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# CYTOGENETICAL AND DERMATOGLYPHIC STUDIES IN PATIENTS AFFECTED BY STEINERT'S MYOTONIC DYSTROPHY

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Steinert's myotonic dystrophy is caracterized by the presence of myotonic phenomena in the intrinsic muscles of the hand, in the flexors of the fingers, and in the masticatory and tongue muscles; by atrophy of the face muscles, presence of cataracts, front baldness and testicular atrophy (Klein, 1958 [7], Becker, 1968 [2]; Allen & Paulson, 1970 [1]).

Since chromosomal studies made by different authors have not brought consistent results in what concerns one determined chromosomal aberration, we deemed it interesting to investigate their problem, so as to compare results with those obtained by Fitzgerald & Caughey (1962)[5] and Mutton & Gross (1965)[10]. The former found a mosaic of normal cells and cells with one excess G chromosome in six out of the seven patients they studied; the latter authors found chromosomal aberration in five out of the twelve patients they studied: a woman with a short arm delection in a chromosome of the G group and one other showing a mosaic of the 46, XX/45, X type; the other patients, all males, showed a high frequency of chromatidic an isochromatidic gaps, as well as chromosomal breaks. Abnormalities detected by Cecchini *et al.* (1970)[3] in two of the patients were not significant.

## MATERIAL AND METHODS

Ten patients affected by Steinert's myotonic dystrophy and ten normal controls of the same age and sex were studied. In both groups karyotypes and dermatoglyphies were studied. The patients were all cases from Hospital das Clínicas de São Paulo and the Hospital do Servidor Municipal de São Paulo.

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Diagnosis was made with basis on clinical examination, evidence of cataracts through study with the groove lamp and electromyography. Chromosomal analysis was made from a lymphocyte culture, following the technique of Moorhead et al (1960)[9], as modified by Kasahara (1973)[6]. Culture of patients and controls was made on the same day. Fifty cells of each individual were analysed and this analysis was done by blind test.

## RESULTS

In table 1 the frequency of aneuploidy in ten affected persons is shown. In table 2, data referring to aneuploidies in the ten controls is shown. Table 3 shows data referring to the frequency in chromatidic breaks: frequency of isochromatidic gaps — in patients and controls — is also shown. In table 4 results of the dermatoglyphic in study of digital, interdigital and hypothenar areas of patients are shown. No alterations were observed.

## DISCUSSION

1. *Comparison between aneuploidies found in the total number of affected persons with those found in the normal persons.*

One 47, XX, +C cell was found in 500 metaphases analysed among affected persons, whereas one 47, XX, +C and one 47, XY, +D cell were found in the same number of metaphases pertaining to the normal controls. With base on a ($X^2$ test), the authors concluded that no significant differences exist between the two groups at the 5% level. One cell with 47 chromosomes in a total of 50 metaphases was found in one of the patients. In this case a mosaicism 46,XX/47,+C was found in blood; the frequency of 47,XX,+C cell was less than 11% (97,,5% confidence limits according to Cloper & Pearson, 1934). Since this same mosaicism was found also in two normal subjects from the control group, the hypothesis of a mosaicism associated with Steinert's myotonic dystrophy can be discarded.

With relation to hypoploid cells, 31 cells with 45 chromosomes in 500 metaphases were analyzed in the affected persons, and 19 cells with 45 chromosomes in 500 metaphases in the control group. It was confirmed in the ($X^2$ test) that the differences observed between the two groups are not significant at the 5% level.

2. *Comparison between frequencies of aneuploidies between affected and normal persons, with relation to sex.*

Hyperploid cells were observed only in male individuals. As stated before it was concluded, through the $X^2$ test, that there's no significant difference between the groups of affected and normal persons, at the 5% level.

Thirteen hypoploid cells were observed in 500 metaphases of affected males, and eight cells of the same type in 500 metaphases of normal ones. This difference is not significant at the 5% level. Eighteen hypoploid cells were found in 500 metaphases of affected females, and eleven cells of the same type in the 500 ones pertaining to the female control group.

Trough the $X^2$ test it was confirmed that the difference between the two groups is not significant at the 5% level.

| Individuals | Age | Sex | Number of metaphases analysed | | | Karyotypes of the cells with 2n=46 |
|---|---|---|---|---|---|---|
| | | | 2n=47* | 2n=46 | 2n=45** | |
| M-1 | 42 | M | 1 | 47 | 2 | 46,XY |
| M-2 | 43 | F | | 47 | 3 | 46,XX |
| M-3 | 46 | F | | 49 | 1 | 46,XX |
| M-5 | 20 | M | | 44 | 6 | 46,XY,t(2;13) |
| M-6 | 13 | F | | 47 | 3 | 46,XX |
| M-8 | 41 | F | | 39 | 11 | 46,XX |
| M-9 | 16 | M | | 50 | | 46,XY |
| M-14 | 40 | M | | 47 | 3 | 46,XY |
| M-16 | 49 | M | | 48 | 2 | 46,XY |
| M-17 | 19 | M | | 50 | | 46,XY |

*Table 1 — Frequency of aneuploidies in the affected persons*: * *47, XY +C;* **accidental loss of a cromosome

| Individuals | Age | Sex | Number of metaphases analysed | | | Karyotypes of the cells with 2n=46 |
|---|---|---|---|---|---|---|
| | | | 2n=47* | 2n=46 | 2n=45** | |
| C — 1 | 40 | M | | 50 | | 46,XY |
| | | | 1* | | | |
| C — 2 | 45 | F | | 47 | 2 | 46,XX |
| C — 3 | 42 | F | | 43 | 7 | 46,XX |
| C — 5 | 22 | M | | 49 | 1 | 46,XY |
| C — 6 | 13 | F | | 48 | 2 | 46,XX |
| C — 8 | 46 | F | | 50 | | 46,XX |
| C — 9 | 20 | M | | 48 | 2 | 46,XY |
| | | | 1** | | | |
| C — 14 | 35 | M | | 47 | 2 | 46,XY |
| C — 16 | 51 | M | | 48 | 2 | 46,XY |
| C — 17 | 20 | M | | 49 | 1 | 46,XY |

*Table 2 — Frequency of aneuploidies in the normal controls: * 47,XX, +C; ** 47,XY, +D; *** accidental loss of a chromosome*

| Affected persons | Number of breaks in 50 cells | Normal controls | Number of breaks in 50 cells |
|---|---|---|---|
| M-1 | 7 | C-1 | 0 |
| M-2 | 7 | C-2 | 2 |
| M-3 | 1 | C-3 | 2 |
| M-5 | 1 | C-5 | 2 |
| M-6 | 3 | C-6 | 3 |
| M-8 | 4 | C-8 | 0 |
| M-9 | 2 | C-9 | 0 |
| M-14 | 1 | C-14 | 0 |
| M-16 | 1 | C-16 | 2 |
| M-17 | 3 | C-17 | 6 |
| | Total 31/500 | | Total 17/500 |

*Table 3 — Frequency of chromosomal and chromatidic breaks, as well as chromatidic and isochromatidic gaps.*

3. *Analysis of structural anomalies detected in the group of affected persons.*

A balanced translocation of a chromosome 2 and a chromosome 13 was detected between the long arms of individual M-5 in Table I (Levisky *et al.*, 1977)[8]. The mother (M-3) and sister (M-6) of this individual, both affected by Steinert's myotonic dystrophy, showed normal karyotypes. In the cases of this same family, while the genes of Steinert's myotonic dystrophy was transmitted through the mother, translocation was transmitted through the father, who is a phenotypically normal individual. Therefore, the association of chromosomal translocation and Steinert's myotonic dystrophy is purely accidental.

4. *Analysis of results in the investigation of breaks*

In the paper published by Mutton & Gross (1965)[10] there is mention of breaks in two male individuals affected by Steinert's myotonic dystrophy, but since the authors did not study normal controls we do not consider these findings to be conclusive.

In the case here presented, a normal control of the same sex and age was studied for every one of the affected persons. Culture of lymphocytes was performed on the same day and analysis made on a "blind test", so as to avoid errors of interpretation due to differences in culture conditions.

| Individual | Sex | Digital area | | | | | | | | | | Interdigital area | | | | | | Hypotenar area | | Angle | atd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | right | | | | | left | | | | | right | | | left | | | right | left | right | left |
| | | I | II | III | IV | V | I | II | III | IV | V | $I_2$ | $I_3$ | $I_4$ | $I_2$ | $I_3$ | $I_4$ | | | | |
| M — 1 | M | R | U | U | V | R | V | A | U | V | V | | $L^d$ | | | $L^d$ | | — | U | 43º | 63º |
| M — 2 | F | A | U | U | U | U | A | A | U | U | A | | | | | $L^d$ | | — | — | 52º | 42º |
| M — 3 | F | V | V | U | V | V | V | U | U | U | U | | $L^d$ | | | | $L^d$ | — | R | 44º | 43º |
| M — 5 | M | V | V | V | V | U | V | V | V | U | U | | $L^d$ | | | $L^d$ | | R | — | 49º | 45º |
| M — 6 | F | V | V | U | U | U | V | V | U | U | U | $L^d$ | | | | | | R | R | 46º | 46º |
| M — 8 | F | U | U | U | U | U | U | R | U | V | U | | | | | | | | | 46º | 48º |
| M — 9 | M | U | U | U | U | U | U | U | U | U | U | $L^d$ | | | | | | | | 45º | 38º |
| M — 14 | M | U | U | U | U | U | U | U | U | U | U | | $L^d$ | | | | $L^d$ | | | 48º | 43º |
| M — 16 | M | U | U | U | U | U | U | A | A | A | U | $L^d$ | | | | | | | | 50º | 50º |
| M — 17 | M | A | A | A | U | U | A | A | A | U | U | $L^d$ | | | | | | | | 48º | 55º |

*Table 4 — Dermatoglyphic patterns in affected persons.*

Chromosomal and chromatidic breaks were not classified separately due to the fact that samples were too small and thus there was great difficulty in the application of statistical data to evaluate results.

In table 3, 31 breaks were observed in 500 metaphases of the affected individuals, as compared to 17 in 500 metaphases of the controls. Through the $X^2$ test one can see that the value obtained (4,290) is significant at the 5% level. At test was also administrated, for which values obtained were transformed in arc sen and, so, not distributed in a normal curve. The mean in the affected group was estimated to be 3,444, and the respective variance 7350; the mean average in the normal controls was estimated to be 1950, the respective variance eving around 4,702. - The *t* test revealed there are no significant differences between the two groups.

The significant differences found, concerning the number of breaks in relation to the total number of metaphases can be ascribed to characteristic variations peculiar to each one of the individuals. It cannot be stated, therefore, that this observation bears any relation with the disease.

We didn't find any special alterations in the study of the dermatoglyphic patterns in the digital, interdigital and hypotenar areas.


## SUMMARY

Cytogenetic and dermatoglyphic studies were performed in 10 patients affected by Steinert's myotonic dystrophy.

No anomalies were found in karyotype and dermatoglyphs in these patients, except for an occasional chromosomal translocation.



## RESUMO

*Estudo citogenético e dermatoglífico em pacientes com distrofia miotônica de Steinert.*

Foi realizado estudo citogenético e dermatoglífico em 10 pacientes com distrofia miotônica. Não foram encontradas anomalias nestes pacientes, exceto por uma ocasional translocação cromossômica.


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