MALIGNANT MESOTHELIOMA IN CHILDHOOD

Report of 13 Cases

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Malignant mesothelioma is of special interest because of its known induction by exposure to asbestos. To study this rare tumor in childhood, review was made of 42,597 death certificates for children who died of cancer in the United States, 1960–1968; 31 had a diagnosis of mesothelioma. Of these, 13 were confirmed by data from hospital records; the remainder had either been erroneously recorded or were unavailable for review. The illness characteristically presented with acute pleural effusion and encasement of the lung by tumor, with survival usually of less than 6 months. The case histories had no information on environmental exposures. To determine if the etiology of the neoplasm in childhood is similar to that in later life, better environmental histories must be obtained by alert practitioners.

MALIGNANT MESOTHELIOMA OF THE PLEURA and peritoneum, though uncommon, has provided opportunities for the study of environmental carcinogenesis. The capacity of asbestos to induce this neoplasm and bronchogenic carcinoma in adults has been well established within the past two decades.[3,4,8,9,11,12,16] Only a few surveys, however, have noted mesothelioma occurring in childhood.[8,9,17] The most comprehensive description of the neoplasm in a patient under 16 years of age was made by Kauffman and Stout,[6] who reviewed the literature and reported on five well-documented cases seen at Columbia University, 1919–1961. Our purpose was to study fatal mesothelioma on a national basis, in persons under the age of 20 years, to characterize its clinical features and to detect etiologic clues if possible.

METHODS

The National Vital Statistics Division, U.S. Public Health Service, provided 42,597 copies of death certificates for all children under 15 years of age who died of cancer in the United States, 1960–1964, and for those under 20 years of age, 1965–1968, in all states except Louisiana and Missouri. Over the 9 years, there were 31 certificates with diagnoses of mesothelioma. All but two deaths occurred in hospitals. Permission to review hospital records was obtained in each case from the appropriate State Health Department or agency. Twenty-three of 29 hospitals contacted provided records from which we extracted the child's sex, race, age at diagnosis, city and state of usual residence, site of tumor, method(s) of diagnosis, and other pertinent information.

Uniform histologic review was not feasible. We excluded all cases that were not well documented by pathology reports in the hospital records. There was no way to estimate the frequency with which the neoplasm was underdiagnosed.

RESULTS

Six of the 23 cases had clearly been misdiagnosed or had errors in recording on the death certificates. There was divided opinion on the diagnoses in another four cases, with rhabdomyosarcoma or various embryonal tumors as alternative possibilities. The remaining 13 cases were thus considered well-documented malignant mesotheliomas on the basis of either biopsy or autopsy findings, or by a combination of the two. In seven of these cases, histologic specimens had been submitted for independent pathology review, and the di-

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agnoses were confirmed. From these data, the mortality rate was between 0.5 and 1 case per 10 million child-years at risk.

Table 1 reveals that 8 of the 10 males and all three females were in their second decade of life. Two males were of Mexican-American descent. A wide geographic scatter by city and state of usual residence was evident. Most children apparently lived within corporate city limits, with a rural farm dwelling specified in only one case (No. 6). The pleura was the major site of tumor origin in these cases, with only one neoplasm limited to the peritoneum and one tumor involving both sites. A fibrous histologic pattern was reported in 10 cases; only three tumors contained a papillary component mixed with fibrous elements.

The hospital records revealed striking clinical similarities in these cases. Every child was healthy and asymptomatic prior to the rapidly fatal illness which was usually heralded by chest pain and an acute pleural effusion. The longest survival after onset of symptoms was 24 months, but, in eight cases, death occurred within 6 months. One child survived just 3 weeks. In the cases with pleural involvement in which thoracotomy or autopsy was performed, the usual finding was a lung encased by tumor with plaques studding the chest wall and diaphragm.

Very little additional environmental data could be found in the records. No histologic findings of asbestos fibers or bodies in lung parenchyma were reported. In no instance was the possibility of an environmental etiology mentioned in the records nor were any exposure histories specifically obtained. The father's occupation was recorded in seven instances (molder, plumber, electrician, mechanical engineer, farmer and building constructor, lumber dealer, and salesman). The family medical histories, where mentioned, were not contributory.

Consideration of the eight cases for which no hospital records were obtained did not significantly alter the results of the study. The impressions regarding the age at diagnosis, sex ratio, geographic scatter, and urban/rural distribution were unchanged. There were four Negroes in this incomplete group; three were 5 years of age or younger and may well have had errors in diagnosis.

COMMENT

Because therapy is of little benefit in childhood mesothelioma, emphasis may well be placed on etiology, in the hope that identifying causes of the neoplasm may lead to prevention. The neoplasm in adults, with a peak occurrence in the 6th–7th decade, often follows brief high-dose or prolonged low-dose occupational exposures to asbestos. There is usually a latent period of 20–40 years between initial exposure and tumor manifestation.[8,12,16] Asbestos fibers or bodies are often

TABLE 1. Deaths from Malignant Mesothelioma in Children in the United States between 1960–1968

Case no.	Age at diagnosis (yrs.)	Sex	City and state of usual residence	Site of tumor	Histology
1	4	M	Ashland, Ky.	Pleura	Undifferentiated†
2	9	M	Pontiac, Mich.	Pleura	Fibrous-papillary†
3*	11	M	Uvalde, Tex.	Pleura	Undifferentiated—cystic
4*	12	M	Chicago, Ill.	Peritoneum	Fibrous—papillary
5‡	14	M	Harrisburg, Pa.	Pleura	Fibrous
6	16	M	Muncie, Ind.	Pleura	Fibrous†
7	16	M	Spencer, Mass.	Pleura	Fibrous
8	16	M	Toledo, Ore.	Pleura & peritoneum	Fibrous—papillary†
9	17	F	Lakewood, Calif.	Pleura	Undifferentiated—cystic
10	17	F	New York, N. Y.	Pleura	Fibrous†
11	17	F	Rochester, N. Y.	Pleura	Fibrous†
12	17	M	Foss, Okla.	Pleura	Fibrous
13	17	M	Pottstown, Pa.	Pleura	Fibrous†

* Mexican-American.
† Confirmed by independent pathology review.
‡ Previously reported in reference 8.

found on microscopic examination of lung parenchyma at autopsy. It is thought that these fibers may give rise to mesothelioma or bronchogenic carcinoma.[13,15]

Exposures need not be occupational; ample opportunity exists for children to encounter asbestos in their environment. Fibers may be airborne from construction sites, factories, or asbestos mines.[8,9,12,16] Recent autopsy series have demonstrated asbestos bodies in the pulmonary tissue from a high percentage of urban residents.[1,7,14] Exposure can even occur in the home, as for example from insulating material, vinyl-asbestos floor tiles, or beverages commercially filtered through asbestos-containing material.[2,5,10] Whether or not such non-occupational exposures account for any of the cases in our series is unknown.

It is possible that mesothelioma of the pleura in children is not induced by asbestos. The absence of geographic clustering among these childhood cases is a feature against an environmental influence. The latent period in children was substantially less than in asbestos-induced mesothelioma of adults. The predominance of fibrous growth patterns in childhood pleural neoplasms confirms the previous observation of this histologic feature among the young, in contrast to the pure tubular or papillary elements usually seen in adults.[6] This difference in tumor characteristics according to age could represent a difference in etiology or in host response.

Even if the asbestos fiber is not involved in the childhood series, other unsuspected environmental agents may be at work. Therefore, when cases are diagnosed in the future, it would be of value for the physician to inquire into the history of unusual exposures, either to asbestos or other materials, in the patient's environment.

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