

RADIO-IODINE THERAPY IN LARGE ATOXIC GOITRE

by

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A large nodular goitre may often produce pressure signs, such as compression of the trachea, with the concomitant distressing symptoms. The normal method of treatment is surgical but when, as so often happens, the patient is elderly or there are complicating conditions, operation may be contra-indicated. A reduction in the size of the goitre may then usually be obtained by means of radio-iodine therapy. HORST et coll. (1960) noted an improvement in 72 out of 75 patients with atoxic nodular goitres receiving this form of treatment.

The results of the therapy and the complications encountered at this hospital in the treatment of large atoxic goitres with ^{131}I are reported in this communication.

Material. Thirty-seven euthyroid patients with pressure symptoms arising from large nodular goitre were given large doses of radio-iodine between 1955 and February 1962. A considerable intrathoracic component of the goitre was present in 10 of the patients and in 2 of these the goitre was entirely within the thorax. Thirty-three of the patients were women and 4 were men; the mean age was 68.2 years. Surgical opinion prior to radiotherapy was against operation, owing to advanced age or complicating conditions.

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Table 1

Doses of radio-iodine administered at 70 treatments of 37 euthyroid patients with large nodular goitre — fractionated treatment was given to 14 patients

Dose of radio-iodine (mCi)	≤ 20	21–40	41–60	61–90	91–100
Number of treatments	19	19	14	6	12

Methods. All the patients were admitted to hospital for treatment. The dose of radio-iodine to be administered was selected with due regard to the uptake of ^{131}I in the thyroid gland, the size of the goitre and the extent of the tracheal compression. Eleven patients with marked respiratory obstruction were given fractionated radio-iodine therapy, that is, instead of one large dose, a number of smaller ones, usually two, were administered at intervals of about a week. Regular follow-up examinations were performed every 2 to 4 months for the first year, and thereafter at intervals of 6 to 12 months. If there were still symptoms from the goitre, and the uptake of radio-iodine by the gland was satisfactory, and if necessary after premedication with thyrotropin, the radio-therapy was renewed after 3 to 12 months. Seventeen patients received a single dose, 18 received two or three doses and 2 patients had four or more doses. Seventy treatments in all were given to these 37 patients; in 10 of them premedication with thyrotropin was undertaken to increase the uptake of radio-iodine by the goitre (EINHORN & LARSSON 1960). The doses are specified in Table 1.

All the patients were followed up. The incidence of immediate complications after ^{131}I therapy was noted, and the results of the therapy and the incidence of hypothyroidism were studied in the 32 patients surviving for a year. Any

Table 2

Immediate complications associated with 70 treatments with radio-iodine in 37 euthyroid patients with large nodular goitre

Dose of ^{131}I (mCi)	Principal symptom	Treatment
20	Increased respiratory distress, fatigue	None
20	Increased respiratory distress	None
25	Drowsiness	None
30	Increased respiratory distress, tachycardia	None
50	Difficulty in swallowing, tachycardia	None
50	Swelling of the goitre and tenderness, respiratory distress, difficulty in swallowing, tachycardia	Large doses of cortisone
70	Swelling of goitre and tenderness, respiratory distress and difficulty in swallowing	Large doses of cortisone
80	Respiratory distress, dizziness	None
100	Auricular flutter, arrhythmia	Digitalis
100	Difficulty in swallowing, tachycardia	None

Table 3

Patients with large nodular atoxic goitre receiving radio-iodine therapy and dying within 12 months of the last dose

Interval between last dose and death	Age at death (years)	Last dose of ¹³¹ I (mC)	Cause of death
63 days	74	50	Heart failure, pulmonary embolism, diabetes mellitus
70 days	76	40	Mammary carcinoma with metastases
5 months	67	45	Cerebral haemorrhage
7 months	64	20	Pulmonary tuberculosis, diabetes mellitus
9 months	75	75	Cardiosclerosis

change in the size of the goitre was assessed by comparing the circumference of the neck and measurements in roentgenograms obtained before and after the treatment.

An immediate complication was defined as any marked deterioration in the general condition or the appearance of local symptoms referable to the goitre within 30 days of the therapy. Patients were classed as hypothyrotic if, after radio-iodine therapy, prolonged thyroid substitution was considered to be indicated owing to signs of hypothyreosis.

Results

Immediate complications. These were observed in 10 patients (Table 2) and in all but one arose in connection with the first treatment. The deterioration always began within 6 days of the administration of radio-iodine, the chief symptom generally being an increase in respiratory distress, sometimes with stridor. Some patients had difficulty in swallowing, tenderness of the goitre, or tachycardia; one patient had an episode of cardiac flutter on the sixth day after therapy. There were no deaths within the first 2 months of treatment (Table 3).

Subjective improvement. Twenty-one of the 32 patients followed up for 12 months after the last radio-iodine treatment reported disappearance of the pressure symptoms, and the other 11 noted an improvement. There was thus no record of deterioration.

Objective findings. A manifest decrease in the size of the goitre was observed in 29 of the 32 patients followed up for at least a year (Figs 1 and 2); there was no obvious reduction in 3 patients. Comparison of routine roentgenograms of the soft tissues of the neck, taken before the therapy and one year afterwards, demonstrated a widening of the tracheal lumen in 8 of the 18 patients examined (Figs 3 and 4).

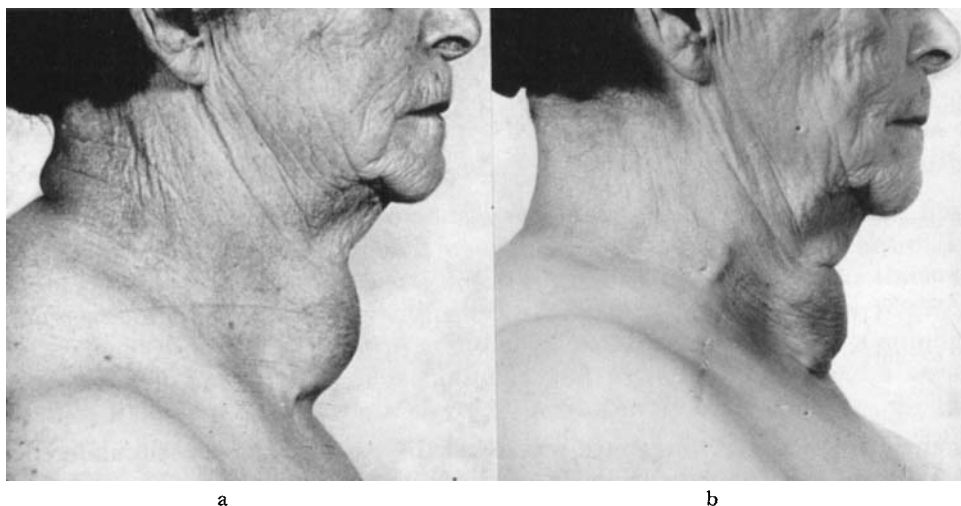


Fig. 1. Doses of $30 + 30 + 30$ mC of ^{131}I given over 12 months: a) before therapy, b) four months after the last dose.

Frequency of hypothyreosis. Thyroid administration in 6 patients was begun immediately after the last dose in order to prevent recurrence of the goitre. Of the remaining 26 patients followed up for at least twelve months, 3 developed hypothyreosis, all of them within one year of the treatment; all of these had received more than one radio-iodine treatment.

None of the patients developed clinically manifest carcinoma of the thyroid gland during the follow-up period.

Discussion

An atoxic goitre may in principle be reduced in size in three ways — by thyroid medication, operation, or by radio-iodine therapy.

Thyroid medication is often applied in patients with moderate enlargement of the thyroid gland, and chiefly in those who are young or middle-aged. This method is of little value, however, in extremely large nodular goitres of long standing, and if compression of the trachea with respiratory distress or a complicating heart condition exists, thyroid medication often only aggravates the condition of the patient.

Radio-iodine therapy is followed by a reduction in the size of a nodular goitre, though it does not disappear entirely (WILLIAMS et coll. 1949, ELLER et coll. 1960, VOLPE et coll. 1960). The reduction noted in some of the patients of the present series led to widening of the compressed trachea (Figs 3 and 4); in others, roentgenography demonstrated no evidence of widening,



Fig. 2. Doses of $110 + 100$ mC of ^{131}I given over 25 months: a) before therapy, b) four months after the last dose.

in spite of a considerable reduction of the goitre. There may however be a marked subjective improvement in the respiratory distress without any widening of the trachea being evident in roentgenograms (HORST et coll. 1960); even small changes in the peritracheal tissues may afford the patient relief from pressure symptoms (DENK & WINKELBAUER 1921). Moreover, many patients with large nodular goitres will be elderly and suffering from cardiovascular disease, and a feeling of improvement may to some extent be due to a reduction in the basal metabolic rate (BLUMGARTH et coll. 1948 and 1951). Roentgenography during Müller's and Valsalva's experiments in patients with enlarged thyroids demonstrate that the compressed tracheal wall is not unyielding (ZIMMERMAN 1958). On the contrary, variations in the lumen may be considerable owing to changes in the tracheal wall due to pressure from the goitre (DENK & HOFER 1918, FUCHSIG 1960). The examinations should be

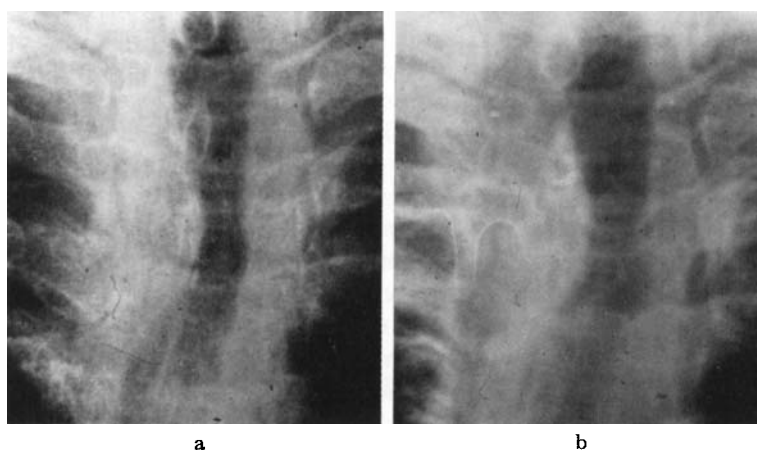


Fig. 3. Doses of $50 + 25$ mC of ^{131}I given over 15 months. Roentgenograms of soft tissues of the neck: a) before treatment, b) six months after the last dose.



Fig. 4. Single dose of 100 mC of ^{131}I . Roentgenograms of soft tissues of the neck: a) before treatment, b) seventeen months after therapy.

performed under carefully standardized conditions so that the films obtained of the trachea before and after ^{131}I therapy may be compared, and account taken of the variations in the tracheal lumen that may accompany the Müller and Valsalva maneuvers (Fig. 5). A difference of 2 mm in the tracheal width may be noted even in normal respiration, in roentgenograms in inspiration and expiration, and any compression due to a large goitre will almost invariably interfere with this physiologic variation (BRÜCKNER 1951).

The outcome for the patients of the present series proved strikingly good, in spite of the fact that the first radio-iodine treatment was given only to those in whom compression of the trachea by the goitre resulted in severe distress and surgery was ruled out on grounds of complicating conditions. There was no death from immediate sequelae though the patients were regarded as poor risks.

The indications for radio-iodine therapy in non-toxic goitre with tracheal compression have been gradually extended as a result of this favourable experience. This form of therapy has the advantage that it avoids the risk of paralysis of the recurrent laryngeal nerve and of damage to the parathyroid glands attending surgical operation. Moreover, the patient's stay in hospital and the convalescence period are shorter. Surgical treatment, on the other hand, has the advantage of providing a better cosmetic result, it is less likely that malignancy will be overlooked, and the supply of large doses of radioactive isotopes is avoided. The latter fact is especially important in young subjects.

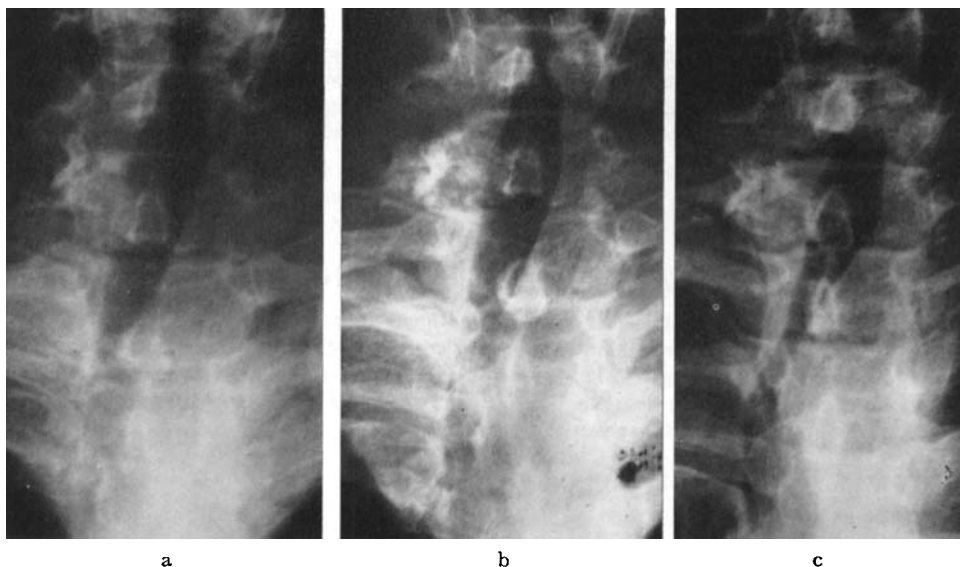


Fig. 5. Investigation one year after ^{131}I therapy. Roentgenograms: a) during normal breathing, b) during Valsalva's maneuver, c) during Müller's maneuver.

Surgery is thus the method of choice in atoxic goitre with tracheal compression although radio-iodine therapy is a good alternative that should always be considered when the patient is a bad surgical risk.

Account should be taken of the possibility of immediate complications when using large doses of radio-iodine (Table 2). Fairly severe sequelae were noted in 10 out of the 70 treatments. Patients with large goitres should therefore be kept in hospital for at least a week after the treatment; the risk of exacerbation is probably small if there is no deterioration during this period. If there is only a small margin for further deterioration, for instance where there is marked compression of the trachea, fractionated therapy should be given. These precautionary measures were observed in the present series, and the immediate complications were easily managed.

The incidence of hypothyroidism was surprisingly low, although no notice of this complication was taken during the therapy. The treatment was continued so long as there were marked pressure symptoms from the goitre, and a sufficiently high uptake of radio-iodine by the thyroid gland was recorded.

There would appear to be justification on physiologic grounds, in the absence of any contraindications, to administer thyroid hormones after radio-iodine therapy, to prevent renewed growth of the goitre. However, though this was omitted in all but 6 patients of the present series, a subsequent growth of the goitre was recorded in only one of them. This was arrested on the administration of a further dose of radio-iodine.

SUMMARY

Thirty-seven patients with large nodular non-toxic goitres and pressure symptoms received radio-iodine therapy. Thirty-two were observed for at least twelve months; 21 of these were free from symptoms and all experienced considerable improvement; only three patients developed hypothyreosis in spite of the large total doses of radio-iodine.

ZUSAMMENFASSUNG

Sieben-und-dreissig Patienten mit grossen knotigen aber nicht toxischen Kröpfen, die Drucksymptome hatten, wurden mit radio-aktivem Jod behandelt. Zwei-und-dreissig von diesen Fällen wurden für wenigstens 12 Monate überwacht; ein-und-zwanzig von diesen wurden symptomfrei, und alle zeigten deutliche Besserung. Nur drei Fälle entwickelten Hypothyreose trotz der sehr grossen Gesamtdose von radioaktivem Jod.

RÉSUMÉ

Trente-sept malades porteurs de gros goitres nodulaires non-toxiques, donnant des signes de compression ont été traités par l'iode radioactif. Trente-deux de ces malades furent suivis pendant au moins douze mois et vingt-et-un de ceux-ci ne présentaient plus de signes fonctionnels et tous les malades avaient été très améliorés; malgré l'importance des doses totales de radio-iode, trois malades seulement ont présenté une hypothyroïdie.

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