Determination of Immunoreactive Insulin with Immunoassay Kits

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Some problems on the radioimmunoassay procedure for estimating the serum insulin were discussed in this paper by using two kind of kits; the one was obtained from Radiochemical Center (RCC) and the other from Dainabot Radioisotope Lab. (Dainabot).

When the procedure was made according to the indication, no difference was observed between both kits in the sensitivity (1 μ/ml in the concentrations below 100 μ/ml), reproducibility, variation through estimating the same sample (within 10% in the concentration of 100 μ/ml), recovery test (93%), or dilution test. Although microfiltration and centrifugation were indicated by RCC and Dainabot respectively as the method for separating insulin bound with antibody from free insulin, it was possible to switch the procedure each other for the estimation of serum insulin. However, employing microfiltration the estimated value was hihger as compared to that with centrifugation, therefore higher value was obtained in the kit from RCC as compared to that from Dainabot in case that same sample was estimated according to their indications. Haemolysis or repeated freeze and thawing of serum lowered the estimated value. The value estimated was higher in the heparinized plasma (100 μ/ml blood) as compared to that serum. Althouh not only the time required for process was longer but pipetting was frequent in the kit from Dainabot, the centrifugation for separation was simple comparing to microfiltration in the kit from RCC. It was necessary to examine not to defreeze the antibody of the kit from Dainabot during mailing or preserving. Economically, the kit from Dainabot was cheeper than the other.

From these results, it is sufficiently possible to use both kits for estimating the serum insulin, however, as they have advantages and disadvantages in the procedure, stability of antibody, or economy, the selection of the kits might be made considering the conditions or equipments of the laboratory.

Symposium VI. Diagnosis of Malignant Tumors

(Chairman) T. Miyagawa, Univ. of Tokyo

Techniques and Information Analysis

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On the diagnosis of the malignant tumors by using radioisotope techniques, the scintigram procedures are supposed to be the best way at present. In this technique, the two opposit mechanisms are applied on the diagnosis of the morphological changes by malignant tumors. One of them is on the positive DEPOSIT technique according to the nature

of the special radioisotope compounds which are selectively gathered to the region of malignant tumor itself in the organ and the other is to find the negative DEFECT where the radioisotope deposit is less than that of surrounding normal tissue of the organ. The representative cases of the former technique are limited and they are ^{131}I deposit on the metastatic thyroid cancers, ^{99m}Tc on the brain tumors and ^{85}Sr, ^{87m}Sr and ^{18}F on the bone tumors. Some investigaters report the ability of other special compounds just as ferments or tumor seekers which are gathered to the malignant tumor selectively, but presently these are very rare cases and not popular. On the other hands, most of the organs in the body are reported and used by various radioisotopes to find the defects.

Concerning the capacity to detect the tumor, the deposit method is superior than that of the defect method and this is confirmed by the scintigrams by paper phantom with three defects whose diameters are 0.5, 1 and 2 cm and three positive deposits of the same diameter on the opposite side. This phantom is demonstrated with various density of dot changing the exposure time also with the various level of back ground density.

Recently the capacity to determine the nature of the tumors is also offered not only to detect the tumors in the body, this means to determine the malignant tumor or the benign. For this purpose the thyroid scintigram is analysed using computer calculation because the thyroid scintigram is the most frequent study in our department.

About 4,000 scintigrams are analysed and about one tenth of them are selected for the analysis after the severe consideration, they are limited to nodular goitor cases and consisted of 133 cases of malignant tumors, 136 of benign tumors and 67 of chronic inflammations. After analysis of these cases on the point of sex, age, uptake, laboratory data and scintigram findings, the pattern of the scintigram(x), the position of the defect in the glands(u), the continuity between the defect and normal tissue(v) and the form of the defect(w) are selected for the calculation because they show the significant differences among the diseases(y). Every scintigrams are calculated their probability of each disease according to the Bayer's rule as followings.

$$Pyi\,(xj,\ uk,\ vm,\ wn) = \frac{Pyi \cdot Pxj/yi \cdot Puk/yi \cdot Pvm/yi \cdot Pwn/yi}{\sum_i Pyi/Pxj/yi \cdot Puk/yi \cdot Pvm/yi \cdot Pwn/yi}$$

For instance, the probability of a scintigram which has a small defect(x2) in the middle of the left lobe(u1) and the border of the defect is not clear (v2) and the type of the defect is concave (w2) is calculated as followings.

$$Py1\,(x2,\ u1,\ v2,\ w2) = \frac{.396 \times .173 \times .382 \times .474 \times .164}{.396 \times .173 \times .382 \times .474 \times .164 + .405 \times .250 \times .260 \times .600 \times .546 + .199 \times .194 \times .268 \times .800 \times .353} = 0.13$$

$$Py2\,(x2,\ u1,\ v2,\ w2) = 0.57$$

$$Py3\,(x2,\ u1,\ v2,\ w2) = 0.30$$

From these data the scintigram of this case is supposed to represent the benign nodule(y2). By this method another series of 53 thyroid scintigrams received from Chiba University Hospital are analysed.

As the result, when the maximum probability is simply selected for the diagnosis, the accuracy is over than 60% which is superior than the result of radiologist whose experience is under two years. When the result of calculation is selected over than 70% as a calculated probability for the correct diagnosis, the accuracy is elevated over than 70%.

In this calculation, several selected factors are only used for the procedure, but the results may be more accurate when the whole factors concerning the patient are calculated.

Of course we do not emphasize that the calculated data always overcome the results of experienced clinicians, but this method suggests the ability of accurate diagnosis on thyroid diseases by scintigrams.

Now we are suggesting the liver diagnosis using scintigrams because this is the secondly popular scintigram study in our department.