CLINICAL STUDY

Increasing use of radioiodine in young people with thyrotoxicosis in Great Britain

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Abstract

Objective: Radioiodine (RI) is an important therapeutic option in young patients with thyrotoxicosis. We wanted to determine whether RI is being used more frequently in this age group.

Design: National survey of Great Britain (England, Wales and Scotland).

Methods: Sixty-one medical physics departments were asked to provide the age and number of patients with thyrotoxicosis <21 years treated with RI (1990–2008). Information on the total number of RI treatments for thyrotoxicosis was also collected.

Results: Forty-three departments (70%), with representation from 21 of the 25 most populous areas of Great Britain, provided data on 69 258 treatments. The number of treatments recorded on patients <21 years during this period was 560 (0.9%). The frequency of treatments in young people as a percentage of the total increased from 0.2% in 1990 to 1.5% in 2008 ($P < 0.001$). When the 18 centres submitting at least 17 years of data were analysed, a similar pattern was observed. The maximum number of young people treated was greatest in 2008 (62) with a fall in the youngest age at which RI was administered from 18 years (1990) to 11 years (2008).

Conclusions: A rising proportion of patients with thyrotoxicosis receiving RI are in those <21 years. This is largely due to an increase in the number of young people treated with a reduction in the minimum age at RI administration. We suspect that European clinicians are becoming more comfortable with RI treatment in young people with thyrotoxicosis, although a changing incidence is a potential contributing factor.

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Introduction

Radioiodine (RI) has an important and well-established role in the treatment of thyroid cancer in the young. However, it is increasingly being promoted as a safe and cost-effective way of treating benign thyroid disease in young people as well. Data from Europe and North America have shown that short-term side effects such as thyroid storm are uncommon following RI administration in patients with thyrotoxicosis and the low additional radiation exposure during therapy has not resulted in a measurable overall increase in long-term neoplasia, or other adverse effects, to date (1, 2). This information is of considerable potential value to paediatric endocrinologists because a 2- to 4-year course of anti-thyroid drugs will only result in remission in a minority of patients (2, 3). Although anecdotal evidence suggests that some paediatric endocrinologists in the UK now consider RI to be a safe and effective alternative to surgery in young patients with thyrotoxicosis, there is as

yet no formal strategy in Great Britain to collect longer-term data on RI usage in the young or to study any potential long-term consequences of these exposures on health. We therefore set out to survey RI usage in the young in Great Britain (England, Scotland and Wales) to determine whether there was evidence of a change in the pattern of RI prescribing in this age group.

Materials and methods

This was a survey of practice with no identifiable patient data and hence formal research ethics committee approval was not required. Sixty-one Medical Physics Departments in Great Britain were approached by letter and then by a phone call, if there was no response. Those administering RI to the young were provided with a questionnaire to complete and return in which they were asked to provide details of yearly RI administration to patients with thyrotoxicosis under the age of 21 years

Figure 1 Map of Great Britain showing the centres submitting data as part of the survey.

during the 19-year period from 1990 to 2008. They were also asked to provide details of the total number of RI treatments for thyrotoxicosis to allow an assessment of whether the rates of administration in young people had changed over time as a percentage of overall RI usage. We suspected that it was the larger centres in the most populated areas where most RI administration would occur because they contain the majority of Great Britain's tertiary paediatric and adult endocrine departments.

We therefore tried to ensure that these centres were represented in our survey. We were aware that data from the earlier years of the survey would not be as readily available and, as part of an additional analysis, elected to analyse data from centres returning information for at least the last 17 of the 19-year study period (~90% or more of the years in question) in addition to the analysis performed on all collected data.

These data were analysed by determining the correlation between year of RI administration and the percentage of RI treatments administered to young people as well as the age of the youngest person treated.

Results

Of the 61 departments contacted, 43 (70%) provided data. Figure 1 shows the location of the departments who submitted data. The majority (21 out of 25) of the most populated areas of Great Britain according to the 2001 census were represented in these 43 centres (<http://www.ons.gov.uk/ons/rel/census/census-2001-key-statistics/urban-areas-in-england-and-wales/index.html>; <http://www.gro-scotland.gov.uk> accessed June 2012). The survey commenced in 2009 and finished in 2011. The time taken to conduct the survey reflects the amount of time taken for units to respond or supply data. The reasons for units not providing data included failing to respond to correspondence or not actually administering RI treatment (the major reasons) as well as not being in a position to submit data (due to lack of resources), not having an accessible record or, finally, agreeing to submit information but then failing to do so.

There was a steady increase in the total number of treatments in the included departments during the period of the audit – from 1099 in 1990 up to a peak of 4854 in 2005. The total number of treatments fell in many of the 43 departments towards the end of the period of the survey with a 13% fall from the peak in 2005 down to a total of 4235 treatments in 2008. The 1099 treatments recorded in 1990 and 4235

Table 1 Overall use of RI compared with administration in patients under 21 years old.

Year	Total no. of treatments per annum	Total no. of treatments in patients <21 years	Patients <21 years (%)	No. of units submitting data on patients <21 years
1990	1099	2	0.2	11
1991	1562	7	0.4	13
1992	2010	12	0.6	16
1993	2323	16	0.7	17
1994	2936	18	0.6	20
1995	3168	14	0.4	20
1996	3579	12	0.3	23
1997	4103	27	0.7	28
1998	4179	30	0.7	31
1999	4257	34	0.8	31
2000	4080	37	0.9	33
2001	4324	40	0.9	33
2002	4372	40	0.9	34
2003	4345	40	0.9	35
2004	4619	39	0.8	38
2005	4854	36	0.7	39
2006	4657	50	1.0	41
2007	4556	44	1.0	42
2008	4235	62	1.5	41
Total	69 258	560

Figure 2 The number of treatments recorded on patients under 21 years during the study period (1990–2008) as a percentage of the total (continuous line) and the same percentage data in the 18 centres submitting at least 17 years of data (broken line).

treatments recorded in 2008 represent an overall 3.8-fold increase.

The number of treatments recorded on patients under 21 years during the period of study was 560 (0.8% of total). The number of young patients receiving RI treatment as a percentage of the total rose approximately sevenfold over the 19-year study period from 0.2% in 1990 to 1.5% in 2008 ($r = +0.845$, $P < 0.001$; Table 1, Fig. 2). The median age and youngest age at which RI was administered in young people under the age of 21 years was 20 and 19 years respectively in 1990 and 18 and 11 years respectively in 2008 ($r = -0.794$, $P < 0.001$; Fig. 3).

When the 18 departments submitting at least 17 years' data were analysed separately (40 949 treatments in total with 321 administered to young people under the age of 21 years), a similar increase from 0.2% in 1990 to 1.4% in 2008 was observed ($r = +0.837$, $P < 0.001$; Fig. 2). There were no missing data for these 15 centres between 1997, when 0.7% of patients treated with RI were under 21 years, and 2008 by which time the figure had risen to 1.4%.

Discussion

There are reports of RI administration to young people with thyrotoxicosis in the UK (4) and our survey suggests that this treatment modality is becoming more popular. The apparent increase in RI administration to the young has occurred at a time when reports from North America document the efficacy and safety of this treatment modality in this age group (1, 2). RI has previously appeared to be a more popular means of treating adults with benign thyroid disease in America when compared with Europe (5, 6, 7). Our data may therefore reflect the fact that health professionals involved in the care of young people with thyrotoxicosis in Great Britain are becoming more comfortable with RI therapy. This is reflected in the steady fall in the age at

which RI was administered. The fall in age at administration suggests that it is not just adult endocrinologists who are using RI more in the young but also paediatric endocrinologists.

We know that the incidence of acquired thyrotoxicosis is 0.9 per 100 000 among <15 years olds in the UK and Ireland (8), but there is little information regarding changes in the incidence of thyrotoxicosis in children and adolescents. However, a twofold increase in incidence over a 10-year period up until 1998 was reported from Hong Kong (9). We expect that virtually all treated patients had autoimmune thyroid disease with most affected by Graves' disease rather than 'Hashitoxicosis' (10). The increase in RI treatments and the increase as a percentage of the overall total (children and adults) may therefore reflect the fact that autoimmune thyroid disease is becoming more common in young people. We suspect that this is a relatively minor factor because of the magnitude of the increase and because of the reduction with time in the age of the youngest patient treated. Most young people do not require more than one RI dose (2) and so multiple administrations to the same patient are unlikely to explain the observed trends.

Thyroid cancer is an uncommon disease in the young (11, 12) but is a well-recognised indication for RI therapy. However, we were careful to stipulate 'RI therapy for thyrotoxicosis' on the circulated questionnaire and so we do not think that the inclusion of RI therapy for other indications is likely to be a major confounding factor.

It is interesting to note the reduction in overall RI administration in the latter years of the survey. The reasons for this are unclear, but recent changes in the prevalence of autoimmune thyroid disease or a change in adult endocrine practice with greater use of anti-thyroid drug or surgery are possible explanations.

A significant limitation of our survey is the fact that we do not have representation from all hospitals in Great Britain and so we cannot be absolutely certain that the trends we have observed apply to all centres. However,

Figure 3 The age of the youngest patient administered RI for thyrotoxicosis by year.

most of the major conurbations were represented in the data collected, and we believe that we have obtained data from enough centres for our observations to be relevant. The relative dearth of data in the earlier years of the audit is, according to discussions with the departments involved, primarily a reflection of inadequate records rather than units not having the facilities to administer RI. Importantly, the changing pattern of RI administration was still seen when departments submitting smaller amounts of data were excluded.

In summary, the proportion of young people receiving RI in Great Britain as a percentage of the total is increasing. The absolute number of young people receiving RI therapy appears to be increasing as well. This may reflect factors such as an increase in the number of young people with autoimmune thyroid disease (9) or the fact that physicians are now using RI more frequently in the young patient with thyrotoxicosis. There is a strong argument for the implementation of a more formal mechanism for collecting data on RI administration in young people with benign as well as malignant thyroid disease. This will help to facilitate the long-term follow-up of these patients so that more comprehensive information regarding theoretical risks can be gathered. Whether the identified trend reflects changes in practice in Europe as a whole needs to be established.

Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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Author contribution statement

N Turner and I Driver were involved in study design and contacted units, collected data, constructed the database and checked the manuscript. J A Salotti and M S Pearce provided advice during the analysis and helped prepare and check the manuscript. T Cheetham designed the study, undertook the analysis and wrote the manuscript.

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