Historical Vignette

Saul Hertz, MD (1905-1950)

A Pioneer in the Use of Radioactive Iodine

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Dr. Saul Hertz Poses a Question

Long before the first atomic bomb of World War II, Dr. Saul Hertz (1905-1950) (Fig. 1) took a profound step forward in the field of Nuclear Medicine. On November 12, 1936, Dr. Hertz attended a luncheon meeting at Harvard Medical School, with the President of the Massachusetts Institute of Technology (MIT), Dr. Karl Compton (1887-1954). Dr. Compton was discussing "What Physics can do for Biology and Medicine." Dr. Hertz, who was Director of the Thyroid Clinic at the Massachusetts General Hospital (MGH) (1931-1943), asked Dr. Compton, "Could iodine be made radioactive artificially?" (1). The question came quite spontaneously, as Dr. Hertz had been conducting studies on the effect of iodine on thyroid function. Dr. Compton responded by letter on December 15, 1936, describing the properties of radioactive iodine (1). A week later, Dr. Hertz wrote back that he hoped to do animal experiments and devise a useful therapy in patients with hyperthyroidism (1).

During the early months of 1937, the engineering skills of MIT and the medical expertise of MGH were brought together. Dr. Hertz was in charge of the biological and medical work with Dr. Arthur Roberts, a young physicist from MIT. Drs. Hertz and Roberts did their first series of experiments with ^{128}I on rabbits in late 1937. These early experiments involving 48 rabbits demonstrated that the normal thyroid gland concentrated ^{128}I, while the hyperplastic thyroid gland took up even more (2,3,4). In May 1938, the John and Mary Markle Foundation of New York City funded the building of a cyclotron at MIT with a $30,000 donation. It was completed two years later in 1940. Experiments continued on rabbits during 1939 and 1940. Without a cyclotron, Hertz and Roberts were dependent on others for longer-lived radioactive isotopes such as ^{131}I.

The First Patients

In late 1940, Dr. Hertz began using the cyclotron to produce ^{130}I and ^{131}I, which he used in studies with subjects with Graves' hyperthyroidism (5). In early 1941, he administered ^{130}I to the first patients at MGH (Fig. 2). Gradually, a series of about thirty patients were treated and followed until Dr. Hertz joined the Navy during the war years (Figs. 3A,3B).

After the war, there was great interest in using atomic energy for peaceful purposes. In May 1946, JAMA published "Radioactive Iodine in the Study of Thyroid Physiology" (6), reflecting the success of Dr. Hertz's treatment with the first series of patients over a five year follow-up (Fig. 3). This firmly launched the use of radioactive iodine that has become the standard treatment for Graves' disease.

Dr. Saul Hertz uses Nuclear Fission in Cancer Treatment

Dr. Hertz established the Radioactive Isotope Research Institute in 1948; it's purpose was to apply fission products to the treatment of thyroid cancer, goiter and other malignant tumors. He extensively studied the use of radioactive iodine in the treatment of thyroid cancer (7), and the application of radioactive phosphorus and the influences of hormones on cancer as demonstrated by isotopic studies (8,9).

Remembering Saul Hertz, MD

Saul Hertz was a brilliant scholar and researcher who devoted his life to scientific work. He authored over thirty scientific publications on thyroid physiology, thyroid

disease and its treatment. Dr. Hertz pioneered tracer use of radioiodine in studying thyroid physiology, and was the first to administer therapeutic doses of radioactive iodine to treat thyroid disease. Mrs. George Bush, who was successfully treated for thyroid disease, wrote to Dr. Hertz's wife, Vitta Hertz, "It is comforting to know that so many people are well because of the scientific expertise of people like Dr. Hertz."

References

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Figure legend

Figure 1. Saul Hertz, MD (*circa* 1945)

Figure 2. Saul Hertz, MD uses a multicounter to analyze the distribution of radioactive iodine in a patient.

Fig. 3. (A.) Saul Hertz's original, handwritten table detailing the first series of MGH subjects whose hyperthyroidism was not cured by administration of ^{131}I. (B.) Original, handwritten table detailing the first series of MGH subjects whose hyperthyroidism was successfully treated with ^{131}I.

Fig. 1

Fig. 2

TABLE I — AN ANALYSIS OF CASES "NOT CURED" BY Ra-I+KI (TO MARCH-'46)

SERIES NO.	CASE-HOSP.NO.	BMR PRIOR TO I^{130}	DOSAGE OF I^{130} and DATES OF ADMINISTRATION	BMR PRIOR TO SUB-TOTAL THYROIDECT.	POST-OP BMR	THYROID WEIGHT	HISTOLOGY	TOTAL THYROID IRRADIATION (r) 12 HR	TOTAL THYROID IRRADIATION (r) 8 DAY	ESTIMATED THYROID WT. BEFORE I^{130}	% OF Ra-I (URINE) EXCRETED - 72 HRS. FOLLOWING THE ADMINISTRATION OF I^{130}
1	ELIZABETH D. MGH-173954	+30	2.1 mC 3-31-'41 1.3 mC 4-16-'41 } 3.4 mC	(-5)(-7)	(-29)	34	INVOLUTION	470 220	660 240	35	20 28
5	LILLIAN R. MGH-308552	+35	5.7mC 7-16-'41	PLANNED EXPERIMENT	(-20)	31	HYPERPLASIA NO INVOL.	1000	1150	40	27
10	GLADYS B. MGH-121922	+55	0.7mC 2-2-'42	(+3)	(-26)	26 30 } 56	HYPERPLASIA +MOD. INVOL.	120	80	60	38
14	WILFRED B. MGH-363179	+50	15mC 7-15-'42	(-15)	(-24)	55	HYPERPLASIA +INVOLUTION	650	—	60	71
16	CARMELLA D. MGH-255820	+25	10mC 8-11-'42	(-8)	(-24)	28	INVOLUTION	1800	—	45	6
19	PETER C. MGH-369233	+65	15mC 8-25-'42 8mC 3-8-'43 5mC 3-9-'43 } 28 mC	(+8) TO (+13)	(+36) TO (-18)	35	SL. HYPERPLASIA +INVOLUTION	2000 1500	—	60	9 15 7
2	MARGARET B. MGH-300230	+35	1.4mC 5-10-'41 0.9mC '41 2.4mC '42 0.8mC '42 } 5.6 mC	NOT OPERATED ← PERSISTENT THYROTOXICOSIS ANOTHER 20mC PROPOSED				160 110 120 100	140 100 120 100	40	54* 48 78 --
4	CAMILLE SCH* MGH-309302	+30	3.6mC 7-14-'41 2.2mC 7-31-'41 } 5.8 mC	← EYES BETTER. NO GOITER BMR (+2) OFF MED. - 4 YRS				270 170	300 180	60	55 56
3	RUTH M. MGH-304558	+50	3.4mC 6-6-'41	REMISSION FOR 1 YR - THEN				430	410	45	45
			20mC 1-9-'46	(RECENTLY FOR TRUE RECURRENCE)				4300	—	30 (RECURRENT)	35

* OPHTHALMOPATHIC TYPE

TABLE II - ANALYSIS OF 20 CASES "CURED" BY RaI + KI ON BASIS OF EXAMINATION MARCH 31, 1946

SERIES NO.	CASE-HOSP. NO.	DOSE OF I^{130} and DATE OF ADMINISTRATION	BMR BEFORE I^{130}	BMR LEVEL OFF IODIDES	TIME OFF IODIDES	THYROID SIZE '46	ESTIMATED THYROID WT. (gm.)	% OF RaI EXCRETED 72-HOURS	ESTIMATED THYROID IRRIDIATION (r) 12 HOUR	8 DAYS *
6	MICHAEL K. MGH-227382	2.3mC 7-24-41 } 4.0 mC 1.7mC 7-30-'41 }	+45	DEC. -'42 (-9) MAY -'43 (-16) JAN. -'46 (-7)	4 YRS.+	N	45	35 22	320 280	390 300
7	ALLISON D. (AET 9.) MGH-319927	1.4mC 9-19-41 } 2.9 mC 1.5mC 9-21-41 }	+65	1-8-'46 (-6)	4 YRS.	N	45	3 20 (?)	260 260 (?)	230 220 (?)
8	NAOMI K. (AET 9) MGH-321155	1.5mC 9-24-'41	+30	7-17-'45 (-3) 3-27-'46 (+4)	7 MOS	FIRM 2 X N	40	15	300	250
9	MILDRED G. MGH-322935	4.9mC 11-26-'41	+30	5-8-'45 (-10)	4 YRS.	N	60	17	650	420
11	FRANCES H MGH-198910	5.8mC 4-9-'42	+37	7-9-'42 (-12) 2-24-'44 (+9) 2-3-'46 (-13)	3.5 YRS.	N	60	17	750	380
12	FERDINAND L. MGH-354330	7.5mC 5-15-'42	+55	'45 (+11) 2-3-'46 (-13)	3 YRS.	HARD 1.5 X N	60-75	26	950	500
13	DOROTHY P. MGH-585541	12mC 6-9-'42	+30	3-'43 (+6) 2-3-'46 (-10)	3 YRS.	N	40	71	750	
15	MARY M. MGH-362811	6mC 8-11-'42 } 10 mC 4mC 8-11-'42 }	+35	4-'45 (-6) 2-3-46 (+2)	10 MOS.	N	40	10	2000	
17	GEORGE T. BCH-1076956	13mC 8-13-'42	+50	6-10 '44 (-15) 1-6-'46 (-9)	3 YRS.+	N	60	14	1300	
18	JEANETTE G. MGH-367094	10.5mC 8-15-42	+35	8-22-'44 (+11) 2-16-'46 (+1)	3 YRS.+	N	40	15	2000	
20	ANNE D. MGH-233271	10mC 11-14 '42	+50	4-3-'45 (-1) 2-16-'46 (-5)	2 YRS.+	N	45	20	1600	
21	RICHARD T. BIH-67686	14mC 11-20-'42	+45	1-8-46 (-13)	3 YRS.+	N	50	15 (?)	2000	
22	ESTHER R. MGH 38[illegible]4	13mC 3-9-'43	+20	6-30-'43 (-8)	2 YRS.+	"?N" (L.M.D.)	55	33	2200	
23	MARGARET D. MGH-385741	8mC 3-15-'43 } 18 mC 10mC 3-16-'43 }	+55	6-9-'43 (-11) 2-16-'46 (-3)	2 YRS.+	FIRM 1.5 X N	75	76 67	500	
24	JANE ANNE F. MGH-397402	10.5mC 3-26-'43 } 15 mC 4.5mC 3-27-'43 }	+40	12-'45 (-5)	2 YRS.+	N (DR. J.C.) (ZILHARDT)	50	57? 31	1000	
25	SOPHIE R. MGH-397951	16mC 4-2-'43	+44	9-28-'44 (-7) 4-27-'45 (+9) 3-20-'46 (+14)	2 YRS.+	N (DR. J.C.) (AUB)	50	20.6 63.0	750	
26	BESSIE W. METAB. #23843	12mC 4-6-'43	+39	'45 (-8) 1-16-'46 (+2)	2 YRS.+	N	45	85	350	
27	WINIFRED K. MGH-398698	13mC 4-12-'43	+40	7-17-'45 (-16) 2-15-'46 (-10)	2 YRS.+	N	50	33	1600	
28	MARGARET H. p.p. Dr Hertz	10.5mC 4-13-'43 } 21 mC 11.0mC 4-13-'43 }	+55	12-'45 (-15) 2-3-'46 (+6)	2 YRS+	N	75	---?	2000	
29	JULIA LAF. RY MGH-395852	8mC 3-29-'43 } 12 mC 4mC 3-30-'43 }	+30	2-'46 (+4)	2 YRS+	N	55	10 53 (?)	1200 250	

* 8 DAY ISOTOPE FIGURES ASSUME NO LOSS OF IODINE FROM THYROID DURING DECAY; THEY ARE THEREFORE EXCESSIVE. THEY WERE NOT MEASURED FOR CASES 13-29 —