Drowning in the Night-Soil Reservoir

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INTRODUCTION

It is not always easy to prove whether infant cadaver found in the reservoir of dipping up night soil were death by drowning or postmortem dumping. Owing to prove the death by drowning, Tomonaga[6] proposed the detection of reservoir contents in the lung and digestive tracts etc., especially, palisade cells and separated cells originating from bean paste. Honma[2] reported that urea containing in the liquid fraction of reservoir contents was detected in the lung exudate. Mikami[3] attempted to detect the chlorophyll containing in reservoir contents in the cadaver. Recently Suyama[5] considered the possibility on the identification of death by drowning by the detection of diatom in various organs. The authors investigated the diatoms and palisade cells in the lung, digestive tracts and various organs of the great circulation system of 4 infants found in the night soil reservoir and confirmed that 3 cases might be death by drowning and one case might be postmortem dumping. So, we reported 4 cases found in the reservoir and investigation on the distribution of diatoms containing in reservoir contents.

MATERIAL AND METHODS

Disorganization of the lung, liver, kidney and contents of the digestive tracts of infant cadavers was carried out at a room temperature and on a water bath. Weighing tissue was entered into a hard glassy flask and 4 ml of fuming nitric acid and conc sulfuric acid were added respectively and the mixture stood for 1-2 days at a room temperature. When liquefaction of tissue was incomplete, the solution was warmed on a water bath, because palisade cells was lost when heated on a sand dish. The sediments of this solution was observed microscopically and kinds of diatoms were determined and each diatom was counted. The small intestine was ligated at intervals of 30 cm from the pyloric opening lest that contents was moved and the distal limit of detected diatoms and palisade cells was observed. Before investigation experimental instruments and materials were perfectly washed with water without diatoms.

EXPERIMENTAL RESULTS

I Autopsy cases

All cases were infant cadavers found in the reservoir of dipping up night soil and their maturity was speculated from the measurement values of various parts of the body, hair, nail, center of ossification and postmortem time was judged from the cadaver phenomena and environmental conditions.

Case 1. A female infant seemed to be born at 38-40 weeks and showed asphyxial phenomena such as petechiae at the subconjunctiva, subpericard and subpleura, and dark red non-coagulated blood in the heart, and was speculated to be 2 days after death. By the hydrostatic test of the lung, when the mass of extirpated lungs and the cervical organs was together poured into water, these organs sank and then when each lung was poured into water separately, the left lung sank gradually and the right lung floated in the water at the top of back suface. The umbilical cord attached at the submiddle of the abdomen with two shortstring-like fragments.

As shown in the table 1, various kinds of diatom species were detected from each disorganized lobes of the lung and they were usually found in the tap

Table 1. Diatoms of the Lung in the First Case

Organ / Weight (g) / Kind	Left		Right		
	Upper	Lower	Upper	Middle	Lower
	9	13	6	6.5	14
Mel. distans	690	510	240	240	600
Fragilaria	180	300	240	240	390
Mel. varians	330	420	120	150	270
Nitzschia	210	240	120	180	240
Navicula	150	210	90	150	270
Coscinodiscus	120	210	150	90	210
Cocconeis	60	90	30		60
Chlorophyll		150	30	60	
Asterionella	90		60	30	
Cymbella		30	30		60
Cymatopleura		30			60
Grammatophora		30			
Total	1830	2220	1110	1140	2160
Per 1g	203	171	185	175	154
Palisade cell	750	1650	570	1200	1530

water and river, and palisade cells were also detected. In the digestive tracts, as shown in table 2, the same kinds of diatoms as in the lung were detected in the contents of stomach. In the small intestine the diatoms were detected to the 120cm and palisade cells were 30 cm from the begining of intestine. The distribution of the same diatoms was few in the liver and kidney.

Table 2. Diatoms of the Stomach, Intestine, Kidney and Liver in the First Case

Organ / Weight (g) / Kind	Stomach	Small Intestine					Left Kidney	Right Kidney	Liver
		1	2	3	4	5			
	2.3	1.6		7.1		3.3	9	9	20
Mel. distans	10	3		1		2	5	5	11
Fragilaria	8	2		2		1	2	4	5
Mel. varians	2	1					1		
Nitzschia	7	9					1	3	2
Navicula	6	1		3			5	2	4
Coscinodiscus	15	6				3	1		
Cocconeis									1
Dictyocha	1	2							
Total	49	24		6		6	15	14	23
Per 1g	21.3	15.0		0.8		1.8	1.7	1.6	1.2
Palisade cell	11	3					5	1	3

Case 2. A male infant seemed to be born at 36-38 weeks. Putrefied phenomena was remarkable, ie. balloonous eye ball, softening brain, and no blood in the heart. Postmortem time seemed to be about 2 weeks. The hydrostatic test of the lung was positive in both sides. The umbilical cord attached at the middle of abdomen and was 56 cm in length and thin, narrow and dry by postmortem change. When the end was observed after swelling of the end by soak into water, the end was flat vertically and was suspected to be cutted sharply.

As shown in the table 3 and 4, diatoms and palisade cells were detected in the disorganized lung, digestive tracts, liver and kidney, and in the intestine diatoms were detected to 90 cm from the begining.

Case 3. A female infant seemed to be born at 40 weeks and showed asphyxial phenomena such as petechiae at the subconjunctiva, internal surface of head skin, hemorrhage in the underpart of the left sternocleidmastoideus and dark red uncoagulated blood in the heart. Postmortem time might be 1-2 days. The hydrostatic test of the both lungs was positive. The umbilical cord attached at submiddle of the abdomen and was cutted sharply at the 18 cm from the begining.

Table 3. Diatoms of the Lung in the 2nd Case

Organ / Weight (g) / Kind	Left		Right		
	Upper	Lower	Upper	Middle	Lower
	4.1	4.0	2.5	1.8	4.2
Mel. distans	200	440	240	160	560
Fragilaria	440	360	120	140	440
Navicula	160	120	80	80	160
Coscinodiscus	80	80	60	60	200
Mel. varians	80	40	20	20	40
Cocconeis	80	40	20		
Mel. italica		80	20	40	
Cymatopleura	40	40	20		
Synedra				20	40
Total	1080	1200	580	520	1440
Per 1g	263.4	300.0	232.0	288.9	342.9
Palisade cell	1640	1540	680	620	1680

Table 4. Diatoms of the Stomach, Intestine, Kidney and Liver in the 2nd Case

Organ / Weight (g) / Kind	Stomach	Small Intestine					Left Kidney	Right Kidney	Liver
		1	2	3	4	5			
	1.5	0.8		0.5		1.6	2.7	3.2	20.5
Mel. distans	12	6		3			1		3
Fragilaria	8	4		4			2	2	1
Navicula	6	2		1			1		2
Coscinodiscus	6							2	2
Mel. varians	4								
Cymatopleura		2							
Dictyocha	4								
Total	40	14		8		0	4	4	8
Per 1g	26.7	17.5		16.0		0	1.5	1.3	0.4
Palisade cell	56	32		0		0	0	3	2

By the disorganization, various kinds of diatoms were detected from each lobes, i.e. Fragilaria was most frequently observed, and Melosira distans, Coscinodiscus, Navicula etc. and palisade cells were also frequently detected. In the small intestine the diatoms were detected to 150 cm from the pyloric opening, in the liver and kidney, few of the same kinds of diatom were detected.

Case 4. A mature female infant seemed to be born at 40 weeks. Putrefied change and worm-eaten were remarkable and abdominal organs were almost destructive and postmortem time might be about 2 months.

By the disorganization of remained lung, the detection of diatoms (Melosira distans and Navicula) was in some lobes and the other was not detected, but the number of diatoms was very fewer than Ist, 2 nd and 3 rd cases and the largest numbers were 8.

II Distribution of diatoms and palisade cells in the contents of reservoir

Owing to verification of the number and species of the diatom and the number of palisade cells in the reservoir contents, 24 reservoirs were examined. As shown in the table 5, Fragilaria, Melosira distans, Navicula, Cyclotella, Coscinodiscus, Cocconeis were frequently found. The number of diatoms was different in every cases and the largest numbers were 1840/ml in the No. 23 case. No. 1 and 14 were increased in the second examination (the secand examination carried out 6 months after the first), in spite of few numbers in the first examination, on the contrary, No. 19 was decreased in the second examination. The palisade cells were detected in all cases except for No. 19, but their numbers was not proportionate to the number of diatom.

Table 5. Diatoms and Palisade Cells of the Reservoirs

Eexp. No.	2	4	13	21	23	24	1		14		19	
							1	2	1	2	1	2
Volume (c.c)	50	85	66	43	20	100	51	65	80	65	44	45
Fragilaria	1300	630	26	7875	10300	3400	12	8	9	26		30
Mel. distans	600			1600	1500	400	8	89	3	148	660	114
Navicula	360	30	4	1600	6800	2700	3	6	4	20	6120	40
Cyclotella	140			4800		100	2	34		54	4920	82
Coscinodiscus	500	210	2	11525	7900	400	3	11	1	48	10920	126
Cocconeis	2180			725	3100	700			2	118	1140	10
Rhoicosphenia	640		4									
Dictyocha	20			900								
Epithemia	40			50								
Mel. varians	40			575	2400	200					13380	
Arachnoidiscus				350								
Chaetoceros	80		8	4600	2800	300		2	5		7140	10
Skeletonema	40			25	200	200						
Grammatophora	20		2		100							
Nitzschia				900				2		3	660	28
Other diatoms	840	120	18	4400	1700		4	352	3	348	7800	172
Total	6800	990	64	39925	36800	8400	32	504	27	765	52740	612
Per 1cc	136	12	1	929	1840	84	0.6	8	0.3	12	1199	14
Palisade cell	1500	2970	312	150	15200	42900	9	12	2	754	0	478

DISCUSSION

From the autopsical findings and disorganization, various kinds of species and a large number of diatoms were detected in the lungs of lst, 2 nd and 3 rd cases and palisade cells which were frequently found in Japanese reservoir were also detected. Therefore, these cases were died by drowning in the reservoir and was liveborn. Shinzawa's[4] detailed experiment verified that water entered easily by water pressure into the lung and stomach even in the cadavers dumped into water after death. So, on account of diagnosis of death by drowning, drowning water had to be detected not only in the lung, but also organs in the great circulation system such as liver, kidney and intestine. In these cases diatoms were detected in the liver, kidney and intestine, and by drowning was clarified. When the infant cadaver was found, it had to be determined whether this cadaver was liveborn or stillborn, and death cause had to be investigated. Determination of liveborn or stillborn was usually based on the hydrostatic test of the lung in forensic autopsy. It was said that this method was attempted by Schreyer[1] in 1683. The cases which this test was negative in liveborn infant were frequently found, on the contrary, in the stillborn this test was frequently positive, for example, the hydrostatic test of the first case was negative, but by disorganization of the lung, a lot of diatoms and palisade cells were detected. Therefore, this case showed to inhaled the contents of reservoir after birth. Determination of liveborn or stillborn was also judged from the volume, color, consistency and histological findings of the lung, level of the diaphragma and difference between the measurement of the chest and the measurement around the abdomen, but the above determination was applied only to a fresh cadaver and was impossible in putrefied cadaver. In the proof of death by drowning, detection of diatoms in the disorganized tissue was possible in highly putrefied cadaver. The author[7] confirmed that skeletonized cadaver in the motor car which had sunk in the sea bottom for a year was death by drowning by the detection of diatoms in disorganinzed bone. In the case of drowning in the reservoir, palisade cells as well as diatoms must be also detected, so disorganization of this case must be carried out at a room temperature or on a water bath.

On the purpose of examination of the kinds of diatom species in the reservoir, 24 reservoir were examinated. It was verified that Fragilaria, Melosira distans, Navicula, Cyclotella, Coscinodiscus, Cocconeis etc. were most frequently found in the reservoir. These diatoms were detected in the lung of lst, 2 nd and 3 rd cases.

The suspect of lst case was a nullipara who did not know labor pains, and bore in her lavatory and she said that it was a precipitate labor, but the suspects of 2 nd and 3 rd cases were unknown. The 4 th case was highly putrefied and identification of liveborn or stillborn and cause of death etc. were

obscure macroscopically at the autopsy. The examination by disorganization was suggested that this cadaver might be not death by drowning in the reservoir, but postmortem dumping. Thereafter, the suspect confessed that she strangled her baby to death and stood it for a day in her room and then dumped it into a reservoir as she was perplexed to lay out a dead body.

CONCLUSION

By the detection of diatom and palisade cell in the disorganized tissue of 4 infants found in the reservoir, it was made up clear that the death cause was death by drowning in 3 cases and one case was postmortem dumping.

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