

MEASUREMENTS OF THE EFFECT OF "THYROID BLOCKING" IN PATIENTS INVESTIGATED WITH ^{125}I -FIBRINOGEN

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The diagnosis of venous thromboses with around 4 MBq of ^{125}I -labelled fibrinogen is today a routine nuclear medicine investigation. At the degradation of the ^{125}I -fibrinogen, $^{125}\text{I}^-$ is released and is available for thyroid uptake. The biological halflife of fibrinogen is around 4 days. To reduce the uptake of $^{125}\text{I}^-$ in the thyroid stable iodine is given.

At Swedish hospitals the patients normally receive 100-300 mg KI per os daily for 1-2 weeks. The aim of the present work is to study the effect of such a blocking regime on the ^{125}I uptake in the thyroid.

MATERIAL AND METHODS

The measurements were carried out on 25 female patients over 50 years of age, who were given ^{125}I -fibrinogen for thrombosis detection in connection with gynecological surgery. The patients were given 300 mg KI daily mostly in 10-12 days after the injection of ^{125}I -fibrinogen. The first tablet of KI was given 1 h before injection.

The measurements of the ^{125}I content in the thyroid were made by means of a 124 mm (diam) x 1.5 mm NaI(Tl)-detector placed in the Malmö low background iron room. The detector was fitted with a brass collimator (100 mm length, 100 mm diameter) which was centered to the neck between jugulum and larynx with a neck-to-collimator distance of 10-20 mm. All patients were measured 9-12 days after the injection. At this time 80-90% of the ^{125}I was released from the fibrinogen.

The activity remaining in the plasma and tissue was found to give a background countrate over the neck which was 4-5 times higher than the countrate caused by the activity in the thyroid itself. This makes it imperative that the background correction is accurate.

An individual determination of this background was made for 14 patients by means of additional measurements over the arm and over the heart during the first two days. At this time the circulating activity almost completely makes up the countrate over the neck and therefore the relation between the countrate from circulating activity over the arm, the heart and the neck can be determined. The background on day 9-10 was then calculated by this relation from measurements over the arm and the heart on the actual day. The value of the background became somewhat different depending upon whether it was based on the arm or the heart measurements. The mean difference was 6%.

The reason is the difference in proportions of blood and tissue within the field of view of the detector. In the results the mean value of the two measurements was used.

For the group of patients who were measured only on day 9-12 the subtraction of the background was made by means of a mean value of the relation calculated from the 14 patients. This value was:
(neck countrate/arm countrate) = 3.5 ± 0.4 . The uptake was measured a

second time on 13 patients, 38-59 days after the injection of ^{125}I -fibrinogen. At that time the background activity was negligible.

The data of countrates were transformed into activity in the thyroid by means of calibration with an IAEA standard neck phantom. Because of the great attenuation coefficient in tissue for the ^{125}I -photons, this calibration is not very accurate for individual patients. An accurate way to determine the activity of ^{125}I is to use the summation peak in the pulse height distribution (1). This could be done on the 10 patients who were measured day 38-59 when the background was negligible.

RESULTS AND DISCUSSION

For the 14 patients for whom an individual background subtraction was carried out the uptake of ^{125}I in the thyroid on day 9-12 is given in figure 1 as a fraction of the total injected ^{125}I activity.

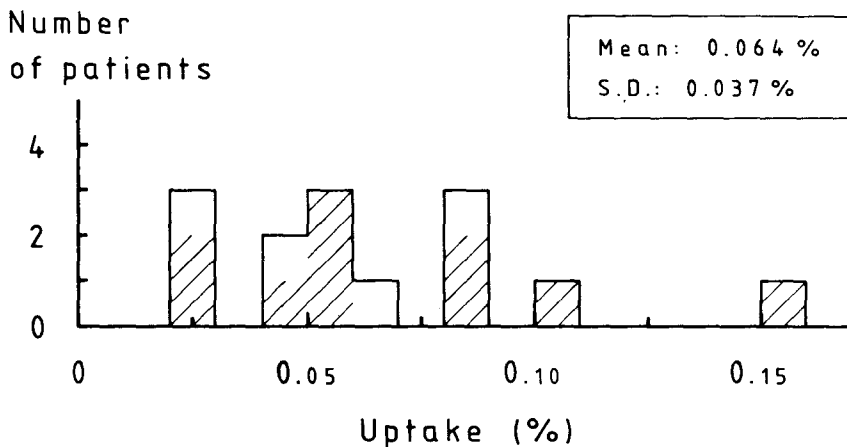


Figure 1. The content of ^{125}I in the thyroid on day 9-12 as a fraction of injected ^{125}I activity. The shadowed areas indicate uptake values calculated with the sum coincident method. The uncertainty due to counting statistics was $\pm 5\%$ (S.D.).

The mean value was found to be 0.06% with a standard error of 0.01%. If the 11 patients for whom no individual background subtraction was made is included in the result the thyroid uptake was 0.07%. Thus the blocking regime used reduces the thyroid uptake by a factor of around 200.

It is of special interest to follow the ^{125}I content in the thyroid after the cessation of the blocking the ^{125}I activity in the thyroid of the 13 patients measured between day 38 and 59 after the ^{125}I -fibrinogen injection is given in figure 2. The mean value of the uptake was 0.5% with a standard error of 0.1%. This is around a

factor of 10 higher than at the end of the blocking. This means that after the withdrawal of the KI about 3% of the available $^{125}\text{I}^-$ has been taken up by the thyroid.

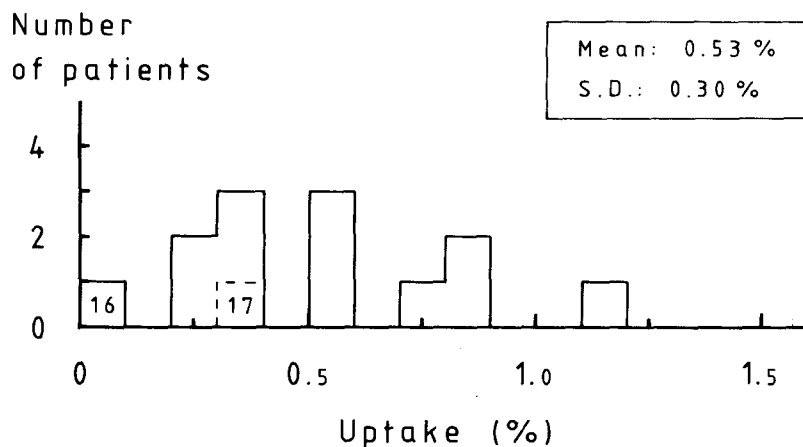


Figure 2. The content of $^{125}\text{I}^-$ in the thyroid on day 38-59 as a fraction of injected ^{125}I activity. The cessation of blocking was made on day 10-12 for 12 patients and on day 16 and 17 for two patients.

Two of the patients with low uptake values have got 300 mg KI daily for 16 and 17 days respectively instead of 10-12 days after injection.

SUMMARY AND CONCLUSION

A thyroid blocking using 300 mg KI daily for 10-12 days after injection of ^{125}I -fibrinogen gives a very efficient reduction of the thyroid uptake.

After cessation of the blocking the uptake increases. Studies of the effect of longer blocking periods with smaller daily amounts of KI are in progress.

REFERENCES

1. Harper, P.H., Siemens, W.D., Lathrop, K.A., and Endlich, H. (1963): J. Nucl. Med. 4, 277.