

AN AUTOPSY CASE OF THYROID CANCER DETECTED IN AN ATOMIC BOMB
SURVIVOR FOLLOWING RADIOTHERAPY FOR TONGUE CANCER

舌癌の放射線治療後発見された甲状腺癌の1原爆被爆者剖検例

KAZUO NERIISHI, M.D. 鍊石和男



RADIATION EFFECTS RESEARCH FOUNDATION
財団法人 放射線影響研究所

A cooperative Japan - United States Research Organization
日米共同研究機関

ACKNOWLEDGMENT

謝 辞

Deep appreciation is expressed to Dr. Tsutomu Yamamoto, Assistant Chief Department of Pathology; Dr. Hisao Sawada, Acting Chief, Department of Medicine; and Dr. John A. Pinkston, Department of Medicine; for their kind review of the manuscript; and to Dr. Yasuo Fukunaga, Second Department of Internal Medicine, Hiroshima University School of Medicine, for making his data available.

御校閲頂いた山本 務病理部副部長，澤田尚雄臨床部部長代理，臨床部 Dr. John A. Pinkston に深謝致します。また，資料を提供頂いた広島大学医学部第二内科福永保夫先生に謝意を表します。

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掲載された。

広島医学 — The Journal of the Hiroshima Medical Association
33:999-1002, 1980

RERF TECHNICAL REPORT SERIES

放影研業績報告書集

The RERF Technical Reports provide the official bilingual statements required to meet the needs of Japanese and American staff members, consultants, and advisory groups. The Technical Report Series is in no way intended to supplant regular journal publication.

放影研業績報告書は，日米専門職員，顧問，諮問機関の要求に応えるための日英両語による公式報告記録である。業績報告書は決して通例の誌上発表論文に代わるものではない。

The Radiation Effects Research Foundation (formerly ABCC) was established in April 1975 as a private nonprofit Japanese Foundation, supported equally by the Government of Japan through the Ministry of Health and Welfare, and the Government of the United States through the National Academy of Sciences under contract with the Department of Energy.

放射線影響研究所(元ABCC)は，昭和50年4月1日に公益法人として発足した。その経費は日米両政府の平等分担とし，日本は厚生省の補助金，米国はエネルギー省との契約に基づく米国学士院の補助金とをもって充てる。



AN AUTOPSY CASE OF THYROID CANCER DETECTED IN AN ATOMIC BOMB SURVIVOR FOLLOWING RADIOTHERAPY FOR TONGUE CANCER

舌癌の放射線治療後発見された甲状腺癌の1原爆被爆者剖検例

KAZUO NERIISHI, M.D. (鎌石和男)

Department of Medicine

臨床部

SUMMARY

It is established that exposure to radiation is associated with the development of thyroid cancer. This report describes a case of thyroid cancer found at autopsy in an atomic bomb survivor who also had received radiotherapy for tongue cancer.

The patient, a female, was exposed to A-bomb radiation (38 rad) at age 29, and at age 60 was found to have squamous cell carcinoma of the tongue. She received chemotherapy and Maruyama vaccine, as well as a course of radiation therapy (9,000 rad to the tongue and 12,000 rad to the neck), but expired 20 months later. At autopsy, in addition to tongue cancer, the thyroid gland was found to contain multicentric papillary adenocarcinoma in both lateral lobes. In addition, both cancers had metastasized to cervical lymph nodes.

It was of interest that the thyroid cancer in this case was noted following two separate radiation exposures. The tumor was multicentric papillary adenocarcinoma, a histologic type reported to be associated with radiation exposure. It is suggested that the thyroid cancer may have been induced by A-bomb irradiation, since the latent period between irradiation for tongue cancer and diagnosis of thyroid cancer was only 12 months.

INTRODUCTION

It is well known that radiation is carcinogenic. This report concerns a case of thyroid cancer detected at autopsy in a person exposed to

要 約

放射線の照射が甲状腺癌の発症に関連していることはよく知られているところである。被爆者で舌癌を発症し、これに放射線治療を受け、死後剖検により甲状腺癌が発見された症例を経験したので報告する。

患者は女性、29歳で原爆に被爆(38 rad)、60歳時に舌の扁平上皮癌の診断を受け、抗癌剤、丸山ワクチンの投与に加え、放射線治療(患部に9,000 rad、頸部に12,000 rad)が行われたが効果なく、1年8か月後死亡した。剖検の結果、舌癌のほかに甲状腺の両葉に多中心性乳頭状腺癌がみられ、また、それぞれの癌の頸部リンパ節転移もみられた。

この症例は2回の放射線被曝と甲状腺癌との関係に興味を持たれるところであるが、放射線に特異性が比較的高いとされる組織型の多中心性乳頭状腺癌を認めた。また、原爆被曝と治療的被曝のいずれが関与したかについては、舌癌の放射線治療から甲状腺癌診断に至る期間がわずか1年であることから、前者が誘発した可能性が大きいものと思われる。

緒 言

放射線照射が発癌に関係することは既によく知られている。被爆者で舌癌を発症し、放射線治療を受け、

A-bomb radiation who also received radiotherapy for cancer of the tongue. A study was also made of histological changes in the thyroid gland which may be associated with radiation.

CASE REPORT

A 61-year-old female (MF [redacted]), exposed to the A-bomb 1,500m from the hypocenter in Hiroshima at the age of 29. She was married at age 22 and gave birth at age 23. Estimated A-bomb exposure dose was 38rad and past medical history was unremarkable. Her father had kidney disease.

Present Illness. She had been in good health, with no history of major illness. Beginning in 1952, at age 36, she received periodic examinations at ABCC and at her examination in 1952, she was 150cm in height and 49.5kg in weight, with good nutritional status. There was no jaundice or anemia, nor abnormalities in the thoracic or abdominal regions. No swelling of the thyroid gland was noted. A burn scar was noted in the upper dorsal region.

Gynecological examination revealed chronic cervicitis and a cervical polyp. Hematological examination revealed RBC 4,460,000, Hb 13.5g/100ml, Hct 44%, WBC 11,700/mm³, with neutrophils 74%, lymphocytes 12.5%, monocytes 6.0%, eosinophils 7.0%, and basophils 0.5%. She subsequently received biennial examinations and nodular goiter was first noted in 1960, at age 44. At that time, her protein-bound iodine (PBI) was normal (6.6μg/100ml).

She was also diagnosed as having hypertension and iron deficiency anemia. Her blood pressure was 180/90 mmHg, and unsaturated iron binding capacity 295μg/100ml. Nodular goiter was again noted in 1964, and she was found to be euthyroid with a resin uptake of 21.4%, PBI 5.7μg/100ml, thyroglobulin autoantibody test (-), and turned red agglutination (-).

An electrocardiogram showed left ventricular hypertrophy and a chest X-ray revealed mild cardiomegaly. From about 1968, at age 52, the goiter was no longer noted and thyroid function tests were not performed. In June 1976, at age 60, a tumor was noted on the right edge of the tongue. She was diagnosed as having tongue cancer and underwent partial excision of the tongue at the Hiroshima University Hospital.

剖検により甲状腺癌が発見された症例を経験したので報告する。また、放射線による甲状腺の組織学的変化についても検討した。

症 例

61歳の女性(MF番号[redacted])。29歳の時、広島の大原町より1,500mの地点で被爆。22歳で結婚し、23歳で出産。被爆推定線量は38rad、既往歴は特になし。父は腎臓病を有す。

現病歴。 特に病気することもなく元気に経過。1952年、36歳からABCCで定期検診を受ける。1952年の検診では身長150cm、体重49.5kg、栄養良好であった。黄疸、貧血ともになく、胸腹部にも異常なし。甲状腺腫脹を認めず。上背部に火傷瘢痕あり。

婦人科的に慢性子宮頸管炎と、子宮頸管ポリープを認めた。血液検査ではRBC 446万、Hb 13.5g/100ml、Hct 44%、WBC 11,700/mm³、好中球74%、リンパ球12.5%、単球6.0%、好酸球7.0%、好塩基球0.5%であった。その後、2年ごとの定期検診を受け、1960年、44歳で初めて結節性甲状腺腫を指摘された。この時タンパク結合ヨウ素(PBI)は6.6μg/100mlで正常であった。

他に高血圧症、鉄欠乏性貧血症の診断も受けた。血圧180/90mmHg、不飽和鉄結合能295μg/100mlであった。1964年、再び結節性甲状腺腫を認め、Resin吸収21.4%、PBI 5.7μg/100ml、チログロブリン自己抗体テスト(-)、赤変凝集反応(-)で甲状腺機能は正常であった。

心電図は左心室肥大、胸部X線は軽度心肥大を示した。1968年、52歳ころより甲状腺腫は指摘されなくなり、甲状腺機能検査も行われなくなった。1976年6月、60歳の時、右舌縁の腫瘍に気付き、広島大学病院にて舌癌の診断を受け、舌部分切除術を受けた。

In October 1976 she developed cervical lymphadenopathy, and from January to March 1977, she received 9,000 rad of radiotherapy to the primary site and 12,000 rad to the neck. The tumor decreased in size initially, but in September 1977 the disease began to progress. Chemotherapy was begun (Bleomycin 7 days 5 mg/day, Mitomycin 10mg, OK432, 2KE 2/week, Maruyama vaccine), but cachexia progressed. On 13 January 1978 she developed massive bleeding from the primary site and expired on 19 January.

Clinical Diagnoses. Cancer of the tongue with metastasis to cervical lymph node.

Pathological Diagnoses. Squamous cell carcinoma of the tongue; metastasis of squamous cell carcinoma to cervical lymph nodes; papillary adenocarcinoma of thyroid; metastasis of papillary adenocarcinoma to cervical lymph nodes; follicular adenoma of right lobe of thyroid; bilateral acute bronchopneumonia with abscess formation in upper left pulmonary lobe; myoma of unstriated muscle of posterior wall of uterus; mild arteriolar nephrosclerosis with cortical cyst; fibrous adhesions in thoracic cavity bilaterally; mild arteriosclerosis of aorta, coronary artery, and cerebral artery; cystic infarct of left cerebral basal ganglia; cholelithiasis; burn scar on skin of both upper extremities; and mild edema of lower extremities.

Autopsy Findings. The autopsy was performed 25 hours after death. The surface of the body showed a surgical scar and a 1.6×1.4 cm fistula on the right lower jaw. There was no palpable adenopathy. A burn scar was noted extending from both upper extremities to the back. The abdominal cavity was unremarkable. The left thoracic cavity contained 100ml of mildly turbid fluid, and there was 10ml of pericardial fluid. The cardiovascular system was unremarkable except for hypertrophy of the left ventricular myocardium. Examination of the respiratory system revealed a malodorous necrotic pharyngeal mucous membrane. Both lungs were congested and markedly edematous. In the middle lobe of the right lung a 7.5 cm diameter abscess was noted. The spleen and bone marrow were unremarkable. The right side of the tongue was deficient to the root and necrotic changes of the mucous membrane extended to a portion of the larynx. Both tonsils were necrotic, and both parotid glands were firm and fibrous. The other

同年10月、頸部リンパ節腫脹が出現し、翌1977年1月から3月にかけて舌癌部に9,000 rad、頸部に12,000 radの放射線治療を受けた。当初腫瘍は縮小したが、同年9月再び進行した。化学療法(Bleomycin 1日5 mgを7日、Mitomycin 10mg, OK 432, 2KE, 週2回、丸山ワクチン)が開始されたが、悪液質は進行し、翌1978年1月13日舌腫瘍部より大量の出血があり、同19日死亡した。

臨床診断. 舌癌とそれに伴う頸部リンパ節転移。

病理診断. 舌癌の扁平上皮癌; 扁平上皮癌の頸部リンパ節転移; 甲状腺の乳頭状腺癌; 乳頭状腺癌の頸部リンパ節転移; 甲状腺右葉の濾胞状腺腫; 両側性の急性気管支肺炎、左葉上葉に膿瘍形成; 子宮後壁の平滑筋腫; 軽度の皮質嚢胞を伴った細動脈腎硬化症; 両胸腔の線維性癒着; 大動脈、冠動脈、脳動脈の中等度の動脈硬化症; 左脳基底神経核の嚢胞性梗塞; 胆石症; 両上肢皮膚の火傷癍痕; 及び、下肢の中等度浮腫。

剖検所見. 死後25時間後剖検を実施した。外表には右下頸部に外科手術痕跡とともに1.6×1.4 cmの瘻孔を認めた。リンパ節触知せず。両側上肢から背部にかけ火傷痕跡あり。腹腔著変なし。胸腔は左に軽度に混濁した胸水100 mlを認める。心嚢水10 ml。心血管系は左室心筋肥大のほか特になし。呼吸器系では、咽頭粘膜は壊死状で悪臭を放ち、両肺ともうっ血あり、浮腫著明。右肺中葉に直径7.5 cmの膿瘍形成を認める。脾臓、骨髄に著変認めず、舌右側は舌根部まで欠損し、粘膜の壊死状変化は一部喉頭部まで及んでいる。扁桃腺は両側とも壊死状態であり、両耳下腺は固く線維性である。

organs of the digestive system were unremarkable. The pancreas, kidneys, and other organs of the urinary tract revealed no abnormality. A cyst in the left ovary and a 6.0×4.0cm myoma in the posterior wall of the uterus were found. The thyroid gland weighed 16.0g, and nodules of approximately 0.3 cm were noted grossly in the left lobe. The brain contained an old 0.7 cm infarct in the left basal ganglia.

Histological Findings. Root of tongue: The epithelium covering the surface of the tongue was thin and the cell arrangement on the outer surface was irregular and coarse. One side of the specimen revealed necrosis with hemorrhage. In adjacent areas there was infiltration by cancer cells of various sizes with densely stained nuclei, which were cord-like or accompanied by diffuse keratinization. In the muscular layer of the tongue, intravascular invasion by tumor cells was found. A mild lymphocytic reaction was seen in the interstitial areas.

Thyroid (left lobe): Fibrotic foci with ossification and calcification were noted in some areas, and the follicles were in small groups separated by connective tissue. The cancer foci consisted of round or roundish diffuse groups of malignant cells of various sizes. The cancer was a well differentiated papillary adenocarcinoma with cells that were not markedly atypic. (Right lobe): Sporadic foci of papillary cancer were present as in the left lobe, and a clearly defined follicular adenoma was also noted.

DISCUSSION

A relationship between radiation exposure and the subsequent development of thyroid cancer has been suspected since 1950, when Duffy and Fitzgerald¹ reported thyroid cancer in children who had received radiation treatment for thymic enlargement. More evidence for a possible cause and effect relationship between the development of thyroid cancer and radiation was found from studies of A-bomb survivors in Hiroshima and Nagasaki,² and the radiation fallout accident in the Marshall Islands.³

The present case was 29 years old at the time of the bomb (ATB) and exposed to 38rad. Hiatt⁴ reports that cancer does not readily develop in the adult thyroid which may be resistant to radiation, because not a single case of thyroid cancer developed in adults who received ¹³¹I

他の消化器系に著変なし。膵、腎、その他尿路系に著変なし。生殖器系は左卵巣に嚢胞を認め、子宮後壁に6.0×4.0cmの筋腫を認めた。内分泌系で甲状腺は16.0gで肉眼的には左葉に0.3cmの小結節を幾つか認めた。脳では左脳基底神経核に0.7cmの陳旧性梗塞を認めた。

組織学的所見。舌根部：舌の表面を覆う上皮は薄く、外表の細胞配列は乱れて粗雑となっている。標本の一側面は出血を伴った壊死像を呈している。その隣接部に索状、又は瀰漫性に角化部を伴った濃染した核をもつ大小の癌細胞の浸潤が認められる。舌の筋層部に癌細胞の脈管内への浸襲がある。間質には、リンパ球の軽度の反応がみられる。

甲状腺(左葉)：一部に骨化及び石灰化を伴った線維化巣がみられるが、濾胞は薄い結合織に境界された小房状を呈している。癌巣は大小の悪性細胞の円型、類円型の瀰漫性群を形成している。癌像はよく分化した乳頭状腺癌で細胞異型は強くない。(右葉)：左葉と同様の乳頭状小癌巣が散在しているが、そのほか明瞭に境界された濾胞状腺腫もみられた。

考 察

放射線による甲状腺癌の発生については Duffy と Fitzgerald ら¹が1950年、胸腺腫に対し放射線照射を受けた小児に甲状腺癌の発生を認めたことを報告して以来知られるところとなった。広島・長崎の原子爆弾²や Marshall 群島での放射性降下物³の事故の研究により甲状腺癌の発生と放射線の因果関係は明らかになってきた。

本症例は29歳で被爆(38 rad)している。Hiatt⁴は¹³¹I治療を受けた成人に25年経過した現在も1例も甲状腺癌が発症していないことから、成人甲状腺は

therapy and were followed over a period of 25 years. On the other hand, Poloyan⁵ has reported cases of thyroid cancer that developed after radiation therapy for acne vulgaris. Most of the patients were irradiated during adolescence, but in one case the cancer developed following irradiation at the relatively late age of 32.⁵ It appears that irradiation of the post-adolescent thyroid gland may still be associated with the subsequent development of thyroid cancer, but less frequently.

It is reported that thyroid cancer develops more frequently following exposure to low doses than high doses. It is believed that carcinogenesis occurs during the process of regeneration of the follicular cells surviving the irradiation. Following higher radiation doses, more cells are destroyed, making it difficult for carcinogenesis to occur.⁶ The present case received a relatively low dose, and therefore may have been at an increased risk for developing thyroid cancer.

Consideration of the latent period may also be relevant. Many reports state that the peak number of surgical operations for thyroid cancer is performed 25 years after irradiation and that cancer develops within 40 years following irradiation.⁷ In the present case, the thyroid cancer was detected 34 years after A-bomb exposure and considering the patient's age ATB, a latent period of this length would not be unusual. It is probable that the development of thyroid cancer in this case was not etiologically related to the earlier radiation therapy for tongue cancer, since the latent period would be only 1 year. As mentioned earlier, it took 25 years for the cancer to develop in those irradiated during childhood. There are a number of possible reasons why it took so long for the cancer in this case to develop. Calcification was evident in the center of the cancer focus, suggesting that it had been a necrotic focus for a long time. The well differentiated histology is usually associated with slow growth.

Irradiation of tissues which have undergone malignant change have been found in many cases to hasten cancer growth, stimulate the development of minute cancers, and change the well differentiated into the anaplastic type.⁸ There was nothing to demonstrate that the growth of cancer has been hastened in this case, and neither minute cancers nor anaplastic carcinomas were observed. However, even though there is no

放射線に抵抗性があるとしている。しかし一方では、Poloyan⁵は尋常性座瘡に対し放射線を照射治療し、甲状腺癌を発症した例を報告している。この報告例の患者の多くは照射時の年齢は思春期が主であるが、32歳で照射を受け発症した例が1例ある。⁵ 思春期後でも甲状腺への照射は、非常にわずかであるが甲状腺癌を引き起こすであろうと思われる。

甲状腺癌は高線量よりも低線量照射によって起こりやすいと言われている。すなわち癌化は照射後も生き残った濾胞細胞が再生する過程で生じると考えられている。高線量の照射を受けると多くの細胞は破壊され発症しにくいと考えられている。⁶ したがって本症例は低線量に被曝し、甲状腺癌発生の危険率が高いと思われる。

潜伏期について検討してみると、多くの報告では照射後25年をピークに甲状腺癌の外科手術を受けており、照射後40年までには発生するとされている。⁷ 本症例は被爆後34年目に甲状腺癌が発見されているが、被爆時の年齢を考慮すると発生は遅れてしかるべきと思われる。本症例の場合、潜伏期がわずか1年なので、甲状腺癌が、放射線治療に誘発された可能性はほとんどないと考えられる。前述のように小児期に照射された者ですら発症するのに25年の経過を要する。本症例の癌が長時間を要したであろうと思われる点が幾つかみられる。すなわち、癌化巣の中心に石灰化がみられ、長時間壊死巣であったことをうかがわせる。また、よく分化している組織は発育するのに時間を要することが知られている。

いったん発症した組織に対して照射した場合、癌の発育速度を速めたり、微小癌の発生を促したり、よく分化したものを退化型のものにしたりすることが知られている。⁸ 本症例で癌の発育が速くなったことを証明するものはなく、また、微小癌も退化型癌も認めていない。しかし、2回目の照射が甲状腺

evidence that the second irradiation had any effect on the thyroid cancer, this does not change the desirability of shielding the thyroid during radiation therapy to the neck if possible, since there have been previous reports of adverse effects.

The diffuse papillary adenocarcinoma was probably the only finding possibly related to the effect of radiation in the present case. No unique changes are caused in thyroid tissue by irradiation, but a number of changes are known to be somewhat common statistically.⁹ These are: 1) focal hyperplasia, 2) adenomas and adenomatous hyperplastic nodules, 3) thyroiditis, 4) colloid nodules, 5) fibrosis, 6) oxyphilic changes, and 7) carcinoma. Recently, Conard^{3,10} has noted multiple atypical cellular masses in the thyroids of Marshall Islanders as a precancer state. Focal hyperplasia is believed to be proliferation of the epithelium resulting from thyroid stimulating hormone stimulation after irradiation, and it is thought to possibly represent a precancer state.⁹

Well differentiated papillary cancer was seen diffusely in this case, but no hyperplasia was evident. A fibrotic focus with calcification was noted in the left lobe, but the frequency of finding fibrosis as an effect of radiation is reported to be low.⁹ Although fibrosis is reported to be somewhat common statistically, there was little reason to attribute the fibrosis in this case to radiation. An adenoma was also noted in this case. In a recent study, adenomas were seen in half of the thyroid tumor patients who had been irradiated, and the frequency was higher than among controls.⁹ However, there is no histologic difference between the adenoma in this case and spontaneous adenomas, and the conclusion cannot be made that radiation is the cause.

In the present case, no thyroiditis, colloid nodules, or oxyphilic changes were observed. Foci of well differentiated papillary carcinoma were noted in both lobes, and development of multiple cancer foci of less than 1 cm in diameter is reported to be a change of comparatively high specificity in radiation-induced thyroid cancer.^{6,11} It is the presence of multifocal papillary adenocarcinoma that strongly suggests the effect of radiation in the present case. Another relevant question would be whether the change was due to A-bomb irradiation or to the later radiation

癌に影響した証拠は得られないものの、増悪を示す上記のような報告もなされているので、できれば、頸部への放射線治療の際、甲状腺は遮蔽された方がよいことには変わりはない。

本症例については、散在性乳頭状腺癌が放射線の影響を物語る唯一のものであった。放射線の甲状腺組織に与える変化は特異的変化というものはないが若干でも統計的に多い変化が幾つか知られている。⁹

1) 局所性過形成、2) 腺腫と腺腫過形成結節、3) 甲状腺炎、4) コロイド結節、5) 線維症、6) 好酸性変化、7) 癌がそれである。最近 Conard^{3,10} は Marshall 島民における多発性異型細胞群を特に前癌状態として注目している。局所性過形成は照射後の甲状腺刺激ホルモン(TSH)に反応した上皮の増殖と考えられ、前癌状態とみなされている。⁹

本症例ではよく分化した乳頭状癌が散在性にみられるが、過形成は認められなかった。また、左葉に石灰化を伴った線維化巣がみられたが、放射線の影響としての線維症がみられるのは頻度は低いといわれている。⁹ 線維症は統計的に若干多いと言われているが、本症例の線維症を放射線が原因とする手がかりはない。腺腫は本症例でもみられた。最近の研究では腺腫は放射線を受けた甲状腺腫患者の半数にみられ、コントロールに比べ比較的頻度は高い。⁹ しかし、本症例の腺腫と自然発生の腺腫と組織学的差異はなく放射線が原因と断定することはできない。

本症例では甲状腺炎、コロイド結節、好酸性変化は認めなかった。よく分化した乳頭状癌が両葉にみられたが、多発性に直径 1 cm 以下の癌巣が発生するのが放射線による甲状腺癌に比較的特異性の高い変化とされている。^{6,11} 本症例の放射線影響を強く示唆するものは、この多中心性乳頭状腺癌である。ここでこの変化が本症例の、被爆によるのかあるいはそれ以後の放射線治療によるものなのかが問題になる。

therapy. The growth of thyroid cancer is very slow unless it is the anaplastic type and it is reported that few patients die as a direct result of thyroid cancer itself.^{2,8}

It is also reported that metastasis has already occurred in nearly half of the cases by the time of diagnosis,⁸ and some investigators even report that in spite of metastasis the prognosis is good, especially when metastasis is confined to lymph nodes.¹² It is controversial whether the prognosis is good in cases with lymph node metastasis, but it seems true that it may not be as poor as with some other types of malignancy. In the present case metastasis was confined to lymph nodes and the tumor itself was not large, but it seems that growth probably occurred over some length of time. Therefore if radiation exposure was etiologically related to the development of the thyroid cancer in this case, it probably was from the A-bomb exposure, while the second irradiation had a minimal, if any effect.

Roudebush et al⁸ reported that the well-differentiated type of thyroid cancer sometimes undergoes anaplastic change following irradiation. This was not found in the present case, in spite of the fact that the neck had been irradiated.

Multifocal atypical cellular masses similar to those noted by Conard were not observed in the present case. In his 20-year review of medical findings in Marshall Islanders, Conard^{3,10} described encapsulated solid cellular masses of about 1 mm in diameter diffusely present in the thyroid tissues. These cellular masses were reported to be markedly atypic, highly mitotic, and strongly suggestive of a precancer state.^{3,10}

Foci of less than 1 cm in diameter were found in the present case, however, similar to those previously described in radiation-induced thyroid cancer.^{6,11} Multiple atypical cellular masses in the thyroid may be strongly suggestive of a precancer state in thyroids which have been irradiated, and if a detailed examination is made of tissues involved with thyroid cancer believed to be related to prior radiation exposure, masses of this type may be found with unexpected frequency.

退化型のものでない限り甲状腺癌の発育は非常に遅く、甲状腺癌自体が直接の原因となって死亡することはまずないといわれる。^{2,8}

また、半数近くは診断時には既に転移を生じているといわれ、⁸ 特にリンパ節のみの転移例は予後はよいとする者さえある。¹² リンパ節転移例は予後がよいとするにはまだ問題があるにしても、他の型の癌よりもよさそうである。本症例でもリンパ節転移のみがみられ、腫瘍自体はさほど大きくなく、ある程度時間を要したことがうかがわれる。したがって組織学的観点からも原爆被爆が大きく関与し、2回目の照射は軽い障害を与えたであろうと思われる。

Roudebush ら⁸ は、よく分化した甲状腺癌が放射線照射により退化型変化を示すことがあるとしているが、頸部照射にもかかわらず本症例では認められなかった。

Conard が注目した多中心性異型細胞群は本症例にはみられなかった。Conard^{3,10} は Marshall 島民の20年目の報告の中で甲状腺組織に被膜にかこまれた直径1 mm内外の充実性の細胞群が散在性にあることに注目した。この細胞群は異型性が強く、細胞分裂の盛んな細胞群であり、前癌状態を強く示唆するものであるとしている。^{3,10}

前述の放射線による甲状腺癌に類似した直径1 cm以下の病巣が本例にみられた。^{6,11} 甲状腺の多中心性異型細胞群は照射された甲状腺の前癌状態を強く示唆すると考えられる。したがって、放射線による甲状腺癌と思われる組織を精査すれば、この種の細胞群は意外に多いかもしれない。

REFERENCES

参考文献

1. DUFFY EJ, FITZGERALD PV: Cancer of the thyroid in children: A report of 28 cases. *J Clin Endocrinol Metab* 10:1296-308, 1950
2. SAMPSON RJ, KEY CR, BUNCHER CR, IJIMA S: Thyroid Carcinoma in Hiroshima and Nagasaki. *JAMA* 209:65-70, 1969 (ABCC TR 25-68)
3. CONARD RA, et al: A twenty-year review of medical findings in a Marshallese population accidentally exposed to radioactive fallout. USAEC Technical Report BNL 50424. New York, Brookhaven National Laboratory, 1975
4. HIATT HH: Thyroid carcinoma and radiation. *NZ Med J* 86:335-6, 1977
5. PALOYAN E: Thyroid neoplasms after radiation therapy for adolescent acne vulgaris. *Arch Dermatol* 114:53-5, 1978
6. WALFSH PG: Irradiation-related thyroid cancer. *Ann Intern Med* 88:261-2, 1978
7. SCHNEIDER AB, FAVUS MJ, STACHURA ME, ARNOLD J, ARNOLD MJ, FROHMAN LA: Incidence, prevalence and characteristics of radiation induced thyroid tumor. *Am J Med* 64:243-52, 1978
8. ROUDEBUSH CP, ASTERIS GT, DEGROOT LJ: Natural history of radiation-associated thyroid cancer. *Arch Intern Med* 138:1631-4, 1978
9. SPITALNIK PF, STRAUS FH Jr: Patterns of human thyroid parenchymal reaction following low dose childhood irradiation. *Cancer* 41:1098-105, 1978
10. CONARD RA: Irradiation of the thyroid gland. *Lancet* 2:1278-9, 1976
11. DEGROOT LJ, FROHMAN LA, KAPLAN EL, REFETTOFF S: Radiation-Associated Thyroid Carcinoma. New York, Grune & Stratton, Inc., 1977
12. CADY B, SEDGWIDE CE, MEISSER WA, BOOKWALTER JR, ROMAGASA V, WERBER J: Changing clinical, pathological, therapeutic and survival patterns in differentiated thyroid carcinoma. *Ann Surg* 183:541-51, 1976