

CAMPUS GETNE 2025

20 y 21 de marzo 2025

CAMPUS GETNE 2025

09:00-09:30h

Pasión por el cáncer de tiroides: recorrido histórico por los hitos más importantes

Dr. Carles Zafón. Endocrinología y Nutrición - Hospital Universitari Vall d'Hebrón, Barcelona

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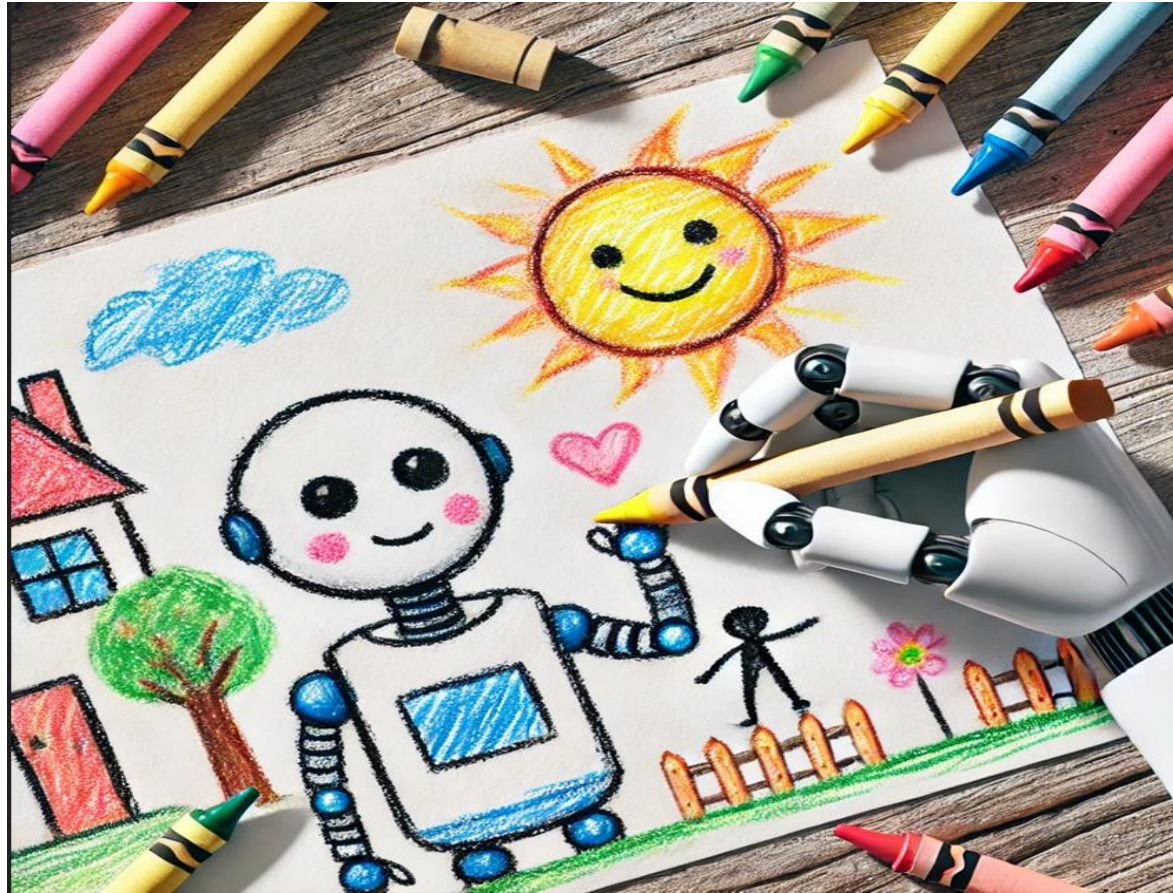
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Universitat Autònoma de Barcelona

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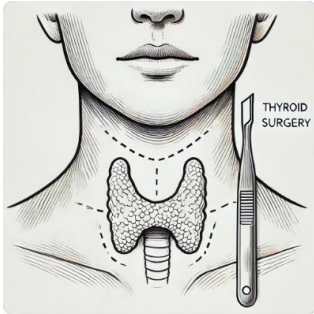
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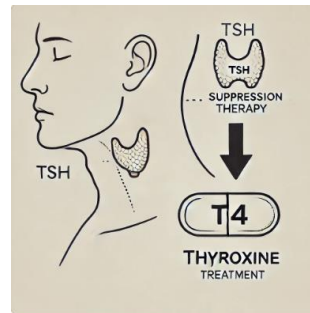
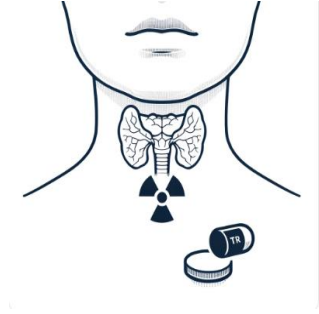
Dr. Carles Zafón. Endocrinología y Nutrición - Hospital Universitari Vall d'Hebrón, Barcelona



372 *CANCER March-April 1959* Vol. 12

**TREATMENT OF CANCER OF THE THYROID
POSTOPERATIVELY WITH SUPPRESSIVE THYROID
MEDICATION, RADIOACTIVE IODINE, AND
THYROID-STIMULATING HORMONE**

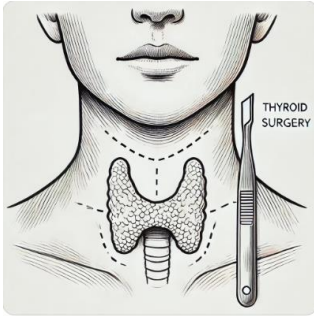
B. CATZ, M.D., M.SC., D. W. PETIT, M.D., H. SCHWARTZ, M.D., F. DAVIS, M.D.,
C. MCCAMMON, M.D., AND P. STARR, M.D.



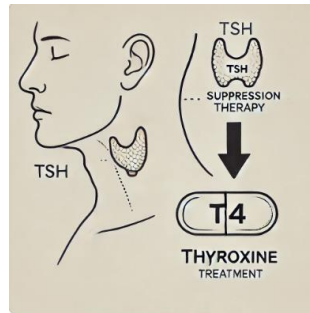
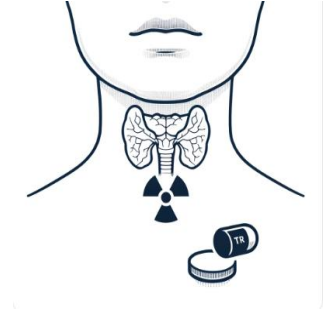
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Pasión por el cáncer de tiroides: recorrido histórico por los hitos más importantes

Dr. Carles Zafón. Endocrinología y Nutrición - Hospital Universitari Vall d'Hebrón, Barcelona



1959

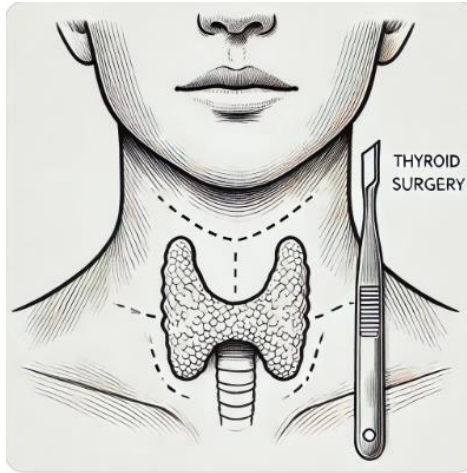


1959



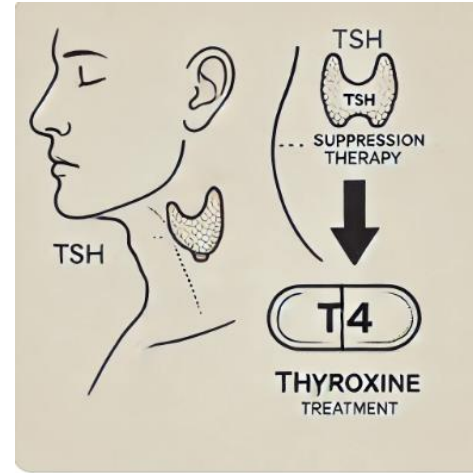
2025



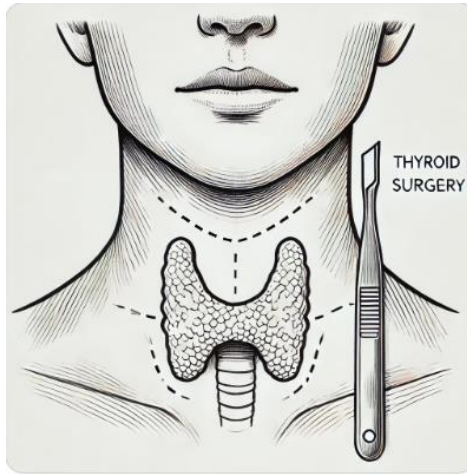


Cirugía de tiroides

Linfadenectomía



Ablación I¹³¹



Cirugía de tiroides

Linfadenectomía



Libro de Abulcasis (s.X)



***Ecclesia abhorret a sanguine* (s.XIII)**



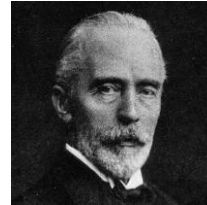
Leonardo da Vinci (s. XV)



**Theodor Billroth, cirujano
(1829-1894)**



**Bernhard von Langenbeck,
Cirujano (1810-1887)**



**Emil Theodor Kocher,
Cirujano (1841-1917)**



**Richard Volkmann, cirujano
(1830-1889)**



Franciszek Jawdyński, cirujano
(1851-1896)

Nr. 25.
Tom VIII. Warszawa d. 23 Czerwca 1888 r. Seryja II.
Rok XXIII.

GAZETA LEKARSKA.

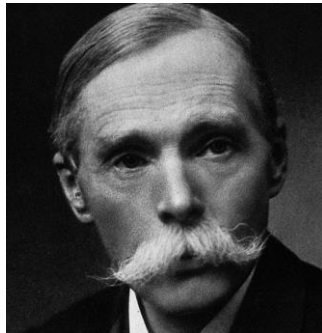
Z ODDZIAŁU CHIRURGICZNEGO WARSZAWSKIEGO SZPITALA NA PRADZE.

I. PRZYPADEK RAKA PIERWOTNEGO SZYI

t. z. RAKA SKRZELOWEGO VOLKMANN'A.

Wycięcie nowotworu wraz z resekcyjną tętnicy szyjowej
wspólnej i żyły szyjowej wewnętrznej. Wyzdrowienie.

Podat
Fr. Jawdyński
ordynator tegoż oddziału.



Sir Henry Trentham Butlin, cirujano
(1845-1912)

“El padre británico de la cirugía de cabeza y cuello”

**DISECCIÓN LINFÁTICA ELECTIVA DE LOS TUMORES
DE CABEZA Y CUELLO**

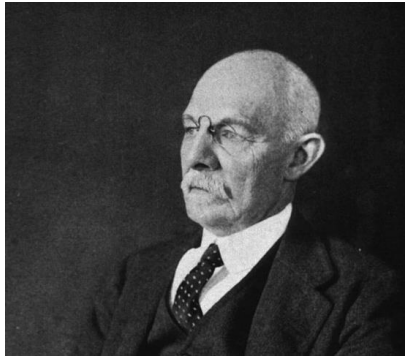
**A DISCUSSION ON THE SURGICAL TREATMENT
OF CYSTS, ADENOMATA, AND CARCINOMA
OF THE THYROID GLAND AND ACCES-
SORY THYROIDS.**

L.—HENRY T. BUTLIN, F.R.C.S.,
Surgeon to St. Bartholomew's Hospital.

MR. PRESIDENT AND GENTLEMEN,—Probably I betray no secret when I tell that it was not originally intended that I should open this debate. I was indeed invited to take part in it, and was pleased at the invitation. Towards the end of March I received a letter from the officers of the Section to ask me to take the place of Professor Annandale, upon whom they had relied to introduce the subject of the surgical treatment of cysts, adenomata, and carcinoma of the thyroid gland and accessory thyroids, and who had, after long nego-

“not only have I never removed a malignant tumor of the thyroid gland, but I have never seen one removed. And more, although I have seen a good many cases of malignant disease of the thyroid gland, I have never yet seen one in which there appeared the smallest likelihood of a successful radical operation”.

Butlin, HT. Br Med J. 1895.v2(1815)



William Halsted, cirujano (1852-1922)

Teoría Halstediana de la progresión tumoral

Uso de los guantes en la cirugía

The operative story of goitre



George Washington Crile, Cirujano (1864-1943)

EXCISION OF CANCER OF THE HEAD AND NECK. WITH SPECIAL REFERENCE TO THE PLAN OF DISSECTION BASED ON ONE HUNDRED AND THIRTY-TWO OPERATIONS.* GEORGE CRILE, M.D. CLEVELAND, O.

Though signal advances have been made in many surgical problems, the treatment of the head and neck has, it would seem, attracted little attention nor kept pace with the progress of the other departments. These unexplained facts are due to the fact that the study of the head and neck is hampered by the complexity of the anatomy, and the tragic ending of many of these cases has held back laymen from the study of the subject with professional confidence.

In this paper it is intended to present an outline sketch of the conclusions regarding the surgical treatment of cancer of the head and neck.

* Read in the Section on Surgery and Anatomy of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.

1906: año cero de la disección cervical en la patología oncológica de cabeza y cuello

Disección en bloques

- Linfadenectomía de los niveles I a V
- Músculo esternocleidomastoideo
- Ganglio linfático submandibular
- Ganglio de la parótida
- Músculo omohioideo
- Ramas cutáneas del plexo cervical
- Vena yugular interna

Pacientes: 132

Pacientes con CT: 4

EXCISION OF CANCER OF THE HEAD AND NECK. WITH SPECIAL REFERENCE TO THE PLAN OF DISSECTION BASED ON ONE HUNDRED AND THIRTY-TWO OPERATIONS. [GEORGE CRILE, M.D. JAMA. 1906;XLVII\(22\):1780-1786.](#)

“Publicación de series específicas de cáncer de tiroides”

The 1950's:

NECK DISSECTION

HAYES MARTIN, M.D., BERNARDO DEL VALLE, M.D.,
HARRY EHRLICH, M.D., and WILLIAM G. CAHAN, M.D.

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WHERE it is not for the tendency of malignant tumors to metastasize, the problem of treatment—concerned only with the primary lesion—would be relatively simple. The degree to which metastasis can be prevented or controlled is actually the main factor that determines the prognosis for cure. In cancer of the mouth, pharynx, larynx, and skin of the head and neck, the cervical lymph nodes constitute the only protective barrier that, for a time, may confine the metastatic growth to an area accessible to treatment by surgery or radiation therapy. Once beyond this barrier, cancer of the head and neck is, to all intents and purposes, hopelessly advanced.

In each of the separate anatomical varieties from the Head and Neck Service, Memorial Center for Cancer and Allied Diseases, New York, New York. The authors wish to express their gratitude and appreciation to the Department of Statistics of Memorial Hospital, particularly to Miss Mary Macdonald and Mrs. Kathleen Birch for their invaluable assistance in compiling and rechecking the statistical data in this report.

Received for publication, October 31, 1950.

[441]

of mouth and pharynx cancer, i.e., lip, tongue, nasopharynx, larynx, etc., the treatment techniques (surgical or radiological) differ or vary greatly. Most of the published reports on this subject are largely limited to discussion of the primary lesion, and little consideration is given to what is actually the major problem and one common to all forms of head and neck cancer, namely, the MANAGEMENT OF CERVICAL METASTASIS. In the present study, little reference will be made to the treatment of the primary lesion, and most of the discussion will be directed toward the treatment of cervical metastasis—specifically by neck dissection.

Neck dissection, like radical mastectomy and abdominoperineal resection of the rectum, has finally become a standardized operation. Although there are many recorded cures of histologically proved cervical metastasis by radiation therapy,¹² nevertheless, in actual practice, neck dissection is generally accepted as the most effective method of treatment.

TABLE 1
ANATOMICAL SITES OF PRIMARY LESIONS IN 665 CASES OF NECK DISSECTION, 1928 to 1945

Site of primary lesion	Total patients			Total operations	
	Total	Unilat. neck dissect.	Bilat. neck dissect.	No.	%
Tongue	144	131	13	157	23.6
Thyroid	76	60	16	92	13.8
Mucosa of cheek	44	40	4	48	7.2
Floor of mouth	41	37	4	45	6.8
Skin of head and neck	34	30	4	38	5.7
Major salivary glands	29	29	—	29	4.4
Intrinsic larynx	18	18	—	18	2.7
Tonsil	15	15	—	15	2.3
Palate (hard and soft)	12	10	2	14	2.1
Extrinsic larynx	9	7	2	11	1.7
Nasopharynx	4	3	1	5	0.7
Paranasal sinuses	3	3	—	3	0.4
Misc. sites	36	35	1	37	5.6
Total	599	533	66	665	100.0

INDICATIONS FOR NECK DISSECTION IN CARCINOMA OF THE THYROID*

RICHARD B. CATTELL, M.D.

From the Department of Surgery, The Lahey Clinic, Boston, Massachusetts

PROGRESS has been made in the treatment of carcinoma of the thyroid by its earlier recognition, by a more radical surgical approach and by better radiation therapy. Furthermore, the use of radioactive iodine as a means of study and treatment of metastatic nodules as reported by Seidlin (1), Trunnell (2), Dobyns (3) and others has increased our knowledge of the function and behavior of thyroid malignancy. Earlier experiences with cancer of the thyroid demonstrated that the results left much to be desired when incomplete operations followed by radiation therapy were the methods of treatment employed. It is recognized today that the best results are obtained by radical operation followed by adequate roentgen therapy.

It is the purpose of this report to outline the indications for neck dissection in the presence of the different types and extents of carcinoma of the thyroid, as at present employed at the Lahey Clinic. It is felt that there has been no clear cut accepted indication for the employment of neck dissection and it is hoped that our limited experience at the present time on this problem may be of some aid in arriving at a proper solution.

In the five-year period, 1945 to 1950, neck dissections on one or both sides have been carried out in 52 patients. All patients have received roentgen therapy postoperatively. It is, of course, impossible to report on the results of such therapy except during a short period of observation. The important finding in this group of cases was the fact that 88 per cent had involvement of the cervical nodes. It is well recognized that the life history of carcinoma of the thyroid shows that it may be slow-growing or it may remain dormant for years, but does eventually cause death in a considerable proportion of cases. This has been emphasized by Ward (4), Frazell and Foote (5), Criele (6), Pemberton (7), and Lahey, Hare and Warren (8). In the light of our present knowledge, the operative procedure should be extended to include removal of the cervical nodes on the affected side to give the best chance for cure.

Received for publication April 24, 1950.

* Read at the Annual Meeting of the American Goiter Association, Houston, Texas, March 10, 1950.

This article will be included in the bound volume of the "Transactions of the American Goiter Association," published by Charles C Thomas, Publisher, which will be available for sale early in 1951.

1099

Martin H., del Valle B., Ehrlich H., & Cahan W. G. (1951). Neck dissection. *Cancer*, 4(3), 441-499.

CATTELL R. B. (1950). *The Journal of Clinical Endocrinology & Metabolism*, 10(9), 1099-1107

“Replanteando la radicalidad del vaciamiento en el cáncer de tiroides”

PAPILLARY THYROID CARCINOMA: PATHOLOGICAL FINDINGS IN CASES WITH AND WITHOUT CLINICAL EVIDENCE OF CERVICAL NODE INVOLVEMENT

EDGAR L. FRAZELL, M.D., AND FRANK W. FOOTE, JR., M.D.

SCARCELY any aspect of treatment is so difficult for the student of thyroid carcinoma to settle as the proper therapeutic approach to that group of tumors usually referred to as papillary carcinoma. These tumors are by far the most frequent form of thyroid cancer. On microscopic examination, they usually exhibit follicular qualities and other traits in addition to papillary qualities. They occur in patients whose ages range from childhood to old age. They are notorious for their slow rate of clinical acceleration; indeed patients may survive for ten or more years with little or no inconvenience even after the demonstration of regional or distant metastases. This situation exists in many patients irrespective of the treatment method employed. Hence, it is no wonder that so rich a field for clinical debate exists.

It is highly doubtful, in fact it may be denied, that there exists any report from any clinic that proves with finality the undoubted superiority of one form of treatment over another. No single group has had sufficient experience with all forms of treatment to justify assuredness at all points. However, from time to time, joyous cries from one high or elsewhere ring out, and the voice of emotion is heard throughout the temple of the thyroid. At present there seems to be some accent on testifying to the essential harmlessness of papillary thyroid carcinomas—that these growths are practically physiological. Would that our thirty-five dead patients could hear this doctrine and be reassured!

Memorial's experience with papillary thyroid carcinoma perhaps is more colored in a certain manner than is that of many hospitals.

From the Head and Neck Service and the Pathology Laboratories, Memorial Center for Cancer and Allied Diseases, New York, New York, and the Division of Laboratories and Research, New York State Department of Health, Albany, New York.
Presented at the Eighth Annual Cancer Symposium of the James Ewing Society, April 16, 1955.
Received for publication, April 11, 1955.

In particular, fifteen to twenty years ago, patients would come to the clinic referred to as a cancer institution as a last port of call. They still do. These people had "had it." They had had neglect, sympomy, dental extractions, biopsy, vaccination, excision of single nodules—thyroid or cervical—partial lobectomy, subtotal thyroidectomy, tracheostomy, roentgen-ray therapy, total thyroidectomy, and occasionally neck dissection. Some of these patients gave no opportunity for further efforts at curative treatment. Others were treated by various methods and sometimes were either improved or became long-term cures. The failures, however, were numerous.

It had to be concluded by the Memorial group that these papillary carcinomas could kill people. As cancers they were insidiously docile and loath to pull the string early on their intended victim. They relaxed the cat and mouse act. The question had to be raised by the perturbed but contentful clinician: Is there some way of treating this disease differently at the outset? Analysis proved that the only therapeutic method not utilized as a form of initial treatment was radical surgery. And so during the last few years radical surgical treatment of papillary thyroid carcinoma has been increasingly accentuated on the Head and Neck Service at Memorial Hospital.

For those who undertake radical surgery for papillary thyroid carcinoma, the problem of approach is several sided. The question of how to attack the tumor-bearing gland is variously regarded but this aspect will not be considered here. Proponents of radical surgery are in general agreement that radical neck dissections should be carried out in conjunction with thyroidectomy when there is clinical or other evidence of cervical lymph-node metastases; however, opinions are varied whether or not radical neck dissection should be done in the absence of clinical or other evidence of cervical lymph-node involvement. The purpose of this paper is to report on clinical and

TABLE 1
PATHOLOGICAL FINDINGS IN 182 RADICAL
NECK DISSECTIONS FOR PAPILLARY CAR-
CINOMA, 1946-1953

	Node metastases		
	Clinically negative	Clinically positive	Clinically doubtful
Total Neck dissections with node metast. proved pathologically	67	104	11
	41 (61.2%)		113 (96%)

“Proponents of radical surgery are in general agreement that radical neck dissection should be carried out in conjunction with thyroidectomy when there is clinical or other evidence of cervical lymph-node metastases; however, opinions are varied whether or not radical neck dissection should be done in the absence of clinical or other evidence of cervical lymph-node involvement”.

Frazell E. L., & Foote F. W. (1955). *Papillary thyroid carcinoma: Pathological findings in cases with and without clinical evidence of cervical node involvement. Cancer, 8(6), 1164-1166.*

“Replanteando la radicalidad del vaciamiento en el cáncer de tiroides”



George Washington Crile,
Cirujano (1864-1943)

- Linfadenectomía de los actuales niveles I a V
- Músculo esternocleidomastoideo
- Glándula salivar submandibular.
- Cola de la parótida
- Músculo omohioideo
- Ramas cutáneas del plexo cervical
- Vena yugular interna



George Crile Jr,
Cirujano (1907-1992)

“Replantando la radicalidad del vaciamiento en el cáncer de tiroides”

The Fallacy of the Conventional Radical Neck Dissection for Papillary Carcinoma of the Thyroid *

GEORGE CRILE, JR., M.D.

From the Department of General Surgery, The Cleveland Clinic Foundation and The Frank B. Bunts Educational Institute, Cleveland, Ohio

I. THE DEFECTS OF THE CONVENTIONAL RADICAL NECK DISSECTION

THERE is a continuing debate among surgeons as to whether it is necessary to treat a metastasizing papillary carcinoma of the thyroid by a so-called “block dissection” of the neck. This is an important question, for the classical operation, so well adapted to eradication of the metastases of squamous cell cancers of the mouth, sacrifices the sternocleidomastoid muscle, often the eleventh nerve and sometimes even the infraorbital branch of the facial nerve. The deformities and dysfunctions which ensue are tragic consequences to teen-age girls and young women who are most commonly affected by papillary cancers of the thyroid. Loss of contour of the neck, paralysis of the muscles of the lower face, shoulder drop, later arthritic changes in the shoulder girdle, hoarseness from unilateral laryngeal nerve injuries, stridor from bilateral injuries, and tetany are serious and often permanent complications. The surgeon who inflicts them must be prepared to defend his position by incontrovertible proof of a higher rate of cure. To date such proof is lacking; in fact published statistics indicate that the results of extensive and carefully planned conservative operations are better than those following conventional radical neck dissections.^{1-5,7}

Those who favor radical neck dissections argue that a classical en bloc cancer operation should give maximum protection against recurrence, but they fail to describe

how such an operation can be performed. The real question is not whether an en bloc operation is good but whether there is such a thing as an en bloc operation that is applicable to cancer of the thyroid.

In some cancers, like those of the jaw, colon, and upper outer quadrant of the breast, en bloc resections of primary cancers in continuity with their zones of lymphatic metastases and extensions are feasible. But papillary cancers of the thyroid are not like these. They are like cancers of the lip, in that they do not lie in soft-tissue continuity with their zones of lymphatic extension and metastasis. Just as the jaw lies between the lip and the neck, so the carotid artery lies between the primary thyroid cancer and its lateral cervical metastases and makes it impossible to perform an en bloc resection of the primary tumor in continuity with its lateral cervical metastases. Moreover the lateral cervical lymph nodes involved by carcinomas of the thyroid are in a deeper compartment than those involved from cancers of the jaw, and lie deep to the carotid, as well as superficial to it. The carotid is in fact surrounded by the zone of metastases of cancer of the thyroid so that a true block dissection of the lateral cervical metastases of a papillary carcinoma of the thyroid cannot be accomplished without resecting the carotid artery and the vagus nerve. Resection of the jugular sternocleidomastoid block, so effective for the more superficially metastasizing squamous cell cancers of the mouth, removes only one small part of the zones of metastases of thyroid cancers.

* Submitted for publication July 20, 1956.



“Since many papillary cancers are amenable to endocrine control, since there is no such operation as a block dissection of a cancer of the thyroid in continuity with its zone of lymphatic metastases, and since the survival rate of reported cases indicates that well-planned conservative operations which do not deform the neck are more effective than standard radical neck dissections, there are few indications for sacrifice of the sternocleidomastoid muscle.”

“the importance of the central zone”

“the battle of the thyroid is won or lost in the central area of the mediastinum and neck”

Survival of Patients with Papillary Carcinoma of the Thyroid after Conservative Operations

GEORGE CRILE, JR., M.D., Cleveland, Ohio

From the Department of General Surgery, The Cleveland Clinic Foundation, Cleveland, Ohio.

IN THE TREATMENT of papillary carcinoma of the thyroid some surgeons have advocated total thyroidectomy and conventional radical neck dissection with sacrifice of the sternocleidomastoid muscle and the eleventh nerve. The deformity that attends this operation is disfiguring to the girls and young women in whom this type of cancer most frequently occurs, and the risk of inducing permanent tetany is great. If operations that conserve more of the uninvolved structures of the neck are effective in controlling papillary carcinoma, disfiguring and disabling operations should not be used.

There is a group of predominantly papillary carcinomas that occur chiefly in people beyond the age of fifty, but in which there are areas of undifferentiated cancer. These tumors are extremely malignant, and if they are grouped with the ordinary papillary carcinomas or mixed papillary and follicular carcinomas, the results of treatment of papillary carcinoma will be much worse than if the carcinomas with undifferentiated areas are classified as undifferentiated carcinomas.

The series of patients reported here contains no tumors with areas of undifferentiated carcinoma. The survival of females for periods up to fifteen years after conservative operations for papillary carcinoma of the thyroid does not differ from that expected in a representative group of similar age from the general population of females. In view of this finding it should rarely be necessary to perform a radical neck dissection or a total thyroidectomy in the treat-

ment of papillary carcinomas that show no undifferentiated areas.

MATERIAL

The material on which this study is based consists of a personal series of 140 consecutive patients treated for papillary carcinoma of the thyroid. (Table 1.) All of the patients have been followed for from five to twenty-five years. Thirty-eight patients had had previous operations on the thyroid and were treated by me for recurrences of their tumors. One hundred two patients (seventy-seven females) had had no previous operation on the thyroid, although many of them had had involved cervical nodes removed. Only one of the seventy-seven patients in the female group of primary cases was treated by a conventional type of neck dissection with sacrifice of the sternocleidomastoid muscle, and only eight of the seventy-seven had undergone total thyroidectomy. Most of the patients were given suppressive doses of desiccated thyroid.

Although prophylactic neck dissections were not carried out when nodes were not grossly involved, although the neck dissections usually were performed through thyroidectomy incisions and were limited to the removal of grossly involved groups of nodes and although in most cases only one lobe or a lobe and a part of the other were removed [1], the survival experience of this group of female patients has been the same as though the patients had never had papillary cancer.

LIFE TABLE (ACTUARIAL) ANALYSIS OF SURVIVAL

According to Ederer, Axtell and Cutler [2], “. . . a group of cancer patients is subject to two forces of mortality: (1) mortality from the specific form of cancer under study and (2) mortality from all other possible causes of death.” Thus in order to estimate the influence

“Replanteando la radicalidad del vaciamiento en el cáncer de tiroides”

Surgical Treatment of Thyroidal Carcinomas

A Study of 885 Cases Observed in a 30-Year Period

B. MARDEN BLACK, MD; RICHARD E. YADEAU, MD; AND LEWIS B. WOOLNER, MD,
ROCHESTER, MINN

The cases of carcinoma of the thyroid seen at the Mayo Clinic from 1926 through 1955 have been reviewed recently in detail. The study, started some years ago, was undertaken originally to determine the adequacy of the pathologic classification currently in use. The pathologic aspects, late survival rates, and some of the details of treatment have been reported.⁶ In the present study, an attempt was made to evaluate in greater detail the surgical procedures in the hope of defining with greater confidence the extent

of the surgical procedure indicated in the treatment of lesions of different types.

Pathologic Classification

The classification of the lesions in this series is shown in Table 1. The papillary carcinomas are well known and need not be discussed at length. The various histologic patterns, whether predominately papillary, mixed papillary and follicular, or follicular, have little bearing on treatment or ultimate outcome. The term “occult” was applied to primary lesions less than 1.5 cm in diameter (average 0.7 cm in diameter) regardless of involvement of lymph nodes. “Intrathyroidal,” similarly, was employed to categorize lesions larger than 1.5 cm in diameter that were still confined to the thyroid. Le-

Vol 88, April, 1964

Read before the 71st Annual Session of the Western Surgical Association, Galveston, Tex, Nov 21-23, 1963.

Section of Surgery (Dr. Black), Fellow in Surgery (Dr. Yadeau), Section of Surgical Pathology (Dr. Woolner), Mayo Clinic and Mayo Foundation.

Estandarización de la toponimia anatómica

Sistematización y nomenclatura de las disección linfática

Indicaciones de cada técnica

Eterno debate de la linfadenectomía profiláctica



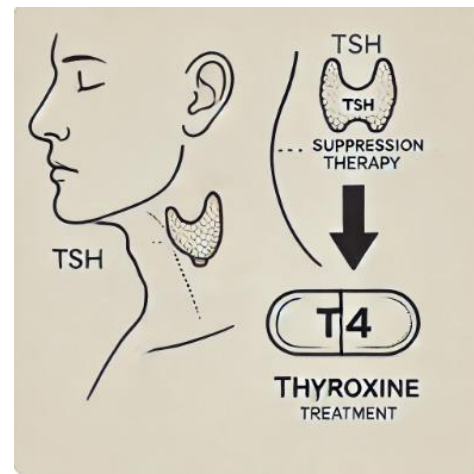
Actualmente la cirugía del carcinoma de tiroides es totalmente independiente de la cirugía de cabeza y cuello

La linfadenectomía es una maniobra habitual en la cirugía del CPT.

La linfadenectomía suele ser del compartimento central y menos frecuente del compartimento lateral del cuello

Muy raramente se precisan disecciones radicales con implicación de otros tejidos

La linfadenectomía electiva sigue aun hoy en día siendo motivo de controversia



Ablación I¹³¹



Karl T. Compton (1887 – 1954)



12/11/1936: “What physics can do for biology and medicine”



James Howard Means,
Jefe Medicina del
Massachusetts general hospital

Saul Hertz,
Director de la unidad de tiroides del
Massachusetts general hospital



“Could iodine be made radioactive artificially?”

Letters to the Editor

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Radioactivity Induced by Neutron Bombardment

EXPERIMENTS have been carried out to ascertain whether neutron bombardment can produce an induced radioactivity, giving rise to unstable products which disintegrate with emission of β -particles. Preliminary results have been communicated in a letter to *La Riforma Scientifica*, 5, 282; 1934.

The source of neutrons is a sealed glass tube containing radium emanation and beryllium powder. The amount of radium emanation available varied in the different experiments from 30 to 630 millieuries. We are much indebted to Prof. G. C. Trabacchi, Laboratorio Fisico della Sanità Pubblica, for putting at our disposal such strong sources.

The elements, or in some cases compounds containing them, were used in the form of small cylinders. After irradiation with the source for a period which varied from a few minutes to several hours, they were put around a Geiger counter with walls of thin aluminium foil (about 0.2 mm. thickness) and the number of impulses per minute was registered.

So far, we have obtained an effect with the following elements:

Phosphorus—Strong effect. Half-period about 3 hours. The disintegration electrons could be photographed in the Wilson chamber. Chemical separation of the active product showed that the unstable element formed under the bombardment is probably silicon.

Iron—Period about 2 hours. As the result of chemical separation of the active product, this is probably manganese.

Silicon—Very strong effect. Period about 3 minutes. Electrons photographed in the Wilson chamber.

Hassium—Strong effect. Period about 12 minutes. Electrons photographed in the Wilson chamber.

Chlorine—Gives an effect with a period much longer than that of any element investigated at present.

Vanadium—Period about 5 minutes.

Copper—Effect rather small. Period about 6 minutes.

Arsenic—Period about two days.

Silver—Strong effect. Period about 2 minutes. **Tellurium**. Period about 1 hour.

Iodine—Intense effect. Period about 30 minutes. **Chromium**—Intense effect. Period about 6 minutes. Electrons photographed in the Wilson chamber.

Barium—Small effect. Period about 2 minutes. **Fluorine**—Period about 10 seconds.

The following elements have also given indication of an effect: sodium, magnesium, titanium, zirconium, zinc, strontium, antimony, selenium and bromine. Some elements give indication of having two or more periods, which may be partly due to several isotopic constituents and partly to successive radioactive transformations. The experiments are being continued in order to verify these results and to extend the research to other elements.

The nuclear reaction which causes these phenomena may be different in different cases. The chemical separation effected in the cases of iron and phosphorus seems to indicate that, at least in these two cases, the neutron is absorbed and a proton is emitted, the unstable product, by the emission of a β -particle, returns to the original element.

The chemical separations have been carried out by Dr. O. D'Agostino, Dr. E. Amaldi and Dr. E. Segrè who collaborated in the physical research.

ENRICO FERMI.

Physical Institute,
Royal University, Rome.

April 10.

Induced Radioactivity

CURIE and Joliot¹ and Ellis and Henderson² have observed that positrons were emitted when aluminium, magnesium and boron were bombarded with high energy α -particles. They noted, further, that the positrons could be detected after the α -particle bombardment had ceased. It was therefore assumed that these electrons were produced by the radioactivity of the unstable nuclei resulting from the capture of the α -particle and the emission of the neutron. Danysz and Zw³ obtained similar results when they bombarded nitrogen with α -particles.

In order to account for the results obtained by bombarding certain ammonium salts in which hydrogen was in part replaced by deuterium with deuterons, Oliphant, Hartree and Rutherford⁴ assumed that a helium nucleus of mass 4 and charge 2 was formed by the union of two deuterons, which differed from the ordinary α -particle in having a large excess energy and being in consequence unstable. It is the purpose of this note to point out that in a similar manner the radioactivity of the light elements is due to the formation, within their nuclei, of an unstable proton of excess energy which disintegrates by emitting a positron. It is suggested that the similarity of the disintegration phenomena observed is due to the radioactivity of this "radioproton".

It has been shown⁵ that the emission of protons from neon, magnesium, silicon, sulphur and argon can be explained by assuming that pairs of electrons are formed by the interaction of α -particles and nuclei as suggested by a formula due to F. Perrin⁶. By assuming that the positron of the pair unites with a neutron to form a proton, it was found possible to retain the hypothesis of stability of nuclei of mass 4n, the feeble proton emission of the elements mentioned being due to the less abundant isotopes. The mechanism was extended to the other proton-emitting elements and the conclusion arrived at in a previous paper⁷ was confirmed, namely, that there are no "free protons" in nuclei, these being combined with neutrons either as α -particles or deuterons. This hypothesis will account for the induced radioactivity as follows.

Consider, for example, the case of aluminium. It is supposed that the proton emission is caused by the positron of the electron pair uniting with the free neutron, the negative electron combining with the positron of the dipion to produce a quantum of γ -radiation and leaving the stable nucleus $^{27}\text{Al}^0$. When the energy of the α -particle increases beyond a critical value, it is supposed that the positron is emitted before the high energy positron unites with it. The radioproton is formed, however, as the positron unites with one of the two neutrons produced

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Vanadium—Period about 5 minutes.

Copper—Effect rather small. Period about 6 minutes.

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Iodine—Intense effect. Period about 30 minutes. **Chromium**—Intense effect. Period about 6 minutes. Electrons photographed in the Wilson chamber.

Barium—Small effect. Period about 2 minutes. **Fluorine**—Period about 10 seconds.



Enrico Fermi,
Royal University, Roma

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Zirconium—Small effect. Period about 2 minutes.

Fluorine—Period about 10 seconds.

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Physical Institute,
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OFFICE OF THE PRESIDENT

December 15, 1936

Dr. S. Hertz
Massachusetts General Hospital
Boston, Mass.

Dear Dr. Hertz:

To my chagrin I have just come across the memorandum which I made on your question about the radioactivity of iodine.

Iodine can be made artificially radioactive. It has a half period of decay of twenty-five minutes and emits gamma rays and beta rays (electrons) with a maximum energy of 2.1 million volts. It is probable that there are several other periods of decay, but if so they correspond to types of radioactivity like the one indicated and they are not as yet very definitely established.

Very sincerely yours

Karl T. Compton
President

KTC/L

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Fluorine—Period about 10 seconds.



Saul Hertz (1905 – 1950)



Arthur Roberts,
Físico (pianista) del MIT

| 128

Experimentación animal (48 conejos)

- Tiroides retiene el isótopo en una magnitud muy superior al resto de tejidos
- Tiroides hiperplásico todavía retiene más iodo

USO TERAPEUTICO (hipertiroidismo)

| 128

Vida media de 30 minutos

510 RADIOACTIVE IODINE IN THYROID PHYSIOLOGY

reaction for the brilliant green lactose bile medium is between pH 7.1 and 7.4.

It cannot be stated definitely that the characteristics of the strains employed in this study might not have been changed if the experiment had been carried on for a considerably longer time, or if greater concentrations of bile had been employed. However, in spite of these factors, it seems that the results of the experiments here reported should argue in favor of the stability of the culture reactions of pure established cultures of *Aerobacter aerogenes*, so far as the influence of bile or bile salts alone is concerned.

9915 P

Radioactive Iodine as an Indicator in the Study of Thyroid Physiology.*

S. HERTZ, A. ROBERTS AND ROBLEY D. EVANS. (Introduced by Henry Jackson.)

From the Thyroid Clinic, Massachusetts General Hospital, Boston, and the Physics Department, Massachusetts Institute of Technology, Cambridge.

The known facts of thyroid physiology indicate that iodine is selectively taken up by the thyroid gland, and that in some measure that gland's function is regulated by its iodine content. Artificial radioactivity may be induced in a variety of elements by means of neutron bombardment. It seemed that the possibility of using "tagged" (radioactive) iodine as a physiologic indicator was one which demanded investigation.

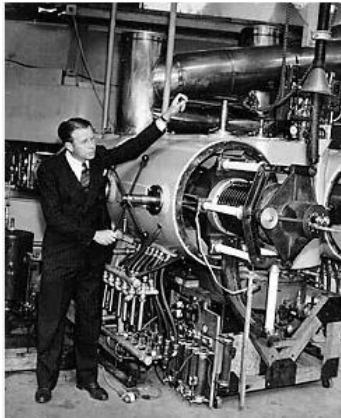
Ethyl iodide (600-1000 cc) was irradiated in a paraffin-surrounded bottle by immersing in it a neutron source consisting of 110 mg of radium mixed with beryllium in a sealed tube. The radioactive iodine thus obtained was concentrated by a method which has been described elsewhere.¹ This method gave a precipitate of radioactive silver iodide, which was dissolved in a solution of 0.5-1.0 g of sodium thiosulphate, and then diluted to 10-15 cc for intravenous injection. In a series of 48 rabbits, no toxic effects from the acute administration of such quantities were experienced. Aliquot portions of the solution of radioactive iodine used for injection were withheld for measurement of radioactivity.

*This work was aided by a grant from the Milton Fund of Harvard University.
¹ Roberts and Irvine, *Phys. Rev.*, 1938, **58**, 609.

Mientras tanto ...



... En California



Ciclotrón de Beckeley



I^{131} , I^{130} y reprodujeron los Trabajos del MIT



Joseph G. Hamilton
Residente de medicina
Estudiaba el metabolismo del
yodo



Ernest Lawrence
Físico
Premi Nobel



Glen Seaborg
Químico
Premio Nobel



John J. Livingood
Físico Nuclear

Y en el MIT



Saul Hertz



Arthur Roberts



30.000 \$

Necesitamos un ciclotrón

Ya tenemos un ciclotrón

90 %: I130 (vida media de 12 horas)

10 %: I131 (vida media de 8 días)





Boston, 31 de marzo de 1941



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

SERIES NO.	CASE-NOSRNO.	RAI: KI: RATIO TO SUB-TOTAL	DOSEAGE OF I ¹³¹ mCi	RAI: KI: RATIO TO SUB-TOTAL	POST-OP. THYROID WT. (G)	HISTOLOGY	TOTAL THYROID IRRADIATION (r)	ESTIMATED THYROID WT. (G)	% OF Ra-I (URINE) EXCRETED - 72 HRS		
1	ELIZABETH D. MGH-308552	+30	21mC 3-31-'41 15mC 4-11-'41	(-5X-7)	(-29)	34 INVOLUTION	470 550	660 520	35	28	
5	LILIAN R. MGH-308552	+35	57mC 7-16-'41	PLANNED EXAGGERATED	(-20)	31 HYPERPLASIA NO INVOL.	1000	1150	40	27	
10	GLADYS B. MGH-308552	+55	07mC 2-2-'42	(+3)	(-24)	26 30	HYPERPLASIA AND INVOL.	120	80	60	38
14	WILFRED B. MGH-363173	+50	15mC 7-15-'42	(-15)	(-24)	55 HYPERPLASIA + INVOLUTION	650	—	60	71	
16	CARMELLA B. MGH-255820	+25	10mC 8-11-'42	(-8)	(-24)	28 INVOLUTION	1800	—	45	6	
19	DETER C. MGH-369233	+65	11mC 8-25-'42 8mC 3-8-'43 5mC 5-9-'43	(30) (75) (+25)	(+36) (75) (-18)	35 3L HYPERPLASIA + INVOLUTION	2000 1500	—	60	9 15 7	
2	MARGARET B. MGH-308230	+35	11mC 5-10-'41 03mC 9-1-41 24mC 9-2-41 03mC 9-2-41	NOT OPERATED PERSISTENT THYROTOXICOSIS ← ANOTHER 20mC PROPOSED			160 110 120 100	160 100 120 100	40	54* 48 78 —	
4	CAMILLE SCHM. MGH-308302	+30	3.6mC 7-13-'41 2.2mC 7-31-'41	← EYE'S BETTER. NO OTHER DRUG (+23) DRP MED. 4 YRS	58 =C		270 170	308 180	60	55 56	
3	RUTH M. MGH-308538	+50	34mC 6-6-'41 20mC 1-9-'46	REMISSION FOR 1 YR. THEN (RECENTLY FOR TRK RECURRING)			430 4300	410 —	45 30mC/RAI	45 35	

* OPHTHALMOPATHIC TYPE

hipertiroidismo



1943 – 1946

se alista en la marina Grave controversia con colegas que se adueñan y publican sus trabajos

JAMA, 11 de mayo de 1946

3102
GOLTER-HERTZ AND ROBERTS 81

RADIOACTIVE IODINE IN THE STUDY OF THYROID PHYSIOLOGY

VII. The Use of Radioactive Iodine Therapy in Hyperthyroidism

DAVID HERTZ, M.D.
ROBERT ROBERTS, M.D.
Boston, Mass.

In previously published experiments of this series¹ radioactive iodine was used as an indicator in the study of animal and human thyroid physiology and iodine metabolism. Much of this preliminary work was done with a view to the discovery of the conditions under which radioactive iodine might be administered with maximum radioiodine effect in the pathologic thyroid of patients ill with hyperthyroidism. The present paper is a progress report on our early experiments (1941-1943) with an "internal tracer" in the treatment of 20 cases of hyperthyroidism. It is, indeed, a three to five year follow-up report on these cases.

Patients were selected who had no previous iodine treatment and who were judged clinically to have hyperthyroidism. The usual clinical tests were made and the patients were presented to the Thyroid Clinic of the Massachusetts General Hospital for discussion and determination of their suitability for this type of treatment. In each instance a dose of radioactive iodine, which had been made up in the Thyroid Unit of the Massachusetts General Hospital for discussion and determination of their suitability for this type of treatment. In each instance a dose of radioactive iodine, which had been made up in the Thyroid Unit of the Massachusetts General Hospital for discussion and determination of their suitability for this type of treatment.

The sample of radioactive iodine used were obtained by desorption from carrier and at the time of administration consisted of a mixture of different radioactive isotopes of iodine. Over 95 per cent of the activity at the time consisted of the 131I isotope. The total activity administered varied between 127 and 28 millicuries. In 19 cases the total dose was administered to the individual patient as one dose, in 10 cases divided doses were employed.

In most cases, after a period of two to four months following the radio-iodine administration, routine iodine therapy was stopped when an essentially normal basal metabolic rate had been maintained or achieved for a few weeks or months. Such basal metabolic rate maintenance was aided in some instances by the use of a few weeks of thyroid extract.

1. Hertz, D., Roberts, R., and Hertz, W. G., Radioactive Iodine in the Study of Thyroid Physiology. J. Clin. Investigation 49: 310-312 (1945).

From the data already obtained from tracer studies it was considered desirable to keep the total amount of iodide administered below 2 mg. of iodine in order to prevent maximum excretion by the thyroid.

Urinary iodine excretion was determined during the first seventy-two hours after the administration of radio-iodine. An indirect estimate of the thyroid retention of radioactive iodine was thereby obtained, since an approximate balance existed between administered iodine on the one hand and the sum of thyroid iodine retention and urinary excretion on the other.

Urinary iodine was carried out on aliquot portions of carefully collected twenty-four hour specimens, which were kept cool and stored during the collection periods. It was early found² that significant amounts of the original dose were to be found only in the first three days' specimens. Fecal excretion was tested and was found to be so low as to be negligible for the purpose of these experiments.

In a few cases external gamma ray counter measurements were made of the activity of the thyroid of patients following the administration of radioactive iodine. Such measurements are difficult, far above necessary, to evaluate quantitatively. However, similar measurements of this type can give good data on the retention of thyroid iodine contents. They were performed in order to follow the loss of iodine from the thyroid following the initial uptake and to evaluate the effect of routine iodination following the administration of radioactive iodine.

External counter measurements were roughly calibrated against actual direct measurements on the thyroid glands at operation and after chemical separation.³ In 2 patients, previously selected for iodine therapy, who received therapeutic amounts of radioactive iodine, the activity of the thyroid gland was measured at intervals of one to two days, twice a day was begun at periods varying from one day to several weeks after the administration of the iodine.

The basal metabolic rate of the patients treated was usually both before and after the administration of radioactive iodine. Basal metabolic levels were measured in treatment to estimate a rough degree of hyperthyroidism present. In addition to the basal metabolic rate, weight, pulse rate, and physical findings were recorded and the total clinical picture was used to evaluate the effect of treatment. No adverse effects, such as fever, nausea or irradiation sickness, were noted in any of the patients. No complaints were recorded regarding the taste of the medication.

In the oral cavity or over the thyroid, encountered at the time of operation, no increase in the degree of hyperthyroidism following the radioactive iodine treatment per se, or recorded through several patients were kept hospitalized for three to four weeks prior to their discharge.

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profession, this form of treatment will prove itself not only highly effective, safe and noninjurious but also cheap and of least inconvenience to the patient who may receive it while continuing at his normal pursuits. After a short period of hospitalization for the usual preliminary clinical studies and the administration of radio-iodine, the patient may be fully iodinated and released, to be followed as an ambulatory case.

SUMMARY

On the basis of a series of animal and clinical experiments using radioactive isotopes of iodine as a tracer in the study of thyroid physiology and iodine metabolism, the treatment of 20 cases of hyperthyroidism with internal irradiation by radioactive iodine was instituted. By careful excretion studies, external counter measurements over the thyroid gland and by planned operations in 2 cases, data were obtained which allow us to construct a formula for a procedure in treatment.

The addition of ordinary iodine therapy after the administration of radio-iodine offers many advantages in the clinical care of hyperthyroidism and in the economy and safety of the procedure.

By an analysis, over a long period, of both the failures and successes in this series of 20 cases, it is shown that radioactive iodine when given in the dosage range of 3 to 25 millicuries to unoperated patients with hyperthyroidism possessing powers of 60 to 75 Gm. is highly effective as a cure of the disease in about 60 per cent of cases. When appreciable activity has been administered and substantial thyrotoxicosis is resorted to, myxedema or hypometabolism may be expected to develop in a large fraction of the cases (100 per cent in 5 cases in this series).

THE TREATMENT OF HYPERTHYROIDISM WITH RADIOACTIVE IODINE

EARLE M. CHAPMAN, M.D.
ROBERT D. EVANS, Ph.D.

Roengen treatment has been used for hyperthyroidism for many years. In 1923 Meigs and Holmes¹ pointed out that in this form of treatment about one third of the patients are cured, another third improved and another third not affected. Since 1923 ordinary iodine by mouth has been used as a prophylactic method of quipping the hyperactive thyroid in preparation for surgery. Under iodine alone occasionally the patient and the doctor have been agreeably surprised to find that the symptoms and signs of hyperthyroidism disappeared, and a permanent remission apparently was effected. That x-ray treatment and iodine treatment sometimes cure hyperthyroidism led to the hope that some day a more effective, nonsurgical agent would be found. Then the MacKenzie's and Astwood's² discovery that several chemical compounds inhibit the function of the thyroid in hyperthyroidism as well as under other circumstances. Several of these agents have been

investigated, and until now thioacetamide has been found to be most useful in the treatment of thyrotoxicosis. Induced radioactivity was discovered in 1934, and that same year Fermi and his co-workers³ in Italy prepared radioactive isotopes of iodine. Because the thyroid absorbs iodine selectively, it seemed likely that beta rays from iodine rendered radioactive would have a greater radiation effect than that derived from roentgen rays delivered through the skin and overlying tissues.

The use of radioactive iodine in the study of thyroid physiology was soon undertaken and reported first in 1938 by Hertz, Roberts and Evans.⁴ Subsequently these and other investigators used various isotopes of radioactive iodine as tracers for the study of thyroid function⁵ and it was found that in untreated hyperthyroidism the thyroid may take up as much as 80 per cent of a small dose (less than 2 mg.) of iodide within a few hours after oral administration.⁶ This established the basis for therapeutic trials of radioactive iodine, and in 1942 Hertz and Roberts⁷ published a preliminary report of the treatment in this manner of 10 patients. In this series the procedure was to give the radioactive iodine and follow this with ordinary iodine by mouth for a period of several months. However, our review in the clinic of these 10 cases of Hertz and Roberts, and an additional 15 so treated under the direction of Hertz, has led to the conclusion that it is difficult to decide whether those patients who improved were responding to the ordinary iodine, to the radioactive iodine or to their combination. The dosage of radioactive iodine given to these 25 patients averaged 5 millicuries in 1941, 10 millicuries in 1942 and 14.5 millicuries in 1943, the largest single dose being 21 millicuries.

In 1943 Dr. Hertz went on active duty in the Navy and asked us to continue with this study. The present report reports the treatment of 22 patients with hyperthyroidism treated only with radioactive iodine and with considerably higher doses. Although both Hertz and Roberts and Hamilton and Lawrence⁸ were encouraged by their therapeutic trials, the details of their findings have not yet been published.

METHOD AND DOSEAGE

Selection and Care of Patients

The patients selected in the Thyroid Clinic of the Massachusetts General Hospital for radioactive iodine therapy were judged by several physicians to be thyrotoxic on the basis of classic disease pattern accompanied with consistently elevated basal metabolic rates. All patients had thyroids estimated to be at least two to three times normal in size. All but 3 were kept free from all forms of treatment, especially iodine, for at least four weeks prior to giving radioactive iodine. For the administration of the drug they were usually hospitalized for a time adequate to obtain levels of their basal metabolic rate, then given radioactive iodine by mouth—simply a drink of what tastes like rather stale water.

1. Meigs, J. W., and Holmes, J. H., Radioactive Iodine in the Study of Thyroid Physiology. J. Clin. Investigation 49: 310-312 (1945).



**Samuel L. Seidlin,
(1895 – 1955)
ENDOCRINÓLOGO
H. Montefiore (NYC)**



Paciente B.B, cáncer de tiroides metastásico



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Full Court Restaurant, 120 and up
Full Course Luncheon, \$1.25 and up
For your favorite special event or
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ANSKARY
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New Palestine Colony
Restores Massachusetts
Preservation 1974 - The
restoration of Northfield Mass.

Hertz to Use Nuclear Fission in Cure for Cancer

By DONALD G. VINCENT
Dr. Paul Hertz, instructor in Medicine in the Medical School, has announced that he has founded an institution, The Radioactive Isotope Research Institute, whose purpose is to apply radioactive fission products to the treatment of the thyroid cancer, goiter, and other malignant growths.
Dr. Hertz is connected with both the Medical School and Beth Israel Hospital as medical co-ordinator and research associate. In the past, he has been in charge of the Thyroid Clinic of the Massachusetts General Hospital and Research Associate at the Massachusetts Institute of Technology.
The research conducted by Dr. Hertz and others which led to the institution of the Radioactive Isotope Research Institute was financed by a grant from the John and Mary Marks Fund in New York City and the British Dr. Foster Fund. Most of the work was done at the Massachusetts General Hospital and at M.I.T.
Wants Control Agency
Dr. Hertz has long hoped that the government will agree to handle all active isotopes for prices working these into isotopes in its greatest quantities. Per capita are available throughout the city at hand in the Department of Health.
The new Radioactive Isotope Research Institute, a limited partnership, is a limited partnership of the members of the Institute of Radioactive Isotope Research. Elements available in the market of products in the United States and other countries which the Institute will handle in its own name. The Institute will handle in its own name the radioisotopes available in the market of products in the United States and other countries which the Institute will handle in its own name. The Institute will handle in its own name the radioisotopes available in the market of products in the United States and other countries which the Institute will handle in its own name.



Simple, No ill Effects
The use of isotopes from this treatment has been noted. When radiotherapy was used on the cancer of the eye, an operation known as a "new class of radiation treatment" was used, but this has been successful before the use of radioisotopes and hence was not costly. Radioactive fission, which has now been shown to be effective in certain diseases.

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Getting the News
By SARAHAN J. ABRAM
ANNING—The transfer of British military bases to the United States will not be completed until the end of the year, according to a report from the British government. The transfer of the bases will be completed in the next few months, according to the report. The transfer of the bases will be completed in the next few months, according to the report.

U.S. Government Officially Endorses Inquiry Committee Recommendation To Admit 100,000 Jews Into Palestine

Local Researchist Discovers Cure for Goitre Through A-Bomb By-Product
Zionists Hold Special Meet In Washington
State Dept.'s Request for Mo Doesn't Halt Urging Speedy

WASHINGTON, May 23 (S patch)—The State Department last night that the United States has officially endorsed the Inquiry Committee's recommendation of immediate admission of 100,000 Jews into Palestine and that it will permit to press for speedy transit of immigrants.
The statement was issued at the understanding created by a State Department memorandum issued this morning which urged further views from Jews and the Anglo-U. S. Report.

UN Commission In Report on Human Rights
B'nai Brith To Convene Here This Week-End

Governor Tobin To Sign Mass.
B'nai Brith leaders from every part of the world will convene in Boston and Boston during the week-end of the 48th annual convention of the B'nai Brith International Brotherhood of the Jewish People, which will be held at the Hotel Statler, Boston, from May 27 to 31. The 48th annual convention will be held at the Hotel Statler, Boston, from May 27 to 31. The 48th annual convention will be held at the Hotel Statler, Boston, from May 27 to 31.



DR. PAUL HERTZ, Co-ordinator, IRI, IRI

Dedicate
Americanism,
Social Science

THURSDAY, MAY 23, 1949
Twenty-Four Pages Seven Cents

En 1950 – Saul Hertz fallece de manera súbita de un infarto de miocardio



En 1951 – I131 es el primer radiofármaco aprobado por la FDA



Isótopos diagnósticos y terapéuticos

Aparataje diagnóstico

Altas dosis/bajas dosis

Terapia con estimulación TSH

PET

Dosis máxima aconsejada (seguridad física)

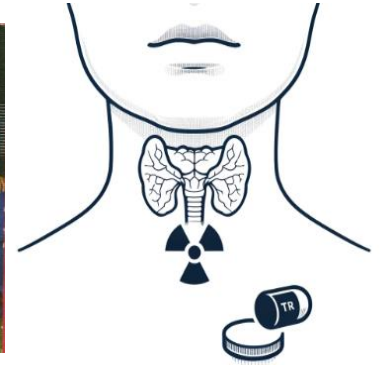
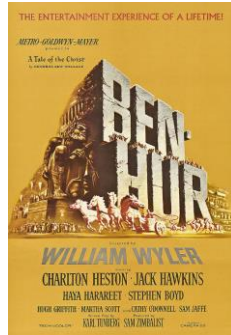
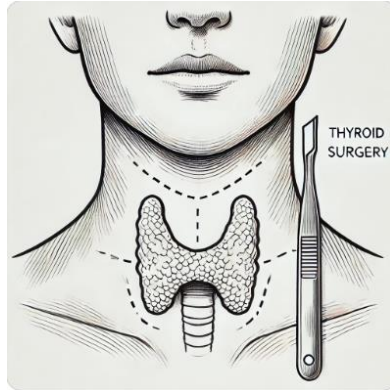
Indicaciones según riesgo

Teragnosis

09:00-09:30h

Pasión por el cáncer de tiroides: recorrido histórico por los hitos más importantes

Dr. Carles Zafón. Endocrinología y Nutrición - Hospital Universitari Vall d'Hebrón, Barcelona



GRACIAS

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