

CLINICAL FINDINGS ON
IN UTERO EXPOSED MICROCEPHALIC CHILDREN
胎内原爆被爆小頭症の臨床所見について

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*DRAFT FOR REPORT CONCERNING
ASSIGNMENT ON "EPIDEMIOLOGICAL STUDY ON MICROCEPHALY"
IN WELFARE MINISTRY'S SCIENTIFIC RESEARCH
(厚生省科学研究「小頭症の疫学的研究」の分担報告草案)*



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ATOMIC BOMB CASUALTY COMMISSION
HIROSHIMA AND NAGASAKI, JAPAN

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謝 辞

I personally am doubtful about the conduct of a study such as the present one by us, who are engaged in clinical medicine, and moreover it is a heavy burden to the members of our Department, and there naturally are certain limitations in the method of investigation. However, our humble survey on in utero exposed microcephalic children has been continued to date and its significance has been recognized to some extent due to the guidance extended to us by Dr. Yoshimasa Matsusaka and others of the A-bomb Casualty Council and the cooperation by Mr. Akinobu and Mr. Fumizawa of Kinoko-kai, for which we express our heartfelt appreciation. During this survey, Dr. Nakaidzumi, chief of the research team, and Dr. Arima frequently visited Hiroshima to provide guidance and perform examinations, many professors of Hiroshima University Attached Hospital cooperated in examination and Dr. Darling, director of ABCC, Dr. Maki, associate director of ABCC, and Dr. Nisimaru extended guidance and cooperation to us. Especially, Dr. Komai kindly provided us suggestions on the direction of this research and sent us literature on this subject, but we were unable to even attempt a genetic study of microcephaly. We wish to express our apology in this respect and hope to make a study in this direction in the future.

Akira Tabuchi 24 December 1966

臨床医学に携わる私どもがこのような調査研究を行なうことには、私自身疑問をもっており、教室員にとっても大きな負担であり、調査方法も自ら一定の限界がある。しかし私どもの胎内被爆小頭症のささやかな研究が今日まで持続され、多少とも研究の存在意義を認められるに至ったのは、松坂義正先生を始めとする原対協の各位の指導と、「きのこ会」の秋信、文沢両氏の協力によるものであり、これら諸先輩の協力はしみじみとありがたく、感謝のことばはない。今回の調査研究には、中泉班長と有馬博士の再三の来広による指導と診察、広大付属病院の各教授の協力診察、ABCCのDarling 所長、横準所長、西丸博士などの指導協力を得た。特に駒井先生には研究の方向づけの教示と文献の送付を受けたが、小頭症の遺伝的研究には手を触れることさえできなかった。心からおわびするとともに今後はこの方向に向かって研究を進めていきたいと思う。

田淵 昭

1966年12月24日

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A paper based on this report was published in the following journal:

本報告に基づく論文は下記の雑誌に発表された

Hiroshima Sanfujinka Ikai Kaishi —J Hiroshima Obstet Gynec Soc 6:12-23, 1967

EDITOR'S NOTE

編集者注記

This report was prepared by Professor Tabuchi et al of Hiroshima University as a Welfare Ministry Scientific Research Assignment on the *Epidemiological Study of Microcephaly* directed by Dr. Masanori Nakaidzumi, Senior Consultant to the Director, ABCC.

The results of clinical findings are presented along with comparisons and discussion of the ABCC data and reports concerning the subjects of the study.

本報告は、ABCC 所長顧問中泉正徳博士を班長として開始された厚生省科学研究「小頭症の疫学的研究」の分担研究を行なった広島大学田淵昭教授らが作成したものである。

臨床所見の報告とともに、この研究課題に関する ABCC の資料および報告との比較検討が行なわれている。

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INTRODUCTION

During the period from 1963 to 1966, we conducted a survey on children exposed in utero in Hiroshima with the assistance and cooperation of the Hiroshima A-bomb Casualty Council and the Kinokokai organized for the purpose of protecting exposed microcephalic children. We were able to locate 44 cases of microcephaly and the results obtained have been reported.

Recently (July 1966) the Welfare Ministry's "Epidemiological Study on Microcephaly" was initiated under the leadership of Dr. Masanori Nakaidzumi and I (Tabuchi) was assigned to the study on "Clinical Picture of Microcephaly." Therefore, I decided to investigate in utero exposed microcephalic children in Hiroshima to clarify the following two points: Can the cause of microcephaly be assumed to be due to A-bomb exposure? Are there any other clinically detectable late disturbances among in utero exposed microcephalic children?

As a first step, the results so far obtained were compared for reconfirmation with the reports of ABCC. Secondly, with the cooperation of the Hiroshima A-bomb Casualty Council and "Kinokokai," we hospitalized microcephalic children, who were willing to undergo detailed examinations, in two groups, one group in September 1966 and the other in November 1966, with the permission and under the leadership of Dr. Wada, Director of the University Hospital. Examinations were made by Prof. Wada (Internal Medicine), Prof. Uchino (Internal Medicine, Research Institute for Nuclear Medicine and Biology), Prof. Konuma (Psychoneurology), Prof. Yamura (Dermatology), Prof. Kato (Urology), Prof. Dodo (Ophthalmology), Prof. Kurozumi (Otorhinology), Prof. Tsushita (Orthopedics), Prof. Koyama (Radiology), Assistant Prof. Tanaka (Dentistry) and Assistant Prof. Arima (Pediatrics, Toho University) to determine whether there were any clinically detectable evidence of degenerate changes or any diseases requiring treatment. In addition, with the permission of Dr. Darling, Director of ABCC, and with the cooperation of Dr. Maki, Associate Director of ABCC, and Dr. Nisimaru, all cases were checked against the observations of ABCC.

はじめに

私どもは広島原爆障害者治療対策協議会(原対協)と、被爆小頭症児の保護の目的で作られた「きのこ会」の援助と協力により、昭和38年から昭和41年にかけて行なった広島での胎内被爆小頭症児について、①小頭症の原因は原爆被爆によると推定できるか、②胎内被爆小頭症(以下小頭症とする)に臨床的に発見できる他の遅発的障害が存在するか、の2点を調査研究することとした。

今回(昭和41年7月)厚生省の「小頭症の疫学的研究」が中泉正徳博士を班長として開始され、私(田淵)も「小頭症の臨床像」を分担することになった。したがって、広島での胎内被爆小頭症児について、①小頭症の原因は原爆被爆によると推定できるか、②胎内被爆小頭症(以下小頭症とする)に臨床的に発見できる他の遅発的障害が存在するか、の2点を調査研究することとした。

まず、①今回までの調査成績をABCCの報告と比較し、再確認につとめるとともに、②原対協と「きのこ会」に依頼し入院精査することを拒否しない小頭症児を集め、広大病院和田院長の許可と指導のもとに、昭和41年9月と11月の2回に分け入院せしめ、和田(内科)、内野(原爆放射能医学研究所内科)、小沼(精神神経科)、矢村(皮膚科)、加藤(泌尿器科)、百々(眼科)、黒住(耳鼻科)、津下(整形外科)、小山(放射線科)の各教授、田中助教授(歯科)と有馬助教授(東邦大小児科)により臨床的に発見できる変質徴候と治療を要する疾患の有無について診断を受け、他方、③ABCC Darling 所長の許可を得て横準所長と西丸博士の協力により、各症例についてABCCの調査と照合を行なった。

However, there are various restrictions in having all the microcephalic children hospitalized. Because of the great time required for processing the data, the final summarization of many laboratory tests and checking is not yet completed. Therefore, this is an intermediate report on the results so far obtained to Dr. Nakaidzumi, the chief of this research group.

MICROCEPHALY DUE TO IN UTERO EXPOSURE

Summary of ABCC Reports Even in the early observations by Yamasaki et al, Plummer, Sutow and others at ABCC microcephaly was reported in children exposed in utero.

Miller reported that the only effect of exposure in utero is occasional decreased development of the head with mental retardation. Among 169 children exposed in utero in Hiroshima there were 33 cases of microcephaly (size smaller than $M-2\sigma$) of whom 15 were mentally retarded and 18 were mentally normal; and there were 13 cases of severe microcephaly (smaller than $M-3\sigma$), all of whom had been exposed in the early period of pregnancy, between 7-15 weeks (8 cases at a distance of less than 1200 m, 4 between 1201-1500 m, and one between 1501-1800 m), and 4 of these severely microcephalic children had normal mentality.

Wood et al recently (1966) reported that of the 183 children exposed in utero who had been followed since 1954 in Hiroshima 33 showed microcephaly (smaller than $M-2\sigma$) and 14 had severe microcephaly (smaller than $M-3\sigma$). Of the 15 cases of microcephaly with mental retardation, 10 had severe microcephaly, 13 had been exposed within 1500 m, 11 had been exposed at between 7-15 weeks gestation, 2 cases were born prematurely and 2 cases were Mongolism (one case died by drowning). The average age of the mothers at time of delivery of these microcephalic children was 28.7 years while for cases without mental retardation it was 27.0 years and for the 15 cases with mental retardation 30.8 years. Of the 10 cases of severe microcephaly (smaller than $M-3\sigma$) with mental retardation, as many as 9 had reduced height growth (smaller than $M-2\sigma$).

Burrow et al examined in utero exposed children at ages 13 and 14 in Nagasaki and reported that mental retardation and congenital malformations are increased in boys exposed within 1999 m; and that the average head circumference was especially small in the high dose group (within 1500 m, positive acute radiation symptoms) in the mothers and exposure dose of more than 50 rad.

しかし、小頭症児全部を入院せしめることはいろいろな制約があり、長期間の時間的余裕が必要であり、諸検査成績や照合の未整理なものが多く、中間的報告にすぎないが、中泉班長への報告書として今日までにまとめた成績をここに記載する。

胎内原爆被爆による小頭症

ABCC 報告の要点 Yamasaki ら, Plummer, Sutow らの ABCC の初期観察でも胎内被爆児に小頭症を報告している。

Miller は、胎内での原爆被爆による唯一の影響は、時に知能遅滞を伴う頭部発育不全を認めることであり、広島での 169 例の胎内被爆児では、①小頭症 ($M-2\sigma$ 以下) は 33 例にみられ、知能遅延せるもの 15 例、知能発育の正常なもの 18 例あり、②高度小頭症 ($M-3\sigma$ 以下) は 13 例で、いずれも 7 ないし 15 週の妊娠初期に被爆し、被爆距離は 8 例は 1200 m 未満、4 例は 1201-1500 m、1 例は 1501-1800 m であり、この高度小頭症にも知能発育の正常であったものが 4 例であると報告している。

Wood らは最近 (1966 年) 1954 年以来連続観察した 183 例の広島での胎内被爆児で、①小頭症 ($M-2\sigma$ 以下) は 33 例で、高度小頭症 ($M-3\sigma$ 以下) は 14 例であり、②知能遅延を伴う小頭症 15 例では 10 例が高度小頭症であり、13 例は 1500 m 以内で、11 例は胎齢 7-15 週で被爆し、2 例は早産し、2 例の蒙古症 (1 例は溺死) があり、③これら小頭症の出産時の母親平均年齢は 28.7 歳で、知能遅滞を伴わないものでは 27.0 歳、知能遅滞を伴ったもの (15 例) では 30.8 歳であり、④知能遅延を伴った高度小頭症 ($M-3\sigma$ 以下) 10 例では、9 例までが身長が低い ($M-2\sigma$ 以下) と報告している。

長崎の胎内被爆児では、Burrow らは 13-14 歳時の調査で、① 1999 m 以内の被爆男子に知能遅延と先天奇形が増加し、②平均頭囲は特に高線量被爆群 (1500 m 以内、母の急性症状 (+)、被爆線量 50 rad 以上) に小さかったと報告した。

Kawamoto (1966) reported that of the 102 children exposed in utero within 1999 m, 7 (6.9%) showed microcephaly (smaller than $M-2\sigma$, male: less than 52.0 cm, female: less than 50.0 cm) and of the 173 children exposed in utero between 2000-2999 m, 5 (2.9%) showed microcephaly (3 with mental retardation). The reasons why more microcephaly was found in children exposed in utero beyond 2000 m in Nagasaki than in Hiroshima survey are perhaps because the Nagasaki A-bomb released more gamma rays than the Hiroshima A-bomb and the radiation dose at the same distance was higher in Nagasaki than in Hiroshima; and therefore, the fetal, neonatal and infant death rates may have been very high in the proximally exposed with a relative decrease in microcephaly (as compared with Hiroshima) and an increase in microcephaly in children exposed at intermediate distances (within 2500 m).

Result of Investigation The frequency of microcephaly obtained in the survey conducted in 1963 on children exposed in utero in Hiroshima by Hirai et al of our Department is shown in Table 1. The findings are as follows: Of the 545 children exposed in utero within 3000 m, 45 (8.3%) showed microcephaly and 12 (2.2%) showed severe microcephaly (smaller than $M-3\sigma$) and this frequency is a definite increase over the 13 cases (2.7%) of microcephaly in 473 nonexposed controls. The gestational age at the time of A-bomb exposure showed that of the 152 children exposed in utero during the first 3 months of pregnancy, there were 26 (17.1%) microcephaly and 10 (6.6%) severe microcephaly, and of the 211 children exposed in utero between 4-7 months of pregnancy, there were 15 (7.1%) microcephaly and 2 (0.9%) severe microcephaly. By exposure distance, of the 12 children proximally exposed in utero within 999 m, 6 (50%) showed microcephaly, all cases being severe and of the 108 children exposed in utero between 1000-1499 m, 24 (22.2%) showed microcephaly and 6 (5.6%) severe microcephaly. Thus, the frequency of microcephaly in children proximally exposed in utero during the early period of pregnancy showed a definite increase.

Later, with the cooperation of the Hiroshima A-bomb Casualty Council, Kinokokai and various other quarters, we were able to confirm that 44 microcephalic children were alive as of the end of 1965, whose names and exposure status are shown in Table 2.

Many of these cases of microcephaly are also included in the reports of ABCC. Our definition of microcephaly as head circumferences 2 or more standard deviations below the mean is the same as ABCC, but there presumably are some differences in the mean head circumference and standard deviation depending upon the number of

河本 (1966年) は、① 1999 m 以内の胎内被爆児 102 例で 7 例 (6.9%) の小頭症 ($M-2\sigma$ 以下, 男 52.0 cm, 女 50.0 cm 以下) を認め、2000-2999 m での被爆 173 例で 5 例 (2.9%) の小頭症があった (知能遅滞せるものは 3 例)、② 広島 の調査と異なり 2000 m 以遠での胎内被爆に多数の小頭症がみられたのは、a) 広島 の原子爆弾に比し、長崎のそれはガンマ線が多く、同一距離の被爆でも被曝線量は高く、b) したがって近距離被爆では胎児、新生児および乳幼児期の死亡が著しく多く、小頭症は相対的に (広島に比し) 減少し、中距離被爆 (2500 m 以内) に小頭症が増加しているのであろうと報告している。

研究成績 本教室、平位らの昭和38年の広島 の胎内原爆被爆児調査では、小頭症の頻度は表1に示すごとく、① 3000 m 以内の被爆児 545 例では45例 (8.3%) に小頭症を認め、高度小頭症 ($M-3\sigma$ 以下) は12例 (2.2%) に及び、非被爆対照児 473 例での小頭症13例 (2.7%) に比べ明らかに増加し、② 被爆時胎齢は妊娠3か月までの早期被爆 152 例では、小頭症26例 (17.1%)、高度小頭症10例 (6.6%)、4-7 か月での被爆例 211 例では小頭症15例 (7.1%) 高度小頭症2例 (0.9%) を認め、③ 被爆距離では999 m 以内の近距離被爆児12例では小頭症6例 (50%) を認め、これらはいずれも高度小頭症であり、1000-1499 m での被爆児 108 例では小頭症24例 (22.2%)、高度小頭症6例 (5.6%) がみられた。すなわち、妊娠初期での近距離被爆群に小頭症の明らかな増加を認めた。

その後、原対協、きのこ会を初め、各方面からの協力を得て、昭和40年末まで生存していることを確認した小頭症は44例であり、その姓名と被爆状況は表2に表示した。

これらの小頭症の多くは、ABCC の報告にも取り上げられ、小頭症の定義を平均頭囲 - 2 標準偏差以下としたことも ABCC と一致しているが、平均頭囲とその標準偏差は調査数により多少は変動するであろうし、小頭症の頻

cases investigated. We reported the frequency of microcephaly as 44, while ABCC has reported 33 cases. It is only a waste of energy on both sides to separately conduct similar research on the same patients. It is desirable to match the data on both sides and share the studies using the same criterion. At present efforts are being made to exchange data for this purpose, but this apparently is not as simple as we thought. Therefore, in this report, we have attempted to analyse only the results we ourselves obtained.

The exposure status and maternal environmental status of in utero exposed microcephalic children are shown in Table 3. By gestation week at the time of A-bomb exposure and exposure distance, it is seen that: there are 32 cases of microcephaly (11 cases of severe microcephaly) in children exposed in utero at less than 15 weeks of pregnancy; particularly in children proximally exposed in utero within 1500m, there are 30 cases of microcephaly (12 cases of severe microcephaly); all children proximally exposed in utero within 1000m and within 15 weeks of pregnancy have severe microcephaly (6 cases); and of children exposed in utero between 1001-1500m, there are 21 cases of microcephaly (5 cases of severe microcephaly) in those exposed in utero at less than 15 weeks of pregnancy and 3 cases of microcephaly (one case of severe microcephaly) in those exposed in utero between 16-28 weeks of pregnancy.

By gestational age and maternal age at the time of A-bomb exposure, of children exposed in utero within 15 weeks of pregnancy and within 1500m, there were 16 cases of microcephaly (5 cases of severe microcephaly) in those whose mothers were less than 25 years old; and 9 cases of microcephaly (5 cases of severe microcephaly) in those whose mothers were about 31 years of age.

By gestational age and paternal age at the time of A-bomb exposure of children exposed in utero within 15 weeks of pregnancy and within 1500m, there were 10 cases of microcephaly (3 cases of severe microcephaly) in those whose fathers were less than 30 years old; and 10 cases of microcephaly (6 cases of severe microcephaly) in those whose fathers were older than 41 years.

By gestational age and age difference between parents at the time of A-bomb exposure, of children exposed in utero within 15 weeks of pregnancy and within 1500m, there were 12 cases of microcephaly (3 cases of severe microcephaly) in those whose parents' age differed from 6-10 years; and 6 cases of microcephaly (5 cases of severe microcephaly) in those whose parents' age differed more than 11 years.

度を私どもは44例といい、ABCCでは33例と報告しているが、同一の患者について同様の研究をそれぞれ別個に行なうことはお互の能力の消耗にすぎない。両者の資料を照合し、同一基準によって研究分担を行なうのが望ましく、現在両者の資料の交換に努力しているが、このことは私どもが考えるほど簡単なことではないらしい。したがって、ここでは私どもの行なった成績についてのみ分析を試みた。

胎内被爆小頭症の被爆状況ならびに母体環境状況は表3に示した。すなわち、①被爆週齢と被爆距離については a) 15週齢以内の早期被爆に32例の小頭症(高度小頭症は11例)があり、b) 特に1500m以内の近距離被爆群に小頭症30例(高度小頭症12例)があり、c) 1000m以内の近距離で15週以内の早期に被爆したものはいずれも高度小頭症(6例)であり、e) 1001mないし1500mでの被爆では、15週前の早期被爆に小頭症21例(高度小頭症5例)、16-28週の妊娠中期被爆に小頭症3例(高度小頭症1例)があった。

②被爆時胎齢と母体年齢については、1500m以内で15週以内の早期に被爆したものでは、a) 母の年齢25歳以下のものに小頭症16例(高度小頭症5例)、b) 母体年齢の31歳前後のものに小頭症9例(高度小頭症5例)がある。

③被爆時胎齢と父の年齢については、1500m以内で15週以内の早期に被爆したものでは、a) 父の年齢が30歳以下のものに小頭症10例(高度小頭症3例)、b) 41歳以後のものに小頭症10例(高度小頭症6例)がある。

④被爆時胎齢と両親の年齢差については、1500m以内で15週以前に被爆したものでは、a) 年齢差が6-10歳のものに小頭症12例(高度小頭症3例)、b) 11歳以上の差のあるものに小頭症6例(高度小頭症5例)がある。

By gestational age at time of exposure and parity, of children exposed in utero before 15 weeks of pregnancy and within 1500 m, there were 12 cases of microcephaly (4 cases of severe microcephaly) in the case of a first child; and 11 cases of microcephaly (6 cases of severe microcephaly) in case of a third or later child.

By gestational age at time of exposure and at term among children exposed in utero within 15 weeks of pregnancy and within 1500 m, there were 9 cases of microcephaly (7 cases of severe microcephaly) whose gestational age was less than 38 weeks, suggestive of premature delivery.

The number of cases in this survey was too small for any statistical examination, but microcephaly was noted in children exposed in utero before 15 weeks of pregnancy and within 1500 m. However, no conclusion can be established on the effects of maternal environmental status at the time of A-bomb exposure.

LATE DISTURBANCES ACCOMPANYING MICRO-CEPHALY

Summary of ABCC Reports Among the disturbances that accompany microcephaly in Hiroshima, Miller has reported for children proximally exposed in utero that there was significantly reduced stature growth, and there were 2 cases born prematurely, 2 cases of Mongolism, 2 cases with dislocation of the hip, 3 cases with strabismus and 1 case who had died of primary hepatic carcinoma.

Wood (1966) et al found significant abnormalities in microcephalic children and reported that among 15 cases of microcephaly with mental retardation, there were strabismus (4 cases), severe myopia with microcornea (1 case), nephritis or urinary tract infection (3 cases), epilepsy (1 case), and congenital dislocation of the hip (1 case); while among 18 cases of microcephaly without mental retardation, there were renal disease (2 cases), myopia (3 cases), hepatitis, funnel chest, congenital dislocation of the hip and congenital absence of several phalanges of right hand (each 1 case); and of the 15 cases of microcephaly with mental retardation, 4 had died and the causes of death were drowning (Mongolism was noted), acute poliomyelitis, tuberculous peritonitis, and primary hepatic carcinoma.

Kawamoto (1966) reported that some cases of microcephaly were found to have mental disturbances, strabismus, and nystagmus; strabismus, myopia, and nystagmus; chronic gastroenteritis; probable Recklinghausen's disease; and otitis media and tonsillar hypertrophy.

⑤ 被爆時胎齢と経産回数では、1500m以内で15週以前に早期被爆したものでは、a) 初産児に小頭症12例(高度小頭症4例)、b) 3回経産以上のものに小頭症11例(高度小頭症6例)がある。

⑥ 被爆時胎齢と在胎週数では、1500m以内で15週以前の早期に被爆したものでは、在胎週数38週までの早産を思わせるものは、小頭症9例(高度小頭症7例)があった。

したがって、これらの分析では症例数が少ないので統計的検討は不可能であるが、1500m以内で15週以前の早期被爆群に小頭症を認め、それ以外の被爆時の母体環境の影響については結論づけは不可能である。

小頭症に合併する遅発障害

ABCC 報告の要点 広島での小頭症の合併障害としては、Miller は近距離被爆小頭症で、①身長は有意に低く、②2例の早産、2例の蒙古症、2例の股関節脱臼、3例の斜視と1例の原発性肝臓癌による死亡を報告した。

Wood ら(1966年)は小頭症に有意な疾病が合併し、①15例の知能遅滞を伴う小頭症では斜視(4例)、強度の近視および小角膜(1例)、腎炎または尿路感染症(3例)、てんかん(1例)、先天性股関節脱臼(1例)がみられ、知能遅延を伴わない小頭症18例では腎疾患(2例)、近視(3例)、肝炎、漏斗胸、先天性股関節脱臼、右手の指骨の先天性欠如症(各1例)がみられ、③知能遅延小頭症15例では、4例が死亡しており、その原因は、a) 溺死(蒙古症を認めた)、b) 急性灰白脊髄炎、c) 結核性腹膜炎、d) 原発性肝臓癌であったと報告している。

河本(1966年)は、小頭症には、①知能障害、斜視、眼球振盪、②斜視、近視、眼球振盪、③慢性胃腸炎、④レクリングハウゼン氏病の疑い、⑤中耳炎、へんとうせん肥大を合併するものがあったと報告している。

Disturbances other than microcephaly found among in utero exposed children include shortening of the 5th middle phalanx. Further, Miller reported 7 children exposed in utero in Hiroshima who had the following abnormalities other than infection or microcephaly associated with mental retardation: Congenital dwarfism, strabismus, and hepatitis (female, exposed in the 21st week of pregnancy at 950 m); primary hepatic carcinoma (female, exposed in the 10th week of pregnancy at 1050 m); unidentified lipidosis (male, exposed in the 35th week of pregnancy at 1170 m); psammoma of brain (male, exposed in the 12th week of pregnancy at 1411 m); congenital absence of several phalanges myopia and microcephaly (M-3 σ), normal intelligence (male, exposed in the 32nd week of pregnancy at 1436 m); sacral meningocele and pyelonephritis (female, exposed in the 18th week of pregnancy at 1450 m, died); and hypospadias (male, exposed in the 38th week of pregnancy at 1730 m).

Wood et al reported the following abnormalities in children exposed in utero without microcephaly (number of cases examined 150): Hemiparesis due to removed psammoma of brain; juvenile cirrhosis (hepatosplenomegaly and leukocytosis); hypospadias; congenital glaucoma; congenital syphilis (3 cases); hepatic tuberculosis; and nephritis. Among these 150 cases there were 3 deaths due to fever and convulsions, meningocele and pyelonephritis, and suicide.

For children exposed in utero (within 1999 m) in Nagasaki, Burrow et al reported that the visual acuity was poor in girls exposed in the first trimester whose mothers had reported acute radiation syndrome; and growth and development (mean standing height, mean sitting height, weight, chest circumference, menarche and epiphyseal closure of wrist) were delayed; but that there were no leukemia or malignancy and no evidence suggesting the effects of radiation in the radial pulse, blood pressure or urologic examinations.

Kawamoto et al who made a study in Nagasaki (218 cases, 1961) similar to the Hiroshima survey (1961) failed to detect segmented heterochromia but reported many cases with small heterochromic spots or pigmented nevi on the iris, membrana pupillaris persistens, and lenticular opacities and that in particular many of those exposed in utero within 1400 m showed subcapsular lenticular opacities.

Result of Investigation Children who had been exposed in utero were hospitalized for examination in two groups, one in September and the other in November 1966. These cases were classified into three groups: Group 1 included 9 cases of severe microcephaly in Hiroshima;

胎内被爆の小頭症以外の障害としては、第5中間指節の短縮が報告されており、さらに、Miller は広島での胎内被爆児で感染ないし小頭症以外の異常で知能遅延を認めた7例、すなわち、①先天性珠嚕、斜視、肝炎(女性、21週で950mの距離で被爆)、②原発性肝臓癌(女性、10週、1050m)、③不詳の脂肪過多症(男性、35週、1170m)、④脳膜砂腫(男性、12週、1411m)、⑤先天性指節欠如、近視、小頭(M-3 σ)、知能正常(男性、32週、1436m)、⑥仙骨髄膜瘤、腎盂腎炎(女性、18週、1450m、死亡)、⑦尿道下裂(男性、38週、1730m)を報告した。

Wood らは、小頭症以外の胎内被爆児(検査例数150例)では、①脳砂腫切除による片側まひ、②若年性肝硬変症(肝脾肥大症と白血球増多症)、③尿道下裂、④先天性緑内障、⑤先天性梅毒(3例)、⑥肝結核、⑦腎炎(2例)などの障害がみられ、150例中3例が、①発熱とけいれん、②髄膜瘤および腎盂腎炎、③自殺により死亡した、と報告している。

長崎での胎内被爆児(1999m以内)では、Burrow らは、①妊娠前期に被爆し母親が急性放射線症候群を訴えた女子は視力が劣り、②成長発育(平均身長、平均座高、体重、胸囲、初潮開始期および手根の骨核閉鎖)は遅延していたが、③白血病や悪性腫瘍はなく、橈骨動脈脈搏、血圧、泌尿器系検査で放射線の影響と考えられるものは証明できなかったと報告した。

河本らは広島での調査(1961年)と同様な長崎の調査(218例、1961年)で、分節虹彩異色症は発見できなかったが、①虹彩に小さな異色斑または色素母斑、②瞳孔膜遺残、③水晶体混濁が多数みられ、特に1400m以内の被爆に水晶体後囊下混濁が多かったと報告している。

研究成績 昭和41年の9月と11月の2回にわたって入院して受診した胎内被爆児を3つの群に分類した。すなわち、第1群は広島の高小頭症と認めたもの9例、第2

Group 2 consisted of 2 cases of microcephaly (smaller than $M-2\sigma$) with mental retardation of Hiroshima and 2 cases exposed in utero in Nagasaki considered to have mental retardation according to Kawamoto's paper; and Group 3 had 4 cases exposed in utero in Hiroshima without microcephaly. The exposure status, abnormal siblings, degree of development and other general findings are shown in Table 4 (The degree of development recorded is by the classification of measurements shown in Table 5). It is seen that the mothers of most cases in each group complained of acute A-bomb sickness after A-bomb exposure; none of the patients (propositus) had microcephaly or other deformities among their siblings; none showed any possible sign of phenylketonuria on ferric chloride test; and chromosome study showed one case of 21-trisomy in Group 1.

Roentgenographic findings of these children as shown in Table 6 are as follows: Skull X-ray examination—Group 1 had 9 cases with high tentorial attachment, 5 cases with abnormality of sella turcica and 1 case with osteoma of the left frontoparietal region; Group 2 had 1 case with high tentorial attachment, 2 cases with abnormality of sella turcica, 1 case with convergence of vascular groove, and 1 case with shallow occipital fossa; and Group 3 had 1 case with high tentorial attachment, 2 cases with abnormality of sella turcica and 1 case with occipital protrusion. Chest X-ray examination—Group 1 had 1 case with minute rib and 1 case with pendulous heart and diaphragmatic tenting, but Groups 2 and 3 did not have a single case with abnormal findings. X-ray examination of the extremities—Group 1 had 2 cases with deformity of the small finger, 2 cases with transverse line in the epiphysis of the radius, 1 case with defect of the phalanges of the foot and 1 case with dislocation of the hip joint; Group 2 of Nagasaki had 1 case with short 2nd phalanx of the left 5th toe and 1 case with transverse line in the fibula; and Group 3 had 1 case with transverse line in the epiphysis of the radius.

Examinations were performed by the various clinical divisions including the examination by Assistant Professor Arima for degenerate signs shown in Table 7 and for whether there were any diseases requiring treatment. The results obtained are shown in Table 8. Head findings—Degenerate signs such as brachycephalus and flat occiput were noted in 8 cases in Group 1, 1 case in Group 2, and 2 cases in Group 3. In Group 1, a case of osteoma of the left frontal region and 1 case of Mongolism were noted.

Facial findings—Abnormalities were noted in 8 cases in Group 1, 2 cases in Group 2, and 3 cases in Group 3. In

群は広島で被爆し知能遅延を認めた小頭症 ($M-2\sigma$ 以下) の 2 例と長崎で被爆し河本論文により知能遅延の考えられるものの 2 例, 第 3 群は広島で胎内被爆し小頭症の認められない 4 例である. その被爆状況, 同胞異常, 発育程度, その他の一般所見は表 4 に表示した (なお, 患者の発育程度は表 5 に示す計測値の分類に従って記載した). すなわち, ① 各群とも被爆後に母の急性原爆症状を訴えたものが多く, ② 患者 (発端者) の同胞に小頭症その他の奇形を認めたものは 1 例もなく, ③ 塩化第 2 鉄液反応でフェニールケトン尿症の疑いのあるものはなく, ④ 染色体分析では第 1 群に 1 例の 21 番常染色体のトリソミーを認めた.

患者の X 線所見は表 6 に示すように, ① 頭部では第 1 群に天幕付着部の高位 9 例, トルコ鞍の異常 5 例, 左前頭頭頂の osteoma 1 例を認め, 第 2 群では天幕付着部高位 1 例, トルコ鞍異常 2 例, 血管溝集合の 1 例, 後頭蓋窩浅の 1 例, 第 3 群では天幕付着部高位 1 例, トルコ鞍異常 2 例, 後頭隆起突出 1 例があり, ② 胸部所見では第 1 群に肋骨細小 1 例, 滴状心と横隔膜 tenting を示すもの 1 例があったが, 第 2 群, 第 3 群には 1 例の異常所見もなく, ③ 四肢所見では, 第 1 群に小指の変形 2 例, 桡骨端横線 2 例, 足指骨欠損 1 例, 股関節脱臼 1 例があり, 第 2 群では長崎被爆群に左第 5 足骨 2 節短 1 例と腓骨の横線 1 例を認め, 第 3 群では桡骨端横線の 1 例があった.

臨床各科の診察には, 表 7 に示すとき有馬助教授の変質徴候と治療を要する疾患の有無について診察を受け, その成績は表 8 に表示した. すなわち, ① 頭部の所見では, 短頭, 後頭扁平などの変質徴候は, 第 1 群では 8 例, 第 2 群では 1 例, 第 3 群では 2 例あり, なお第 1 群では左前頭の osteoma 1 例, 蒙古症 1 例を認めた.

② 顔面所見では第 1 群に 8 例, 第 2 群に 2 例, 第 3 群に 3 例の異常を認め, なお第 2 群の 1 例 (長崎被爆例) に

Group 2, a case of mandibular osteoma (Nagasaki exposed) was noted.

Ophthalmological findings — In Group 1, 1 case of epicanthus, 2 cases of strabismus, 1 case of hyaline remnant with medullated neurofibrosis were noted, in Group 2 there was no abnormality except for myopia, and in Group 3, 1 case with vitreous opacity and latent exotropia and 1 case of right lenticular pigmentation were found.

Otorhinological findings — Slight degenerate signs were noted in all groups.

Skin findings — Many cases of abnormalities such as leukoplakia, pigmentation, pigmented nevi, and hypertrichosis were noted in all 3 groups, especially Group 1.

Findings of spine and extremities — Many findings were noted in all 3 groups. Four cases of brachyphalangia were noted in Group 1.

Genitourological findings — 1 case with duplicated pelvis and ureter was noted in Group 1.

Visceral and hematological findings — 2 cases of anemia, 1 case of leukocytosis, 1 case of polycythemia vera, and 1 case of pendulous heart were noted in Group 1, but there were no such disease in Groups 2 and 3.

Past history — 1 case with epilepsy and 3 cases with convulsion of unknown etiology were found in Group 1.

SUMMARY

Radiation Exposure and Microcephaly Since animal experiments have shown that microcephaly is induced by fetal exposure to radiation and microcephaly has been found in children of mothers exposed to X-ray therapy during pregnancy (Murphy et al), the main cause of microcephaly in children exposed in utero to the A-bomb is considered to be ionizing radiation. Wood et al reported the increased incidence of microcephaly and mental retardation in children exposed in utero at proximal distances which they felt could not be attributed to any other known variable. ABCC has recently concluded that the effect of in utero exposure is primarily due to the immediate effect of radiation upon the fetuses although in A-bomb exposure the physical injury to the mother due to the A-bomb cannot be completely ignored. Our survey likewise revealed an increase of microcephaly in children exposed early in pregnancy at less than 15 weeks at closer distances than 1500 m. Thus, we presume that A-bomb radiation increases the incidence of microcephaly.

下顎骨骨腫がみられた。

③眼所見では第1群にエピカンthus 1例、斜視2例、硝子体動脈遺残と有髄神経線維症1例、第2群では近視のほかには異常はなく、第3群では1例の硝子体混濁と潜伏性外斜視、1例の右水晶体色素沈着を認めた。

④耳鼻所見では、あらゆる群に軽度の変質徴候がみられた。

⑤皮膚所見では、白斑、色素沈着、色素性母斑、多毛等の異常が3群ともに多数の症例にみられたが、特に第1群のものはその程度が著明であった。

⑥脊髓四肢の所見も3群ともに多発していたが、第1群に短指症4例があった。

⑦泌尿器所見では第1群に重複腎盂尿管1例があった。

⑧内臓および血液所見では、第1群に貧血2例、白血球増多症1例、真性多血症1例、滴状心1例があったが、第2群、第3群にはこれらの疾患はなかった。

⑨既往症の調査では、第1群のみにてんかん1例、原因不明のひきつけが3例あった。

あとがき

放射線被曝と小頭症 動物でも放射線により胎仔に小頭症が実験的に誘発され、妊娠中のX線治療で小頭症が発生する (Murphy ら) 事実から、胎内原爆被爆児の小頭症は電離放射線が主因をなすものと考えられ、Wood らも胎内被爆児にみる小頭症および知能遅延は被曝距離の近いものに多く、それ以外のいかなる周知の変数も発生原因とは考えられないといっており、ABCCは最近、胎内被爆症は主として放射線の胎児への直接効果であろうが、原爆被爆の場合は母親の原爆による身体障害の影響も無視できないであろうと結論している。われわれの調査成績もABCCの報告と同様に15週以内の早期胎齢で、1500m以内の近距離被爆に小頭症の増加を認めているので、原爆放射線が小頭症を増加せしめると推定している。

Degenerate Signs and Diseases in Microcephaly

Animal experiments have shown that central nervous disturbances in fetuses due to radiation are frequently accompanied by other disturbances (mesodermal deformities, Murakami et al). Wood et al reported that microcephalic children without mental retardation do not have a high rate of noninfectious diseases or retardation of growth and development, but microcephalic children with mental retardation have greater retardation of growth and development, more illnesses and a higher mortality rate.

Our survey also revealed that microcephaly was complicated by degenerate signs of the head and face, severe abnormal pigmentation of skin, degenerate changes of extremities or brachydactyly and hematological disease, with a high rate of epilepsy-like convulsions. It is not yet clear whether these complications are symptoms secondary to microcephaly or due to other separate disturbances of in utero exposure. In any event, microcephalic children have various weak points which put them to disadvantage in adapting to the living environment and therefore causing greater susceptibility to diseases and weakened vitality.

Future Aims of Investigation O'Connell (1965) reported that almost all children with microcephaly smaller than $M-2\sigma$ have mental retardation. ABCC divided microcephaly into two groups, that with normal mental development and that with mental retardation.

On the other hand, Komai reported in his genetic study on microcephaly in Japanese that: 44.8% are children born of cousin marriages and the majority of cases of microcephaly are controlled by simple autosomal genes; there are more cases among males (perhaps because males are more apt to be the propositus); the gene frequency is 0.0034-0.0063, and the mutation rate is $2.20-7.57 \times 10^{-5}$.

Our survey revealed no consanguineous marriage among the parents of microcephalic children exposed in utero and more microcephaly in females than in males.

The cases of microcephaly include those due to: lower limits of quantitative character due to polygenes; recessive inheritance; maternal disturbances during pregnancy (acute A-bomb sickness and others); and direct damage to fetuses due to radiation. This might be the cause for the discrepancy between O'Connell's result and ABCC's result but it was impossible in our survey to classify in utero exposed microcephaly cases into the above causes. Future study in this field will be focussed on the following: Genetic study on in utero exposed microcephaly cases; and investigation on children exposed in utero who are mentally retarded but not microcephalic.

小頭症の変質徴候と疾患 動物では放射線による胎仔の中枢神経系障害には、しばしば他の障害 (中胚葉系奇形) を伴い (村上ら), Wood らの報告では, 知能遅延を伴わない小頭症では, 非感染性疾患や発育成長の遅延を認めることはできなかったが, 知能遅延を伴う小頭症では発育成長の遅延と疾患の増加を認め, 死亡率も高いと報告している。

われわれの調査でも, 小頭症には, 頭部, 顔面の変質徴候や皮膚の高度な色素沈着異常, 四肢の変質や短指症, 血液疾患の合併, てんかん様けいれんが多かった。これらの合併症が小頭症の続発症状かまたは小頭症とは別個な胎内被爆障害によるかは明らかでないが, とにかく小頭症には生活環境に対応するには不適当な種々な弱点をもっており, したがって, 疾患にもかかりやすく, 生命力も弱いであろう。

今後の調査焦点 O'Connell (1965年) は $M-2\sigma$ 以下の小頭症児童はそのほとんどが知能低下していると報告しているが, ABCC では小頭症を知能正常のものと知能遅延したものの2群に分けている。

他方, 駒井博士は日本人の小頭症の遺伝的研究で, ① 44.8%はいとこ結婚による子供であり, 大多数の小頭症は単純性常染色体遺伝子に支配され, ② 患者は男に多く (発端者になる機会が多いためか), ③ 遺伝子の頻度は 0.0034ないし 0.0063であり, ④ 突然変異率は $2.20-7.57 \times 10^{-5}$ 程度であると報告している。

われわれの調査では, 胎内被爆小頭症では両親の血族結婚はなく, 患者は男よりも女に多かった。

小頭症には, ① 多遺伝子による量的形質の下限, ② 劣性遺伝によるもの, ③ 妊娠中の母体障害 (急性原爆症その他), ④ 胎児の放射線による直接障害などの原因によるものが含まれており, これが O'Connell と ABCC の報告の違いを起こしたのであろうが, これらを今回の胎内被爆小頭症で分類検討することは不可能であった。したがって, 今後この方面の研究の焦点は, ① 胎内被爆小頭症についての遺伝的研究と, ② 胎内原爆被爆児の小頭症を伴わない精薄児についての調査であろう。

TABLE 1 FREQUENCY OF MICROCEPHALY AMONG IN UTERO EXPOSED CHILDREN (HIRAI, 1963)

表 1 胎内被爆小頭症の頻度 (平位, 昭和38年)

Category 区分	Both Sexes 男+女			Male 男			Female 女		
	Number Examined 調査数	a	b	Number Examined 調査数	a	b	Number Examined 調査数	a	b
Exposed Children (<3000 m)									
被爆児	545	45 (8.3)	12 (2.2)	232	18 (7.8)	5 (2.2)	313	27 (8.6)	7 (2.2)
Gestational Age ATB 被爆胎齡									
<3 mos. 3 か月以内	152	26 (17.1)	10 (6.6)	62	11 (17.7)	3 (4.8)	90	15 (16.7)	7 (7.8)
4-7 mos. 4-7 か月	211	15 (7.1)	2 (0.9)	93	6 (6.5)	2 (2.2)	118	9 (7.6)	
Exposure Distance 被爆距離									
<999 m	12	6 (50.0)	6 (50.0)	5	3 (60.0)	3 (60.0)	7	3 (42.9)	3 (42.9)
1000-1499	108	24 (22.2)	6 (5.6)	52	9 (17.3)	2 (3.8)	56	15 (26.8)	4 (7.1)
1500-1999	137	6 (4.4)		58	2 (3.4)		79	4 (5.1)	
Nonexposed Control Children									
非被爆対照児	473	12 (2.7)		147	3 (2.0)		326	9 (2.8)	

a: Number of cases with microcephaly (head size M-2 σ or smaller) 小頭症 (M-2 σ 以下) 数b: Number of cases with severe microcephaly (head size M-3 σ or smaller) 高度小頭症 (M-3 σ 以下) 数

TABLE 5 GRADING OF MEASUREMENTS (1963, Based on Averages for Nonexposed Control Children)

表 5 計測値の分類 (昭和38年, 非被爆対照児の平均値より)

Items 項目	Grade 分類				
	-3	-2	-1	0	+1
		M-3	M-2	M-1	M
Head Circumference 頭囲 (cm)		51.8 (50.5)	53.1 (51.9)	54.4 (53.3)	55.7 (54.7)
Stature 身長 (cm)		149.2 (139.2)	154.8 (144.3)	160.4 (149.4)	166.0 (154.5)
Weight 体重 (kg)		36.4 (33.9)	42.8 (39.3)	49.2 (47.7)	55.6 (50.1)
Adaptation Ability 適応能力	Uneducable 教育不能	Partial compulsory education 義務教育中退	Complete compulsory education; Able to help with household tasks 義務教育終了手伝い可能		

Parentheses: Measurements for females.

() 内は女兒の計測値

TABLE 2 LIST OF MICROCEPHALIC IN UTERO EXPOSED CHILDREN IN HIROSHIMA (1965 Survey)

表2 広島での胎内原爆被爆小頭症(昭和40年調査)一覽表

Case No.* 基本番号	Name 姓名	Sex 性別	Maternal Exposure Status 母の被爆状況		Age of Parents ATB 被爆時両親年齢		Consan- guinity 血族結婚	Birth Order** 出産順位	Condition at Birth 出産時状況		Head Circumference 頭圍		ABCC Master File Number ABCC 基本名 簿番号
			Gestation Weeks ATB 被爆胎齡(週)	Exposure Distance (m) 被爆距離	Mother 母	Father 父			Gestation Weeks at Term 在胎週数	Birth Weight (g) 生下時体重	Degree 程度	Cephalic Index 頭蓋長幅係數	
1-1-(1)	MY	F 女	6	910	33	51	(-)	III/3	32	1700	-3	86.4	
1-2-(2)	SA	F 女	6	1120	24	28	(-)	I/2	40	2300		86.8	
1-1-(3)	HN	M 男	7	900	23	25	(-)	I/3	36	1400	-3	78.6	
1-2-(4)	NO	F 女	8	1090	31	41	(-)	III/4	38	2000	-3	88.9	
1-2-(5)	SH	F 女	8	1240	19	27	(-)	I/3	35	2400		83.2	
1-2-(6)	YK	M 男	8	1350	37	42	(-)	VI/6	40	3000?		75.7	
1-2-(7)	MH	F 女	8	1500	21	27	(-)	I/?	40	2800		91.3	
1-2-(8)	EF	F 女	9	1195	32	42	(-)	IV/5	40	2900		80.6	
1-2-(9)	KY	F 女	9	1340	21	29	(-)	I/1	40	2700		78.2	
1-1-(10)	YH	F 女	10	730	25	29	(-)	III/5	38	?	-3	90.3	
1-2-(11)	YK	M 男	10	1050?	38	45	(-)	IX/9	40	1600		85.6	
1-2-(12)	TO	F 女	10	1224	24	43	(-)	II/3	40	2000	-3	?	
1-2-(13)	KA	F 女	10	1400	26	28	(-)	III/3	40	3000		83.4	
1-1-(14)	MM	M 男	11	950	33	39	(-)	VI/7	38	2700	-3	76.9	
1-2-(15)	HK	M 男	11	1180	29	46	(-)	III/4	40	1300	-3	76.8	
1-2-(16)	HO	M 男	11	1380	24	31	(-)	I/2	40	?		86.3	
1-3-(17)	KY	M 男	11	1900	44	46	(-)	?	40	?		78.8	
1-1-(18)	KO	M 男	12	860	35	52	(-)	I/1	40	1500	-3	85.9	
1-1-(19)	MT	F 女	12	970	24	27	(-)	I/1	41	2000	-3	83.9	
1-2-(20)	TT	F 女	12	1050	23	32	(-)	I/3	36	1500	-3	88.4	
1-2-(21)	KH	M 男	12	1070	24	26	(-)	II/3	40	?		85.9	
1-2-(22)	MK	F 女	12	1280	44	53	(-)	IV/4	37	?	-3	87.6	
1-2-(23)	TS	M 男	12	1360	22	27	(-)	II/3	40	?		76.4	
1-2-(24)	YM	F 女	12	1400	22	?	(-)	I/3	40	?		89.0	
1-4-(25)	ST	M 男	12	2900	20	28	(-)	I/2	40	?		84.3	
1-2-(26)	TI	M 男	13	1050	33	38	(-)	V/5	38	?		87.1	
1-2-(27)	SO	M 男	13	1300	21	42?	(-)	II/?	40	?			
1-2-(28)	SM	F 女	14	1150	24	32	(-)	I/4	40	2200		83.6	
1-2-(29)	MM	M 男	14	1300	23	32	(-)	I/4	40	?		81.7	
1-4-(30)	MN	F 女	14	2000	27	29	(-)	II/3	40	?		93.1	
1-4-(31)	YT	M 男	14	2500	23	29	(-)	I/2	40	?		88.2	
1-3-(32)	KS	F 女	15	1750	34	42	(-)	VIII/8	40	2780		77.1	
2-2-(33)	IK	F 女	16	1420	?	35	(-)	I/2	38	?		88.2	
2-3-(34)	KO	F 女	16	1860	30	34	(-)	III/3	40	2000		84.8	
2-2-(35)	YM	F 女	18	1260	?	29	(-)	I/?	40	?		90.1	
2-4-(36)	TS	F 女	19	2100	39	48	(-)	V/5	40	?		84.8	
2-4-(37)	MN	M 男	19	2800	28	34	(-)	II/5	40	?		77.1	
2-2-(38)	HS	M 男	24	1150	33	33	(-)	III/3	40	1900	-3	79.1	
2-4-(39)	EN	F 女	25	2800	36	41	(-)	V/5	40	?		79.5	
2-4-(40)	HS	M 男	26	2300	29	35	(-)	III/4	40	?		72.4	
3-3-(41)	YH	F 女	29	1600	30	31	(-)	III/3	42	?		82.6	
3-4-(42)	MN	F 女	37	2600	36	44	(-)	IV/4	40	?		78.1	
3-3-(43)	NA	M 男	38	1600	36	42	(-)	IV/5	40	?		77.2	
3-4-(44)	YM	F 女	40	2900	23	29	(-)	I/4	40	3000		87.0	

* (Week of gestation ATB)-(Exposure distance)-(Serial number) (被爆胎齡)-(被爆距離)-(通し番号)

** Order of birth/Total size of sibship 出産順位は、第何子/同胞総数

TABLE 3 EXPOSURE AND MATERNAL ENVIRONMENTAL STATUS OF MICROCEPHALIC IN UTERO EXPOSED CHILDREN

表3 胎内被爆小頭症の被爆ならびに母体環境状況

a) Gestational Age at Time of Exposure and Exposure Distance

被爆時胎齡と被爆距離

Distance (m) 距離	Gestation Weeks 週齡						Total 計	
	<15		16-28		29+			
	a	b	a	b	a	b	a	b
-1000	6 (3)	6(3)					6 (3)	6(3)
-1500	21 (8)	5(1)	3(1)	1(1)			24 (9)	6(2)
-2000	3 (1)		2(0)		1(1)		6 (2)	
2001+	2 (2)		4(2)		2(0)		8 (4)	
Total 計	32(14)	11(4)	9(3)	1(1)	3(1)		44(18)	12(5)

a: Microcephaly 小頭症

b: Severe microcephaly 高度の小頭症

Parentheses: Number of males ()内は男児

b) Gestational Age and Maternal Age at Time of Exposure

(Excluding two female cases exposed within 1500 m for whom information was not available)

被爆時胎齡と母体年齡(1500m以内被爆, 不明2例(♀)を除く)

Age 年齡	Gestation Weeks 週齡				Total 計	
	<15		16-28			
	a	b	a	b	a	b
- 25	16 (6)	5(1)			16 (6)	5(1)
-30	2 (1)	1(1)			2 (1)	1(1)
31 +	9 (4)	5(2)	1(1)	1(1)	10 (5)	6(3)
Total 計	27(11)	11(4)	1(1)	1(1)	28(12)	12(5)

c) Gestational Age and Paternal Age at Time of Exposure

(Excluding one female case exposed within 1500 m for whom information was not available)

被爆時胎齡と父の年齡(1500m以内被爆, 不明1例(♀)を除く)

Age 年齡	Gestation Weeks 週齡				Total 計	
	<15		16-28			
	a	b	a	b	a	b
-30	10 (3)	3(1)	1(0)		11 (3)	3(1)
-40	6 (3)	2(1)	2(1)	1(1)	8 (4)	3(2)
41+	10 (5)	6(2)			10 (5)	6(2)
Total 計	26(11)	11(4)	3(1)	1(1)	29(12)	12(5)

- d) Gestational Age at Time of Exposure and Age Difference between Parents
(Excluding three female cases exposed within 1500 m for whom information was not available)
被爆時胎齡と父-母の年齢差(1500 m 以内被爆, 不明 3 例(♀)を除く)

Age 年齢	Gestation Weeks 週齡				Total 計	
	<15		16-28			
	a	b	a	b	a	b
-5	9 (4)	3(1)	1(1)	1(1)	10 (5)	4(2)
-10	12 (5)	3(1)			12 (5)	3(1)
11+	6 (3)	5(2)			6 (3)	5(2)
Total 計	27(12)	11(4)	1(1)	1(1)	28(13)	12(5)

- e) Gestational Age at Time of Exposure and Parity (Exposed within 1500 m)
被爆時胎齡と経産(1500 m 以内被爆)

Parity 経産	Gestation Weeks 胎齡				Total 計	
	< 15		16-28			
	a	b	a	b	a	b
I	12 (4)	4(2)	2(0)		14 (4)	4(2)
II	4 (3)	1(0)			4 (3)	1(0)
III	5 (1)	4(1)	1(1)	1(1)	6 (2)	5(2)
IV	6 (3)	2(1)			6 (3)	2(1)
Total 計	27(11)	11(4)	3(1)	1(1)	30(12)	12(5)

- f) Gestational Age at Time of Exposure and Duration of Pregnancy (Exposed within 1500 m)
被爆時胎齡と在胎週齡(1500 m 以内被爆)

Duration (weeks) 週齡	Gestation Weeks 胎齡				Total 計	
	<15		16-28			
	a	b	a	b	a	b
-38	9 (2)	7(2)	1(0)		10 (2)	7(2)
-41	18 (9)	4(2)	2(1)	1(1)	20(10)	5(3)
42+						
Total 計	27(11)	11(4)	3(1)	1(1)	30(12)	12(5)

TABLE 4 EXPOSURE STATUS AND GENERAL FINDINGS IN CASES EXAMINED CLINICALLY

表4 臨床研究を行なった患者の被爆状況と一般所見

Case No. 基本番号	Name 姓名	Maternal Exposure Status 母の被爆状況				Abnor- malities in Siblings* 同胞異常	Development 発育				Findings 所見			Remarks 備考	
		Gestation Weeks 週齢	Distance 距離	Age 年齢	Acute Symptoms 急性症状		Stature 身長	Weight 体重	Head Circum- ference 頭囲	Adap- tation Ability 適応能力	IQ	Blood Type 血液型	PKU**		Chromo- some Aberration 染色体異常
a) Severe Microcephaly 高度小頭症															
1-1-(1)	MY	6	910	33	(+)	0/2	-3	-3	-3	(-2)(-3)		B	(-)	(-)	
1-2-(4)	NO	8	1090	31	(+)	0/3	-3	-1	-3	(-2)(-3)		A	(-)	(-)	
1-1-(10)	YH	10	730	25	(+)	0/4	-3	-3	-3	-3		O	(-)	(-)	
1-2-(15)	HK	11	1180	29	(+)	0/3	-1	-3	-3	(-2)(-3)	22.9	O	(-)	(-)	
1-1-(18)	KO	12	860	35	(+)	0/0	-3	-3	-3	(-2)(-3)	25.5	O	(-)	(-)	
1-1-(19)	MT	12	970	24	(+)	0/0	-3	-2	-3	(-2)(-3)	13.6	O	(-)	(-)	
1-1-(20)	TT	12	1050	23	(+)	0/2	-3	-3	-3	(-2)(-3)		AB	(-)	(-)	
1-2-(22)	MK	12	1280	44	(±)	0/3	-3	-1	-3	(-2)(-3)		A	(-)	No. 21-trisomy	
2-2-(38)	HS	24	1150	33	(+)	0/2	0	-1	-3	(-1)(-2)		B	(-)	(-)	
b) Control Exposed Cases 比較被爆例															
i) Mental Retardation 知能遅延															
1-2-(11)	YK	10	1050?	38	(+)	0/7	-2	-1	-2	-1	41.7	O	(-)	(-)	
1-3-(32)	KS	15	1750	34	(+)	0/7	-3	-3	-2	-2	34.3	O	(-)	(-)	
Nagasaki 長崎†															
	MO	16	1091	18	(+)	0/3	-1?	-1?	-3?	(-1)(-2)		A	(-)	} Refer to Kawamoto's paper (河本論文参照)	
	JH	28	1141	?	(+)	?	2?	-2?	-3?	-2		B	(-)		
ii) In Utero Exposed 胎内被爆															
	MS	22	880	22	(+)	0/2	0	+1	-1	0		A	(-)	(-)	Microcephaly(-) 小頭症
	YH	10	1600	26	(+)	0/0	+1	+1	0	-2		AB	(-)	(-)	Microcephaly(-) 小頭症
	TS	18	1250	28	(-)	0/2	-2	-1	0	-2					Microcephaly(-) 小頭症
	KO	4	2800	?	(-)	0/5	+1	+1	+1	-1					Microcephaly(-) 小頭症

* Number of abnormal children/Number of siblings (excluding the propositus)

異常児数/同胞数(発端者を除く)

** By ferric chloride reaction

塩化第2鉄反応によって調べた

† The method of classification of Nagasaki cases is presumably different but they are shown according to our criteria.

長崎被爆は分類の方法は異なるであろうが、一応われわれの調査基準によった。

TABLE 6 ABNORMAL X-RAY FINDINGS

表 6 患者の X 線異常所見

Case No. 基本番号	Name 姓名	Head 頭部				Spine 脊椎		Chest 胸部		Extremities 四肢		Others その他	Remarks 備考
		High Tentorial Attachment 天幕附着部高位	Calcifi- cation 石灰沈着	Sella Turcica トルコ鞍	Others その他	Thoracic Vertebrae 胸椎	Lumber Vertebrae 腰椎	Rib 肋骨	Lung Field 肺野	Deformity of Small Finger 小指変形	Transverse Line at Epiphysis of Radius 桡骨端横線		
a) Severe Microcephaly (Head size M-3 σ or smaller)													
高度小頭症 (M-3 σ 以下)													
1-1-(1)	MY	(+)		Small 小				Thin 細					
1-2-(4)	NO	(+)		Small 小								Absence of phalanges of foot 足趾骨欠損	
1-1-(10)	YH	(+)											
1-2-(15)	HK	(+)		Small 小				Pendulous heart tenting 滴状心 tenting			(+)		
1-1-(18)	KO	(+)									Short 短	(+)	
1-1-(19)	MT	(+)		Irregular 不整	Front parietal osteoma 前頭頭頂 骨腫						Short 短		
1-2-(20)	TT	(+)											
1-2-(22)	MK			Deep 深									
2-2-(38)	HS	(+)											
1-1-(3)	HN	(+)										L.C.C.	According to X-ray taken in 1965 昭和40年の X 線 写真による
1-2-(12)	TO												
b) Control Exposed Cases													
比較被爆例													
i) Mental Retardation 知能遅延													
1-2-(11)	YK	(+)		Small 小									
1-3-(32)	TS												
Nagasaki	長崎												
	MO				Convergence of vascular grooves 血管溝集合							Short 2nd phalanx of left 5th toe 左第 V 足骨 2 節短	
	JH			Small 小	Shallow occipital fornix fossa 後頭蓋窩浅							Transverse line of fibula 腓骨の横線	
ii) In Utero Exposure 胎内被爆													
	MS	(+)		Irregular 不整	Prominent occipital eminence 後頭隆起突出						(+)		
	YH			Small (Irregular 不整)									
	TS												
	KO												

Cases with no abnormal findings not listed. 異常所見のないものは記載をさけた

All cases had 8 carpal bones. 手根骨はいずれも 8 個

TABLE 7 DEGENERATIVE SIGNS (ARIMA)

表 7 変質徴候 (有馬氏)

I) Head 頭部	Normal 正常	Abnormal 異常
Hair: Curly. Alopecia. Scanty pigmentation.		
毛髪 卷毛 脱毛 色素少		
Brachycephaly: Oxycephaly. Scaphocephaly. Flat occiput.		
短頭 尖頭 舟状 後頭扁平		
Asymmetry: Megacephaly. Microcephaly. Tumor.		
非対称 大頭 小頭 腫瘤		
II) Face 顔面	Normal 正常	Abnormal 異常
Eye: Strabismus (divergent, convergent). Narrow palpebral fissure. Cataract. Corneal opacity. Abnormality of iris.		
眼 斜視 (内外) 開離狭 白内障 角膜濁 紅彩異常		
Epicanthus. Mongoloid. Non-mongoloid.		
エピカンthus モウコ様 反モウコ様		
Nose: Saddle nose. Prominence of root of nose. Large. Small. Curved concha.		
鼻 鞍鼻 鼻根膨隆 大 小 甲介彎曲		
Mouth: Gothic palate. Odontoloxia. Harelip. Cleft palate. Uvula bifida. Micrognathia. Megaloglossia.		
口 高口蓋 齒列不整 兔唇 口蓋裂 二分垂 小顎 巨舌		
Pinna: Small. Large. Low position. Bent. Lop ear. Nodular.		
耳介 小 大 下位 彎曲 聳立 結節		
Skin: Hemangioma. Vascular engorgement.		
皮膚 血管腫 血管怒張		
III) Fingers 手指	Normal 正常	Abnormal 異常
Digitus varus of 5th finger. Brachydactylia. Arachnodactylia. Short 2nd phalanx. Polydactylia. Syndactylia.		
5 指内彎 短指 長指 第 2 節短 多指 合指		
Adactylia. Wide thumb (mm). Monkey line (complete, incomplete). Brachial trigeminal line (t).		
欠指 拇指広 猿線 (完, 不全) 腕三叉線 (t)		
IV) Upper and Lower Extremities 四肢	Normal 正常	Abnormal 異常
Cubitus valgus. Cubitus varus. Limitation of extension. Limitation of flexion.		
外反肘 内反肘 伸展制限 屈曲制限		
V) Trunk 軀幹	Normal 正常	Abnormal 異常
Heart murmurs. Pigeon breast. Funnel chest. Asymmetry. Umbilical hernia. Accessory mamma. Pterygoid neck.		
心雑音 鳩胸 ロート胸 非対称 臍ヘルニア 副乳 翼状頸		
VI) Skin 皮膚	Normal 正常	Abnormal 異常
Leukoplakia. Cafe. Pigmented nevi. Hypertrichosis. Hemangioma. Skin sinus.		
白斑 色素性母斑 多毛 血管腫 皮膚洞		
VII) Genitourinary Organ 泌尿生殖器	Normal 正常	Abnormal 異常
Hernia. Cryptorchidism (left, right). Hypospodias. Vaginal fistula. Aproctia. Hermaphrodism.		
ヘルニア 停留睾丸 (左, 右) 尿道下裂 陰瘻 鎖肛 半陰陽		
VIII) Viscera 内臓	Normal 正常	Abnormal 異常
Brain. Skull film. Pneumoencephalography. Angiography. Chest and abdomen. Physical examination. Roentgenography.		
脳 単純 気脳 血管写 胸腹部 理学的 レ線		

表 8 變質徵候と疾患

Case No.	Name	Head	Face (Oral cavity)	Eyes	Ear & Nose	Skin	Spine & Extremities	Urogenital Organ	Viscera & Blood	Past History
基本番号	姓名	頭部	顔面(口腔)	眼所見	耳鼻所見	皮膚所見	脊髄四肢	泌尿性器	内臓及び血液	既往症
a) Severe Microcephaly 高度小頭症										
1-1-(1)	MY	Brachycephaly. Flat occiput. 短頭 後頭扁平	Chronic gingivitis. 慢性歯齦炎	Epicanthus エピカントス 両眼近視	Saddle nose. Flat root of nose. 鞍鼻 鼻根扁平	Pigmentary abnormality of whole body (卅) Hypertrichosis (卅) 全身色素沈着異常(卅) 多毛(卅)	Scoliosis. Cubitus valgus. 脊柱側彎外反肘	Right double Pyeloureter 右重複腎盂尿管	Anemia (pernicious ?). 貧血(悪性?)	Epilepsy at age 8. 8歳時てんかん
1-2-(4)	NO	Brachycephaly. Narrow forehead. 短頭 前額狭小	3 J labial displacement. 2 T2 defects. 3 J唇側転位 2 T 2欠損	Strabismus. Myopia. 斜視, 近視	Lop ear. 耳介隆立	Abnormality of pigmentation (leukoplakia, nevus, pigmentation) (卅) 色素異常(白斑, 母斑, 沈着)(卅)	Brachydactylia. Brachial trigominal line t'. Absence of 2-5 phalanges of right foot. 短指, 腕三又線 t'' 右第2-5足骨欠損症	(一)	Hyperactive tendon reflexes. 腱反射亢進	Convulsions. ひきつけ
1-1-(10)	YH	Flat occiput. 後頭扁平	Facial abnormalities, Protrusion of lips. 顔面異常, 口唇突出	?	?	(一)	Dislocation of hips 両側股関節脱臼	Urobilinuria ウロビリネ尿	Leukocytosis 白血球増多症	
1-2-(15)	HK	Brachycephaly. Alopecia. Occipital deformity. 短頭, 脱毛 後頭変形	Odontologia. Mild micrognathia. 5 1 5 malposition. 3 1 2 歯列不整, 軽度小顎 5 1 5 転位 2 1 2	Myopia. 近視	Prominence of root of nose. Curved concha. Small pinna. 鼻根膨隆, 甲介彎曲, 耳介小	Leukoplakia. Pigmentation (卅) 白斑, 色素沈着(卅)	Irregular monkey line of fingers. Brachial trigeminal line t'. Decreased equilibrium function. 手指猿線不整, 腕三又線 t' 平衡機能低下	(一)	Pendulous heart. Diaphragmatic tenting. 滴状心, 横隔膜 Tenting	Bronchial pneumonia. 気管支肺炎
1-1-(18)	KO	Brachycephaly. 短頭	Gothic palate. Gingivitis. Rotated teeth. Excessive overbite. 高口蓋, 歯肉炎, 捻転歯, 過蓋咬合	Hyaline remnant. Fibrosis of medullated nerve. Myopia. 晶子体動脈遺残, 有髓神経線維症, 近視	Bent pinna. Dysfunction (extra-vestibule). 耳介彎曲, 機能失調(前庭外)	Pigmentary abnormality of whole body (leukoplakia, pigmentation) (卅) 全身性色素異常(白斑, 沈着)(卅)	Inability to stand on one leg. Bilateral brachydactylia. Brachial trigeminal line t'. Abnormality of length of leg. 片脚起立不能, 両側短指 腕三又線 t'', 下肢長異常	(一)	Abnormal thorn test polychymia vera. Thorn test 異常 真性多血症	Convulsions. ひきつけ
1-1-(19)	MT	Left frontal osteoma. 左前頭骨腫	(一)	Mongolism-like symptoms モウコ症様症状	Saddle nose 鞍鼻	Pigmentary abnormality of part of body and hypertrichosis (卅). 部分的色素異常と多毛(卅)	Brachydactylia (Left small finger). Bent hip joint (left). Accelerated tendon reflexes. 短指症(左小指) 股関節(左)屈曲, 腱反射亢進	(一)	(一)	Pneumonia. Epilepsy ? 肺炎 てんかん?
1-2-(20)	TT	Brachycephaly. 短頭	Protrusion of lips. 口唇突出	Myopia. 近視	Small pinna. 耳介小	Pigmentary abnormality of whole body (卅). 全身性色素沈着異常(卅)	Sluggish movements. Accelerated tendon reflexes. Decreased equilibrium function. 運動遲拙, 腱反射亢進 平衡機能低下	(一)	(一)	
1-2-(22)	MK	Flat occiput. Mongolism. 後頭扁平 蒙古症	Protrusion of lips. Enamel dysplasia. 口唇突出 エナメル不全	?	?	Leukoplakia (卅). 白斑(卅)	Short limbs. Bilateral short 2nd finger. Digitus varus of 5th finger. Bilateral hallux valgus. Bilateral flatfoot. 四肢短, 両側2指短, 5指内彎, 両外反母趾, 両扁平足	(一)	Anemia. 貧血	Fever. Stomatitis. 発熱 口内炎
2-2-(38)	HS	Brachycephaly 短頭	Gothic palate. 6 1 1 Malposition 1 1 Enamel dysplasia. 高口蓋 6 1 1 転位 エナメル不全	Divergent strabismus. Right myopia. Left hyperopia. 外斜視 右近視 左遠視	Prominence of root of nose. Curved concha. Low pinna. Small pinna. 鼻根膨隆, 鼻甲介彎曲 耳介下位, 耳介小	Localized leukoplakia. Nevus (+). Atheroma of left lower extremities(?) 局所の白斑, 母斑(+) 左下肢のアテローム(?)	Multiple bone tumors of arms and legs. Difference in anterior-posterior diameter of forearm and length of arm by left and right sides. Accelerated tendon reflexes. Decreased equilibrium function. 上腕, 下腿の多発性骨腫瘍 前腕前後径, 上肢長に左右差あり, 腱反射亢進, 平衡機能低下	(一)	(一)	Twins (One has died). Fever. 双胎児(1児死亡) 発熱

Case No. 基本番号	Name 姓名	Head 頭部	Face (Oral cavity) 顔面 (口腔)	Eyes 眼所見	Ear & Nose 耳鼻所見	Skin 皮膚所見	Spine & Extremities 脊髄四肢	Urogenital Organ 泌尿性器	Viscera & Blood 内臓及び血液	Past History 既往症
b) Exposed Control Group 比較被爆群										
i) Mental Retardation 知能遅延										
1-2-(11)	YK	(—)	$\frac{2}{1} \frac{2}{2}$ microdont. $\frac{6}{7}$ caries. $\frac{5}{7}$ rotated teeth. $\frac{2}{1} \frac{2}{2}$ 倭小歯, $\frac{6}{7}$ カリエス, $\frac{5}{7}$ 捻転歯	Myopia. 近視	Curved concha. Small pinna. 鼻甲介彎曲, 耳介小	<i>Nevi over whole body</i> <i>Leukoplakia of part of</i> <i>body (+)</i> 全身性母斑, 一部白 斑(+)	<i>Brachydactylia</i> (short 2nd phalanx). Accelerated tendon reflexes. Decreased equili- brium function. 短指(第2節短) 腱反射亢進 平衡機能低下 <i>Monkey line</i> left insufficient. <i>Cubitus valgus</i> . Brachial tri- geminal line t. Accelerated tendon reflexes. Decreased equilibrium function. 猿線左不全, 外反肘, 腕三叉線 t', 腱反射亢進, 平衡機能低下	(—)	Hypotension 低血圧	
1-3-(32)	KS	(—)	Gothic palate. Odontoloxia. $\frac{2}{1} \frac{2}{2}$ malposition. Enamel $\frac{3}{1} \frac{3}{3}$ dysplasia. 高口蓋, 齒列不整, $\frac{2}{1} \frac{2}{2}$ 転位, エナメル不全	Myopia. 近視	Prominence of root of nose. Small pinna. 鼻根膨隆 耳介小	<i>Left facial pigmented</i> <i>nevus (+)</i> . 左顔面色素性母斑(+)	猿線左不全, 外反肘, 腕三叉線 t', 腱反射亢進, 平衡機能低下	Urobilinuria ウロビリן尿	(—)	Gastric ulcer ? 胃潰瘍?
Nagasaki 長崎 MO		Convergence of vascular grooves. 血管溝集中	<i>Osteoma of left</i> <i>mandibula</i> . Enamel dysplasia. 左下顎骨の骨腫 エナメル不全	Myopia. 近視	Small pinna. Chronic tonsillitis. 耳介小 慢性扁桃腺炎	<i>Localized leukoplakia</i> <i>and nevus (+)</i> . 局所的白斑と母斑(+)	2nd phalanx of left 5th toe (short). Microdactylia. Cubitus valgus. Limitation of extension of right middle and ring fingers. Accelerated tendon reflexes. Decreased equilibrium function. 左第5趾の2節(短), 手指の倭小, 外反肘, 右中環指伸展制限, 腱反射 亢進, 平衡機能低下 <i>Motor paralysis (cerebral</i> <i>paralysis ?)</i> . <i>Cubitus valgus</i> . <i>Excessive extension of upper</i> <i>and lower extremities</i> . 運動麻痺(脳性麻痺?) 外反肘, 四肢過伸展	Urobilinuria ウロビリן尿	(—)	Dental bleeding 歯出血
Nagasaki 長崎 JH		(—)	(—)	Slight myopia. 軽度近視	(—)	Tumor of left chest 左胸部腫瘍 (neurofibroma).	(—)	(—)	(—)	
ii) In Utero Exposure 胎内被爆										
MS	Abnormal promi- nence of occipital protuberance. 後頭結節異常突出	$\frac{8}{1} \frac{8}{8}$ malposition. Enamel dysplasia. $\frac{8}{1} \frac{8}{8}$ 転位 エナメル不全	Vitreous opacity. Latent divergent strabismus. 硝子体混濁 潜伏性外斜視	(—)	Localized pigmentation(+) Tumor of left forearm 局所の色素沈着(+) 左前腕腫瘍 (Pecklinghausen tumor ?)	Accelerated tendon reflexes. Decreased equilibrium function. 腱反射亢進 平衡機能低下	(—)	Nephritis 腎炎	Fever. 発熱	
YH	(—)	$\frac{3}{1} \frac{3}{3}$ malposition. $\frac{3}{1} \frac{3}{3}$ 転位	Pigmentation of right crystalline lens. Myopia. 右水晶体色素沈着 近視	Narrow external meatus. Lop ear. Curved concha. 外耳道狭小 耳介聳立 鼻甲介彎曲	<i>Localized leukoplakia</i> <i>and pigmentation (+)</i> . 局所的白斑と色素 沈着(+)	Ataxic gait. Accelerated tendon reflexes. 失調性歩行, 腱反射亢進	(—)	(—)		
TS	Brachycephaly 短頭	Enamel dysplasia. エナメル不全	Myopia. 近視	Saddle nose. 鞍鼻	<i>Localized pigmented</i> <i>nevi (+)</i> . 局所的色素母斑(+)	<i>Convulsive paralysis of lower</i> <i>extremities</i> . <i>Huge transverse</i> <i>process of 7th cervical vertebra</i> . <i>Retention of 5th lumbar vertebral</i> <i>epiphyseal center</i> . 両下肢痙攣性麻痺 第7頸椎横突起巨大, 第5腰椎骨端核遺残 X-ray showed thoracic scoliosis with convexity to right. <i>Cubitus valgus</i> . X-P 上右凸の胸椎側彎, 外反肘	?	Dysfunction of adrenal gland and pituitary body ? 副腎下垂体機能 不全?	Pneumonia. 肺炎	
KO	(—)	(—)	Left myopia. 左近視	Deviated nasal septum. 鼻中隔彎曲	(—)	(—)	(—)	(—)	Abnormal thorn test (dysfunction of adrenal gland and pituitary body ?) Thorn test の異常(副腎, 下垂体機能不全?)	

(—): No specific findings. 特異所見のないもの

?: Examination not possible. 診察不能なもの

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