validated and widely accepted methods can be submitted as evidence.

In conclusion, PMCT in children does identify the majority of unnatural causes of death correctly (67 %); it does not give new insight into the cause of death if this is unexplained according to the pathologist. Diagnostic accuracy in natural deaths in this study is low compared to other publications. At present, PMCT cannot replace conventional autopsy in children, but in combination with minimally invasive autopsy, it might be suitable for determining those cases that require conventional autopsy.

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