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The outcome of radioiodine therapy of hyperthyroidism: comparison of patients with a toxic nodular goiter and with Graves' disease

Hyperthyroidism is a frequent clinical syndrome which appears in about 2% of adult population. The main example of hyperthyroidism are Graves' disease and a toxic nodular goiter (1, 2). The oldest method of hyperthyroidism treatment is surgery. The progress of this modality goes back to the 19th century. The discovery and progress in employing two other modalities of therapy, antithyroid drugs and radioiodine treatment, date back to the 40s of the 20th century (1–3).

All the three modalities, used for above 60 years old patients, have not been applied in an unanimous way. The main goal of the treatment of hyperthyroidism is to reduce thyroid hyper secretion. To this end, three modalities of therapy are commonly used: antithyroid drugs, surgery and radioiodine. In the therapy for Graves' hyperthyrodism these three treatment methods are of the same significance, but the choice of one of them depends on many factors, such as: the patient's age, severity of hyperthyroidism, glandular size, presence of ophthalmopathy and other diseases, as well as on the preference of a particular medical centre and the patient's decision (1–3).

The current standard of care for a toxic nodular goitre is either radioiodine treatment or subtotal thyroidectomy. A therapy with antithyroid drugs does not bring permanent effects and hyperthyroidism relapses upon its discontinuation (4). Each of these methods has its advantages and disadvantages. Despite many other factors, the expected efficacy of treatment seems to be an essential factor which has an influence on the choice of a therapeutic method.

The aim of the study was to investigate the efficacy of the radioiodine treatment of hyperthyroidism depending on the kind of thyroid disease.

MATERIAL AND METHODS

The study population were 300 patients, aged 20–80 yr (mean 50.5), 263 females and 37 males (F:M = 7:1). The subjects comprised 150 persons with Graves' disease and 150 persons with a toxic nodular goitre, including 109 patients with a solitary nodule and 41 with a multinodular goiter. The following laboratory procedures for radioiodine therapy were employed: the measurement of thyroid hormone levels (FT4, FT3) using fluoroimmunological method (FIA) and thyreotropin levels (TSH) using immunofluorometric method (IFMA) type "Delfia"from Pharmacia LKB, the estimation of thyroid-stimulating immunoglobulin levels (TSI) using immunoradiometric method (IRMA) from BRAHMS Diagnostica GmbH, 24-h and 48-h radioiodine uptake, $^{99m}TcO_4$ thyroid scanning and USG.

A therapeutic radioiodine dose was calculated individually for each patient using Marinelli's formula. While the therapeutic dose of ^{131}I was administered to the patients they were either

hyperthyroid or subclinically hyperthyroid. During the 12-month follow-up period the thyroid function was measured every month.

RESULTS

After the follow-up period, the radioiodine therapy proved to be successful in 223 patients (74.33%). Of these patients, 173 (57.66%) were demonstrated to be euthyroid and 50 (16.6%) hypothyroid. Unsuccessful treatment of ^{131}I was noted in 77 persons (25.66%).

Among the patients with Graves' disease the withdrawal of hyperthyroidism was observed in 94 subjects (62.7%) whereas half of them were found to be euthyroid and 47 subjects were hypothyroid. Fifty-six (37.3%) patients still remained hyperthyroid.

In the whole group of 150 patients with a toxic nodular goiter the successful effect of radioiodine treatment was demonstrated in 129 persons (86%), while 21 (14%) of them still remained hyperthyroid. Among the subjects with a successful radioiodine therapy, 126 patients (84%) were euthyroid and 3 (2%) hypothyroid.

Among 109 patients with a solitary nodule the withdrawal of hyperthyroidism was observed in 93 subjects (85.3%), whereas 91 patients (83.5%) still remained euthyroid and 2 (1.8%) were hypothyroid. The remaining 16 (14.7%) patients were found to be hyperthyroid. In the sub-group of the patients with a multinodular goiter the therapy was completed successfully in 36 patients (87.8%). Thirty-five patients (85.4%) were still euthyroid, one patient (2.4%) hypothyroid and five subjects (12.2%) were hyperthyroid (Table 1).

Table 1. Efficacy of ^{131} iodine therapy in the studied groups of patients

Thyroid disorder	Number of all studied patients	Positive effect of ^{131} I therapy	Euthyreosis	Hypothyreosis	Negative effect of ^{131} I therapy
Whole studied group	300 (100%)	223 (74.3%)	173 (57.7%)	50 (16.6%)	77 (25.7%)
Graves-Basedov disease	150 (100%)	94 (62.7%)	47(31.3%)	47 (31.3%)	56 (37.4%)
Whole group with nodular goiter	150 (100%)	129 (86%)	126 (84.0%)	3 (2.0%)	21 (12.0%)
Autonomic adenoma	109 (100%)	93 (85.3%)	91(83.5)	2 (1.8)	16 (14.7%)
Multinodular goiter	41 (100%)	36 (85.3%)	35 (85.4%)	1 (2.4%)	5 (12.2%)

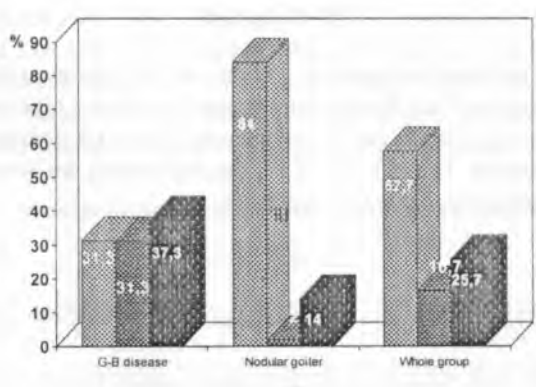

Fig. 1. The results of the radioiodine treatment of hyperthyroidism in relation to its etiology

DISCUSSION

A separate analysis of the patients' therapy related to the form of hyperthyroidism made it possible to note essential differences in the treatment results between the patients with Graves' disease and a toxic nodular goiter. The results of the successful therapy of hyperthyroidism in the group of the patients with Graves' disease in 62.7% of subjects were comparable with the results in the study by Catargi et al. (67%) (5). What is more, the percentage of the patients who remained hyperthyroid (33%) approximated the results presented in this paper. The percentage of euthyroid persons was slightly lower, although hypothyroidism frequently appeared instead. Catargi et al. (5) used the same method of the estimation of the ^{131}I dose as the one chosen for the present study.

Howarth et al. (6) showed a lower efficacy of treatment (40%). As compared to the results of the present study (hypothyroid patients 31.35%, euthyroid patients 31.35%), the cited paper (6) demonstrated that the percentage of the hypothyroid patients (17%) was lower than that of euthyroid patients (31%). A slightly higher efficacy of treatment (69.5%) was described by Allahabadia et al. (7), with a lower 15% euthyroid group. A higher level (86%) of the efficacy of ^{131}I therapy was demonstrated by Alexander (8).

A comparable degree of the efficacy of ^{131}I therapy as that manifested in our data concerning the group of the patients with a toxic nodular goiter (86%, including 84% of euthyroid patients) was found by Walter et al. (9) and Meller et al. (10) (83% and 84%, respectively). Reiners et al. (11) recapitulated a 32-year long experience of many authors with radioiodine in the therapy of thyroid autonomy, analyzing the outcomes of treatment from 1967 to 1999. On the basis of those investigations, the researchers concluded (11) that the results of radioiodine therapy for a solitary nodule are to be recognized as satisfactory if the care rate of the withdrawal of hyperthyroidism ranges between 85% and 100%, with 10–20% of patients still remaining hypothyroid. As to the outcome of the treatment of patients with a multinodular goiter and disseminated functional autonomy the efficiency ranged from 45% to 94%. Jastrzębska et al. (12) suggest that during a 12-month period of observation the radioiodine therapy should been effective in 60–70% patients with a solitary nodule, as well as with a multinodular goiter, and hypothyroid patients should constitute 10% to 20%. In the light of all those data, the efficacy of 86% (84% euthyroid and 2% hypothyroid patients) in the group with a toxic nodular goiter demonstrated in our study seems to be a very good outcome. Just as Jastrzębska et al. (12), we have not observed a difference of the results in the radioiodine treatment in the two groups: the solitary nodule and multinodular goiter ones.

CONCLUSIONS

The efficacy of radioiodine treatment and the rate of hypothyroidism were related to the etiology of hyperthyroidism. Radioiodine therapy revealed a higher degree of efficacy, with a lower rate of hypothyroidism, in the patients with toxic nodular goiter than in the ones with Graves' disease. The efficacy of ^{131}I therapy among the patients with a solitary nodule and a multinodular goiter was comparable.

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SUMMARY

Hyperthyroidism is one of frequently encountered clinical syndromes appearing in about 2% of adult population. The aim of this study was to evaluate the efficacy of radioiodine treatment in relation to the form of hyperthyroidism. The study investigated 300 patients: 150 with Graves' disease and 150 with a toxic adenoma goiter (109 with a solitary nodule and 41 with a multinodular goiter). In all the cases the estimation of FT3, FT4, TSH, TSI concentrations, radioiodine uptake and technetium – 99 m pertechnetate scans were carried out. The radioiodine dose was calculated on the basis of Marinelli's formula. After a year long observation period, 31.35% of the patients with Graves' disease were found to be euthyroid, 31.35% hypothyroid and 37.3% hyperthyroid, whereas among the patients with a toxic nodular goiter 84% were euthyroid, 2% hypothyroid, and 14% were hyperthyroid. The results of radioiodine therapy for a solitary nodule and a multinodular goiter were similar. The radioiodine therapy revealed a significantly higher efficacy with a lower rate of hypothyroidism in the therapy of a toxic nodular goiter than in Graves' disease, but its efficacy in the patients with a solitary nodule and a multinodular goiter was comparable.

Porównanie wyników leczenia radiojodem nadczynności tarczycy u chorych z wolem guzkowym i chorobą Gravesa

Nadczynność tarczycy jest często spotykanym zespołem klinicznym i dotyczy 2% dorosłej populacji. Celem pracy była ocena skuteczności leczenia radiojodem w zależności od postaci nadczynności tarczycy. Badania przeprowadzono u 300 chorych, w tym u 150 z chorobą Gravesa-Basedowa i u 150 z wolem guzkowym nadczynnym (109 z pojedynczym gruczolakiem autonomicznym i 41 z wolem wieloguzkowym). U wszystkich chorych wykonano oznaczenie stężenia FT3, FT4, TSH,

TSI, jodochwytność i scyntygrafię nadtechnecjanową tarczycy. Aktywność terapeutyczną oszacowano na podstawie formuły Marinellego. Po rocznej obserwacji stwierdzono wśród chorych z chorobą Gravesa-Basedowa eutyreozę u 31,35%, hypotyreozę u 31,35%, a hypertyreozę u 37,3%, zaś u chorych z wolem guzkowym nadczynnym eutyreozę u 84%, hypotyreozę u 2%, a hypertyreozę u 14%. Wyniki terapii radiojodem u osób z pojedynczym gruczolakiem autonomicznym i wolem wieloguzkowym były porównywalne. Terapia jodem radioaktywnym wykazuje znacznie wyższą skuteczność, przy niższym odsetku niedoczynności, w leczeniu wola guzkowego nadczynnego niż w chorobie Gravesa-Basedowa, a jej skuteczność wśród chorych z pojedynczym guzkiem autonomicznym i chorych z wolem wieloguzkowym toksycznym jest porównywalna.