OBJECTIVE VERSUS SUBJECTIVE MEASUREMENT OF THYROID VOLUME BY ULTRASOUND IN INFANTS REFERRED WITH TSH ELEVATION ON NEWBORN SCREENING

Chourouk Mansour, Yasmine Ouarzazi, Jeremy Jones, Morag Attie, Emily Stenhouse, Greg Irwin, Joachim Pohlenz, Malcolm Donaldson

University of Edinburgh

Mother and Child Health EPSH/BARAKI, Algiers, Algeria

Department of Radiology, Royal Hospital for Sick Children, Glasgow, UK

Department of Radiology, Royal Hospital for Sick Children, Glasgow, UK.

Universitas-Kinderklinik, Mainz, Germany

Section of Child Health, Glasgow University School of Medicine, Glasgow, UK.

INTRODUCTION

Thyroid imaging by ultrasound, scintigraphy, or both is an integral part of the assessment of infants referred with elevation of thyroid stimulating hormone (TSH) on newborn screening.

Assessing thyroid size when the gland is ectopic is important since:

An enlarged gland suggests either iodine deficiency or dysmorphogenesis due to example to a thyroglobulin (Tg) defect.

The finding of a hypoplastic gland is an indication to rule out a PAXS or a TSH receptor mutation.

But what constitutes a small, normal or large gland (see Figure 1)? Should the evaluation be made by a subjective assessment by the radiologist or radiographer, or by objective measurement compared with normative data, or both?

AIMS OF STUDY

To compare intra-observer variation in the objective (Om) measurement of thyroid volume (v) by ultrasound (US) and to examine the correlation between subjective (Sx) and Om assessment.

METHODS

OBJECTIVE MEASUREMENT (OM)

Images were reviewed for 65 children scanned 2007-2013. Of these, 23 were excluded (4 found to have thyroid dysgenesis, images unavailable in 19 leaving 42 for analysis).

To prior the study the diagnoses, based on clinical, biochemical, radiological and molecular genetic analysis was:

Congenital hypothyroidism due to hypoplasia in infants in 4 patients (2 with hebrocytosis and 1 with hypothyroid TSH-R mutation, one with Down’s syndrome and PAXS-8 mutation).

Congenital hypothyroidism due to dysmorphogenesis in 15 with proven mutation in 5 (2 with Tg. 2 with TPO and 1 with DUOX2 defect).

Transient hypothyroidism in 13 (including 1 with Down and 1 with Turner syndrome).

Status uncertain in 9 (including 3 with Down’s syndrome).

RESULTS

Table 1 shows the intra-observer variation in OM measurement of thyroid volume. Differences were small after excluding two patients with large glands in whom thyroid length was more than 34 mm. Figure 2 shows one of these infants in whom the thyroid is very large, and in whom the gland length had to be estimated by extrapolation.

Table 2 shows the correlation between subjective and objective assessment.

Table 3 shows a comparison with normative data.

Table 4 shows the correlation with normative data.

DISCUSSION

Subjective assessment of thyroid size on ultrasound in infants referred with TSH elevation on newborn screening may be grossly misleading, with a tendency to overestimate volume and hence to overdiagnose thyroid dysmorphogenesis.

The impression of large size in a normal or small gland may relate to the shape of the ventral margin of the gland which normally has three distinct (usually convex) curves to the gland margin (see Figure 3). If the gland shape changes to show a single curved ventral margin (see Figure 1) it looks “enlarged” gland.

Thyroïd volume is relatively small in the infants with transient TSH elevation, which is less than that seen in other countries such as Poland.

The current formula method of calculating thyroid volume by taking each lobe as a prolate ellipsoid and ignoring the isthmus will underestimate thyroid volume when thyroid shape is altered and when the isthmus is enlarged (as in dysmorphogenesis).

For assessing thyroid volume are needed.

The accuracy of subjective assessment of thyroid volume may be improved.

Subjective assessment of thyroid size on ultrasound in infants with TSH elevation on newborn screening volume may grossly overestimate true size and should always be carried out in conjunction with objective measurement.

CONCLUSIONS

Table 1 shows intraobserver differences in Om assessment of thyroid size.

Table 2 shows a comparison with normative data.

Table 3 shows a comparison with normative data.

Table 4 shows a comparison with normative data.

REFERENCES

