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Re: Decreased Salivary Gland Accumulation of Pertechnetate in Neonatal Hypothyroidism

From the study of ten newborn infants suffering from congenital hypothyroidism, Spencer et al. (*1*) indicate that some type of salivary gland immaturity explains the lack of pertechnetate concentration. We believe that several other causes could account for the absence of salivary gland images obtained with pertechnetate or I-123, both tracers used commonly nowadays for the thyroid investigation of the newborn.

1: When no apparent thyroid or salivary uptake is observed, it may indicate an athyreosis or may be due to a congenital lack of iodide transport and/or related anions. The latter, described by Stanbury and Chapman as early as 1960 (*2*), was studied completely by Wolff et al. in 1964 (*3*). From these works it is possible to state that this congenital defect is present when the lack of concentration of the tracer by the gastric glands does not concentrate the tracer. We have investigated two such patients, and we presented our preliminary data on this lack of active transport in 1977.* (A complete publication of our two cases has been postponed to evaluate the subsequent course.) From our experience we found that it is possible generally to visualize the gastric glands in a newborn infant (Fig. 1) whether an iodine excess is present or whether a substitution therapy has already been instituted.

2: In a newborn the geometry of the head and of the neck, as well as the local variations of the volume of the soft tissues "seen" by the scintillation camera, render problematic the interpretation of an image, especially when a pinhole collimator is used. It is well always to verify the gastric concentration of the tracer.

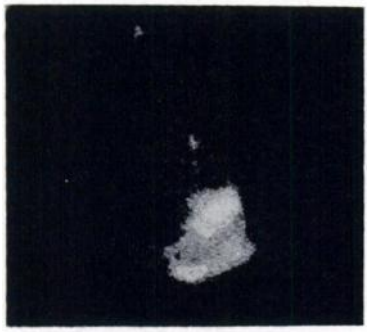

FIG. 1. Athyreosis. Lack of thyroid and salivary gland visualization by ^{123}I contrasts with clearly demonstrable transport of tracer by gastric glands.

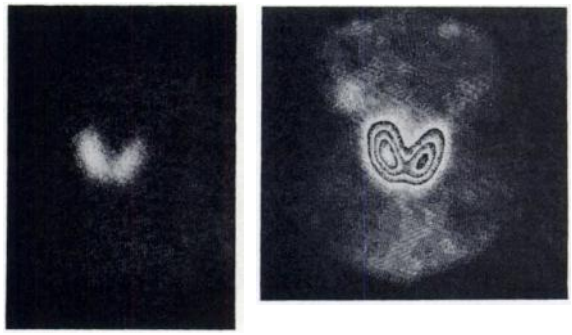

FIG. 2. Left: High thyroid uptake blurs visualization of salivary glands (untreated image). Right: Treated image. Enhanced contrast in zones of low activity reveals presence of salivary glands.

3: Assuming that in a particular hypothyroid case the thyroid uptake of the tracer is unusually high, whether due to a thyroid congenital defect or to an acquired block of the iodide organification by pharmacologic doses of iodide (*4*), technical considerations can explain the nonvisualization of the salivary glands. Since the raw data is now usually digitized, the salivary glands can be visualized often in difficult situations (Fig. 2).

4: The salivary glands in the newborn are so likely to concentrate the TcO_4 ion that tiny ectopic thyroid glands are quite often overlooked, masked by the salivary and oral radioactivity (Fig. 3). On the other hand I-123, normally organified by the ectopic tissue whether small or large, accumulates in this gland. In our experience, these ectopic glands can be detected with I-123 after some time, and by means of data processing the contrast between the thyroid and the salivary glands becomes obvious (Fig. 3).

Finally, with regard to speculation about the immaturity of the salivary glands, the correct gestational age of these newborns should be considered.

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FOOTNOTE

* SAVOIE JC, LEGER AF, DOUMITH R, COURPOTIN C: Complete lack of active transport of iodide in congenital hypothyroidism. Two unrelated cases. 8th European Thyroid Association Meeting, Poster Session II, Lyon (France), 1977.

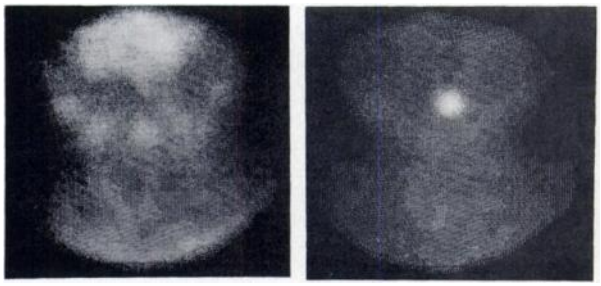

FIG. 3. $^{99m}TcO_4^-$. Thyroid lingual ectopia is hardly detectable within complex images of salivary and oral concentrations (left). Same ectopia, investigated with ^{123}I, is clearly detected when salivary background is removed (right).

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Reply

Our communication was based on observations of pertechnetate accumulation. We will try to answer their points in order.

1: Each of the infants did have gastric imaging; all showed gastric concentration after pertechnetate administration.

2: Multiple views were taken in all cases but two. In none of the images with pinhole collimator could the salivary glands be clearly defined within a reasonable imaging time.

3: Digitization of data can often be advantageous; however, there was failure to visualize the salivary glands whether the thyroid gland was prominent or absent.

4: If Drs. Savoie and Leger have data on the differential handling of pertechnetate and iodide by the salivary glands in neonates, publication of the information would be welcome.

5: None of the children studied were the product of markedly premature birth.

We look forward to the publication of data by Drs. Savoie and Leger on congenital lack of iodide transport.

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Re: Standards for Performance Measurements in Scintillation Cameras (*1*)

NEMA is to be congratulated for their effort in standardizing factory performance parameters. This will provide better appreciation of specifications. Insofar as these measurements will reflect a part of factory quality control, their value is very clear.

Unfortunately, performance of these tests at the user's site is constrained by several factors. Multichannel analyzers and computers are not too common in nuclear medical facilities. It is even rarer to find a camera with easily accessible connections for the multichannel analyzer.

Acceptance testing is a different matter. Spatial, temporal, and perception perspectives are all involved. Factory and user's site are separated in space and time, and one must question whether the ravages of time and travel have affected performance.

The perceptive perspective is nonquantitative. This is the user's expectations: to wit, does the unit produce images that can be clinically interpreted.

While the existence of standards is admirable and desirable, it is obvious that manufacturer's quality control extends far beyond these important but few parameters. Similarly, acceptance testing is much more than verifying manufacturer's specifications. All pertinent functions of camera and accessories must be tested.

On quality control, I am certain that all of the authors of the various schemata would agree that their protocols are guidelines and not a total system. It is essential that the testing program be actively pursued and the need for procedure variance be understood in post-facto evaluation of unexpected findings in clinical studies.

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REFERENCE

1. MUEHLLEHNER G, WAKE RH, SANO R: Standards for performance measurements in scintillation cameras. *J. Nucl Med* 22:72-77, 1981

Reply

For many years most reporting of scintillation camera parameters has been through pictures, and Dr. Hidalgo is correct in stating that ultimately the user wants clinically acceptable images. Quality control should provide quantitative measures of whatever the user expects to see nonquantitatively in the images. There is a particularly difficult problem in specifying flood-field uniformity, as we pointed out in our publication (*1*). However, because a task is difficult or may require certain equipment should not be a reason to give up and go back to acceptable pictures.

NEMA used the approach that the *standard* should be as accurate as possible, hence the requirement for a multichannel analyzer in performing the measurement. *Verification* of performance in the form of acceptance testing may well involve less accurate measurements as long as the sources of error are understood. For example, in a camera with a diameter of 400 mm and a spatial resolution of 4 mm FWHM, 1000 samples are necessary before sampling errors can be ignored in measuring spatial resolution. However, resolution may be measured in a 256 × 256 matrix, and the resulting value can be adjusted to compensate for the sampling error inherent in only 256 samples.

Nuclear medicine departments that do not have a digital imaging system and also do not have access to a multichannel analyzer can engage the services of a consulting physicist. Lewellen et al. (*2*) described a portable acquisition system that is capable of performing the measurements suggested in the NEMA standards even though the use of a one-parameter multichannel analyzer lengthens the time necessary to perform the measurements.

It should be stressed that such quantitative, time-consuming measurements are not necessary for routine quality control. For comparative specifications and for acceptance testing, however, the use of standardized and quantitative performance measurements is highly recommended.

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