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PUBLICAÇÃO IEA N.º 137

Fevereiro — 1967

INSTITUTO DE ENERGIA ATÔMICA
Caixa Postal 11049 (Pinheiros)
CIDADE UNIVERSITÁRIA "ARMANDO DE SALLES OLIVEIRA"
SÃO PAULO — BRASIL

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Arq. bras. Endocrin. Metab., 15(1):55-62
Abril, 1966. *Rio de Janeiro, Guanabara*

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RESUMO

Os tempos correspondentes às diferentes fases do reflexo de Achilles, foram registradas e medidas em 80 eutoreoidianos, 60 hipertireoidianos e em 28 hipotireoidianos.

Os valôres médios, os desvios padrão e as variançcas de cada parâmetro para cada grupo são apresentadas. A análise dos dados sugere a utilização do tempo de percussão-meio relaxamento como o mais discriminativo para fins diagnósticos.

Os AA. concluem ser a medida dêste tempo um parâmetro adequado para a triagem de tireopatas. Recomendam nesse sentido o método pela sua exequibilidade, rapidez e custo baixo.

SUMMARY

The times corresponding to the different phases of the Achilles tendon reflex were measured in 80 euthyroid, 60 hyperthyroid and 28 hypothyroid patients.

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Mean values, standard deviations and variances are presented for each diagnostic group. The analysis of the presented data lead the authors to suggest the tap half relaxation time as best representing thyroid status.

Achilles tendon reflex can be considered as an adequate screening test for thyroid disorders. It is particularly suitable for this purpose as it can be performed very easily, quickly and inexpensively.

INTRODUCTION

The limitations of the routine thyroid function tests, namely, basal metabolic rate and serum cholesterol determinations, point to the need for a simple, reliable and discriminative proof reflecting the peripheral effects of the thyroid hormones. Special interest has arisen concerning the response time of the Achilles tendon reflex as one such measurable parameter. This technique was first tried by ORD (1) in 1884, and since then by CHANEY (2), MUSSIO FOUNIER (3), HARREL and DANIEL (4), LAMBERT et al. (5, 6), LAWSON (7), GILSON (8) among others.

In cases of hypothyroidism the reflex time was longer than the response elicited in hyperthyroidism. A prolonged reflex time would be characteristic of hypothyroidism and a short one should be found frequently in hyperthyroidism. In view of the practical interest and the simplicity of this determination, it was decided to make a critical evaluation of the usefulness of Achilles tendon reflex duration time in patients with thyroid disease.

MATERIAL AND METHODS

168 patients of both sexes were studied. They were grouped as follows: 80 euthyroid, 60 hyperthyroid and 28 hypothyroid subjects. The classification was based on clinical laboratory criteria including determinations of basal metabolic rate, serum cholesterol, protein bound iodine, 2 and 24 hour radioiodine thyroid uptake and thyroid scan.

The device introduce by MOULOPOULOS et al. (9) was adopted to record the duration of the reflex reponse. This technique was preferred for the initian part of this study, on account of its simplicity and the easy with which it can be improvised in any service where a standard electrocardiograph is available. (Fig. 1 shows a schematic representation of the recording device).

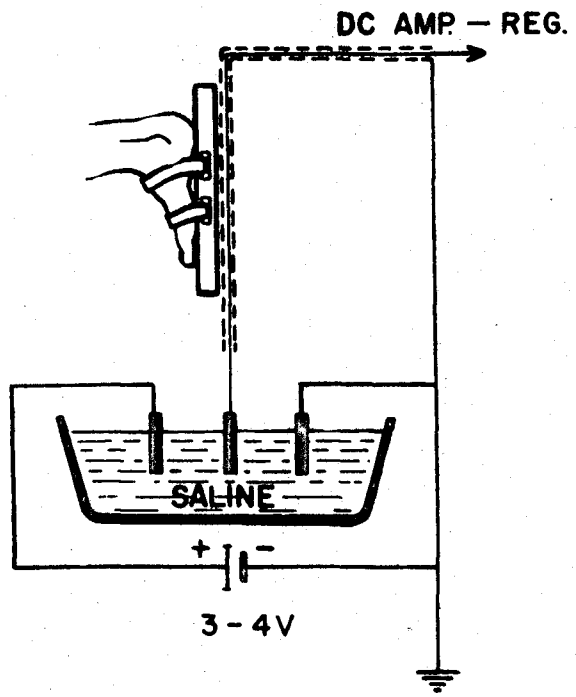

Fig. 1 — Schematic representation of the recording device used.

The patient kneels on a chair or lies prone on a stretcher with one foct outside the suport surface. One coaxial-wire electrode is fixed by means of an elastic band to the sole of the foot ("Moving Electrode"). It moves forward during the reflex contraction of the calf muscle. The lower end of the electrode dips into a Pyrex glass tub filled with saline. Two

broad surfaced electrodes are separated aproximately 15 cm from each other and immersed in the saline solution; they have fixed positions and are connected to the poles of a dry cell battery (4, 5). The negative pole is connected to the shield of the moving electrode and grounded. The active moving electrode is connected to the input of the DC amplifier of a standard electrocardiograph.

When the reflex is elicited by tapping the Achilles tendon, the foot oscilates and carries the moving electrode with it. Thus, the moving electrode varies its relative position in the electric field between the fixed electrodes, and a potential difference is recorded by the inscribing galvanometer of the electrocardiograph.

RESULTS

Figure 2 shows a recorded graph of the reflex response. Four different times corresponding to segments AB, BC, CD

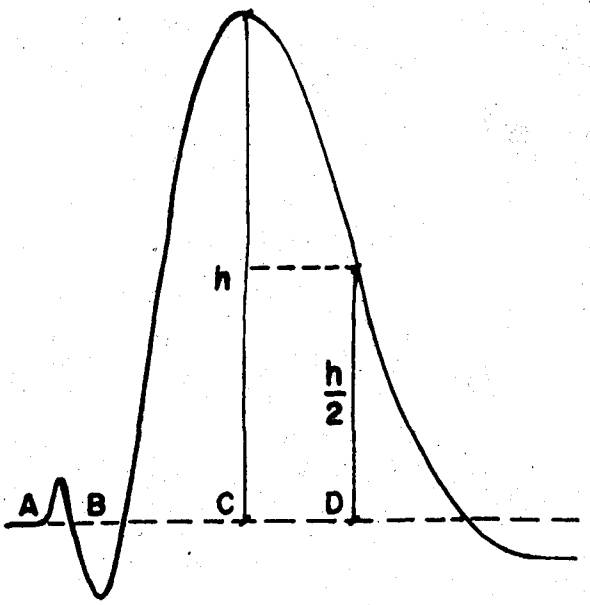

Fig. 2 — Schematic recorded graph. Times AB, BC, CD and AD are shown.

and AD can be considered. Segment AB represents the conduction time of the stimulus. The recorded potential variation corresponds to the jarring of the foot by the tendon tap. Segment BC measures the time from the onset to the maximum contraction of the calf muscle. The maximum value (in millivolts) depends partly upon the gain of the amplifier as well as upon the intensity of the tapping force. Time BC is

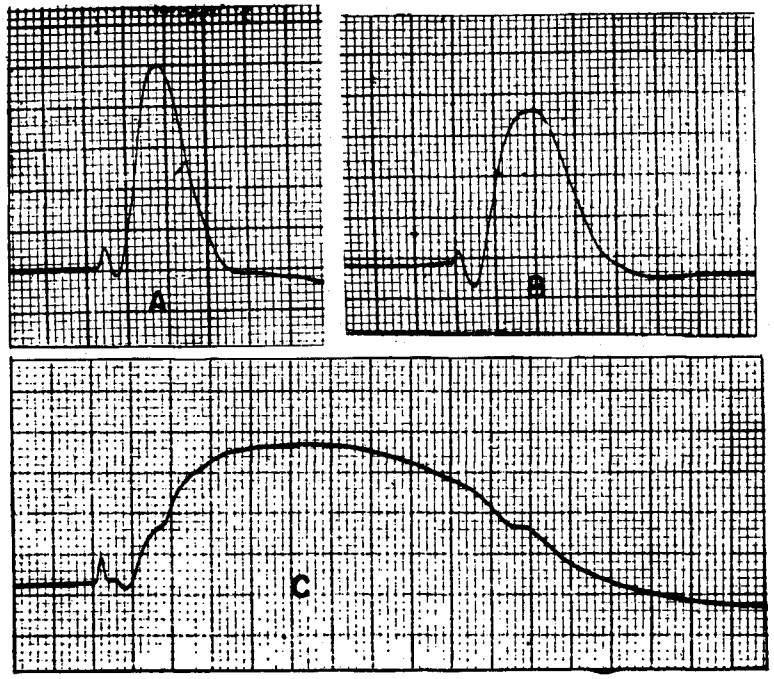

Fig. 3 — Achilles reflex graphs — A: hyperthyroid, B: euthyroid and C hypothyroid responses.

referred to as contraction time. The relaxation phase begins at C, however, the end is unclearly defined due to its asymptotic character. For quantitative determinations, point D was arbitrarily fixed and corresponds to half of the maximal recorded deflaction. Time AD is defined as tap half-relaxation time.

Six to ten reflexes were recorded for each patient. AB,

BC, CD and AD were measured and expressed in milliseconds. The mean value of 4 to 6 measurements was considered representative of the duration of the different reflex plases. Reflexes elicited bilaterally and at several day intervals were consistent and reproducible. The reflex was not elicited immediately in a few cases of the series. However, a response was obtained on subsequent days.

Figure 3 shows three typical graphs recorded in hyperthyroid (A), euthyroid (B) and hypothyroid (C) patients. Time AB was constant in the three groups, e.g. euthyroid 50 ± 7.8; hyperthyroid 50 ± 7.7 and hypothyroid 49 ± 8.9 (mean ± S.D.).

PHASE RECORDED	HYPERTHYROID	EUTHYROID	HYPOTHYROID
TAP—HALF RELAXATION A D	$\bar{X}$ = 222 σ = 18 σ^2 = 332 E% = 8,1	$\bar{X}$ = 293 σ = 21 σ^2 = 439 E% = 7,1	$\bar{X}$ = 507 σ = 62 σ^2 = 3867 E% = 12,2
CONTRACTION B C	$\bar{X}$ = 98 σ = 13 σ^2 = 177 E% = 13,2	$\bar{X}$ = 120 σ = 19 σ^2 = 353 E% = 15,8	$\bar{X}$ = 218 σ = 22 σ^2 = 489 E% = 10,1
HALF RELAXATION C D	$\bar{X}$ = 77 σ = 16 σ^2 = 253 E% = 20,8	$\bar{X}$ = 122 σ = 19 σ^2 = 344 E% = 15,6	$\bar{X}$ = 227 σ = 53 σ^2 = 2806 E% = 23,3

Table I — AD, BC and CD mean values, standard deviations, variances and percent error for each diagnostic group.

Table I summarizes AD, BC and CD mean values, as well as the standard deviations, the variances and the percent error for each diagnostic group. For each measurement, we have compared the overlapping of the values ranging from ± 2 SD to the mean (Fig. 4), in order to obtain data relative to the diagnostic error in the three groups. In the AD series, only 10% of the hyperthyroid patients cannot be correctly clas-

sified. None of the hypothyroid subjects overlaps the two other groups. In the BC series, 80% of the hyperthyroids overlap those in the euthyroid group, but the hypothyroids are still completey separated from the other groups. Regarding CD time, there is an error of 40% in the hyperthyroid group and of 18% in the group of hypothyroid patients.

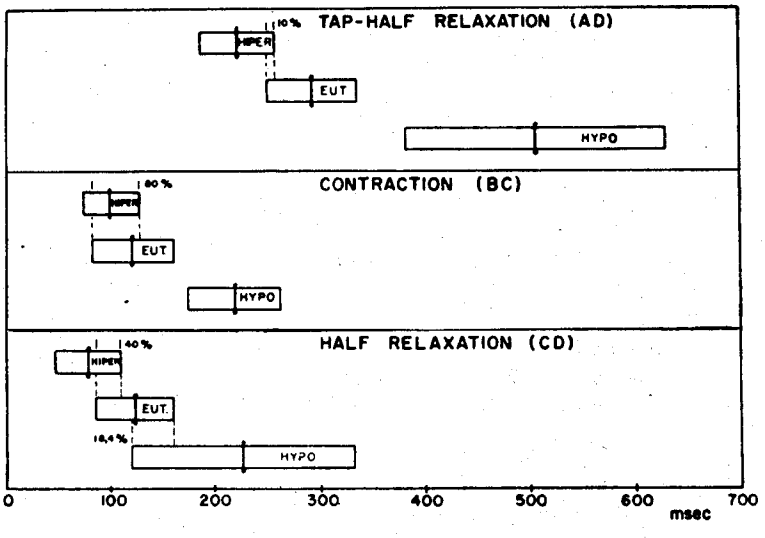

Fig. 4 — Mean ± 2 S.D. each diagnostic group, with percent values of the overlap areas.

DISCUSSION AND CONCLUSIONS

From the analysis of the presented data we can conclude that the value which best reflects the status of the thyroid is the tap half-relaxation time, AD, since its standard deviations, variances, percent errors and diagnostic errors are smaller than in any other series.

The discrepancy of the presented results from those suggesting the relaxation time (NUTTAL (10) and others) or from those that recommend the contraction time (RIVES et al. (11), LAWSON), are probably related to different techniques utilized

(electric field, magnetic field, photcelectric cell, etc.). Our results agree well with those of LAMBERT et al. (5). The techinique used by these authors is basically the same one utilized in this study, although differences exist in the experimental arrangement.

We can conclude that the Achilles tendon reflex, measured as the tap half-relaxation time is an adequate screening test for thyroid patients. It is particularly appropriate, for this purpose as it can be performed very easily, quickly and is inexpensive.

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