

May 1964

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Recommended Citation

Potchen, E. James (1964) "The Larkin Report for 1963: Isotopic Localization of the Parathyroid Gland," *The Linacre Quarterly*: Vol. 31 : No. 2, Article 9.

Available at: <http://epublications.marquette.edu/lnq/vol31/iss2/9>

The Larkin Report For 1963:

Isotopic Localization of the Parathyroid Gland*

E. JAMES POTCHEN, M.D.**

Hyperparathyroidism is a disease of protean manifestation caused by the abnormal activity of a small parathyroid gland. The ability to identify externally a hyperactive parathyroid should be helpful in the medical evaluation and surgical localization of this disease. The goal of this project is the development of a clinical technic for the selective isotopic labeling of hyperactive parathyroid glands.

The basic premise that an injected amino acid precursor of parathyroid polypeptides would at some time be found within the parathyroid gland has now been well-established in both experimental animals and human subjects^{1, 2, 3}. The autoradiographic demonstration of an isotopically labeled amino acid within the rat parathyroid was the basis of the initial experiments. The parathyroid activity was stimulated by a low calcium diet. Thyroid protein anabolism, which was considered the most probable source of extraneous radioactive emission in the neck, was effectively suppressed with thyroxine. Methionine was selected as the amino acid of choice for

these experiments because of the availability of the Se-75 selenomethionine. This is a gamma-emitting, metabolically active protein precursor which had previously been used for external scanning of the pancreas. The initial experiments utilized tritiated methionine as the low beta-emission was necessary for quality autoradiography. The autoradiographs demonstrated a selective isotopic labeling within the parathyroid in each instance.

After these developmental experiments, Se-75 selenomethionine was used in the study of selected patients with hyperparathyroidism. One patient, who was prepared with oral tri-iodo thyronine, received Se-75 selenomethionine, intravenously, one hour prior to the surgical removal of a parathyroid adenoma. This tissue was radioassayed and compared with blood, thyroid, and muscle removed at the same time. The parathyroid tissue had the greatest concentration of radioisotope by a ratio of 7.8 to 1.

This technic has subsequently been used for the preoperative external scanning of patients with hyperparathyroidism. The procedure consists of administering oral triiodothyronine for 4 to 7 days preceding the intravenous injection of 200 mc. of Se-75 selenomethionine. The neck is then scanned serially using a Picker Magnascanner. In some instances, focal isotopic accretion has been correctly identified as hyperactive parathyroid tissue which was subsequently confirmed at surgical exploration. The

¹Potchen, E. J. and Dealy, J. B., Jr.: Selective isotopic labeling of the parathyroid gland. *J. Nuclear Med.* 4:203 May 1963 (abstract).

²Potchen, E. J.: Isotopic labeling of the rat parathyroid demonstrated by autoradiography. *J. Nuclear Med.* 4:480-484 Nov. 1963.

³Potchen, E. J. and Sodee, D. B.: Selective isotopic labeling of the human parathyroid. (to be published)

*Presented before the Guild of St. Luke of Boston at Boston College, Jan. 29, 1964.

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serum flux of selenomethionine has made the scan timing of critical importance. Experiments to evaluate these kinetic interrelationships are in progress.

In summary, a technic has been developed which in some instances has been successful in the preoperative identification and localization of parathyroid adenomas. The experimental data are incomplete regarding the re-

liability and accuracy of this technic. Therefore the procedure cannot, as yet, be recommended for routine clinical use. The refinements and standardization of this technic should provide a simple and useful method for increasing the accuracy of clinical diagnosis and anatomic localization of hyperactive parathyroids.

(Se-75 selenomethionine was supplied by E. R. Squibb and Company.)

FEDERATION EXECUTIVE BOARD MEETING SCHEDULED

The Executive Board of the National Federation of Catholic Physicians' Guilds will hold its annual meeting June 24, 1964. Time: 10:00 a.m. - 1:30 p.m. Place: Sir Francis Drake Hotel, San Francisco, California.

The Officers of the national organization and one delegate from each active constituent Guild comprising the Board will conduct business.