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Muscular Dystrophy in Three Pairs of Twins [1]

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There have been very few reports of twins concordant for muscular dystrophy. This is because muscular dystrophy is a relatively rare condition and the life span of patients with the most common type is under 30 years.

Male monozygotic twins, aged 45 years, showing concordance for facioscapulohumeral muscular dystrophy (Landouzy-Déjèrine type) have been described. (1) There was no history of muscular dystrophy in their family; but this type of muscular dystrophy is known to be usually inherited by an autosomal dominant mechanism. (2-3) The variable expressivity of the gene was clearly exhibited in these twins since one twin was severely incapacitated while the other had not even been aware of his affection till a clinical examination revealed definite weakness in certain muscle groups.

Stephens and Tyler (4) described a pair of male monozygotic twins concordant for Duchenne muscular dystrophy. The authors concluded that they were likely the result of a recent mutation. The disease ran a similar course in each twin; it was first recognized at six years, complete incapacity had developed by 11 years and the twins died within a few months of each other at 25 years. These twins had no affected relatives but the Duchenne form of muscular dystrophy is usually inherited by a sex-linked recessive mechanism. (3-4-5)

Three pairs of male twins (Sets A, B, and C) all concordant for muscular dystrophy are presented in this paper.

Determination of zygosity

Previous to this investigation none of the three pairs of twins had had a zygosity determination. Therefore series of test were undertaken to show for each pair whether the twins had a monozygous or dizygous origin. The most important of these tests was the typing with blood sera identifying the groups or antigens indicated in Table I. It is noted that both members of each pair of twins had identical reactions with the above sera. On this basis alone we can say that there is over 90% assurance for the monozygosity of each pair. (6)

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Table I - Blood Groupings for Three Pairs of Male Twins with Muscular Dystrophy

Twins	Blood Types
Set A	
K.B.	O, M+N+S—, P+, C+C^{w}+c— D+E—, K—, Fy(a—), Le(a+)
W.B.	O, M+N+S—, P+, C+C^{w}+c— D+E—, K—, Fy(a—), Le(a+)
Set B	
C.G.	A_1, M+N+S+, P—, C—C^{w}—c+D+E—, K—, Fy(a+), Le(a+)
R.G.	A_1, M+N+S+, P—, C—C^{w}—c+D+E—, K—, Fy(a+), Le(a+)
Set C	
Ri. H.	A_1, M+N+S—, P+, C+C^{w}—c+D+E—, K—, Fy(a+), Le(a—)
Ro. H.	A_1, M+N+S—, P+, C+C^{w}—c+D+E—, K—, Fy(a+), Le(a—)

Secondly there was evidence from dermatoglyphics. Finger, palm and sole prints were recorded using the Faurot Inkless method. (7) A homolateral comparison of patterns on the digits and palms, the digital ridge counts, and main line terminations was carried out.

Identical blood groupings and the similarity in dermatoglyphics together with the physical resemblance of the twins indicated a monozygous origin for two of the three pairs (Sets A and B, Table II).

Table II - Factors in the Determination of Zygosity for Two Pairs of Twins (Sets A and B) with Muscular Dystrophy

	Set A	Set B
Sex	Both male	Both male
Birth Date	20th March, 1945	4th December, 1941
Blood Groups	Both twins identical for seven blood groups	Both twins identical for seven blood groups
Dermatoglyphics	Homolateral differences typical of monozygotic twins	Homolateral differences typical of monozygotic twins
Physical appearance	Writer unable to tell them apart (See fig. 1). Both twins fairly obese, with similar age of onset of symptoms and similar rate of progression of the disease	Writer unable to tell them apart (See fig. 2). Both twins thin, muscle atrophy is obvious. Similar age of onset of symptoms and similar rate of progression of the disease.
Conclusion about Zygosity	Monozygotic	Monozygotic

Set C constituted a problem in the determination of zygosity. The blood groups mentioned earlier were identical, but differences in dermatoglyphics were much more suggestive of dizygosity as was also the history of twinning on the maternal side of the family and the rather different expressions of the disease in the two twins. Thus further tests on Set C became necessary. These included blood groupings of the parents, taste reaction to phenylthiocarbamide (P.T.C.), assessment of eye and hair colours, ear size and shape, ability to roll the tongue into a tube, and presence of hair on the middle phalanx of the fingers. The results of most of these are shown in Table III. These tests did not establish the zygosity of this pair of twins with certainty: but it would appear that this set represents the relatively rare case of dizygous twins with identical blood groupings.

Table III - Factors in the Determination of Zygosity for a Pair of Twins (Set C) with Muscular Dystrophy.

	Ri. H.	Ro. H
Sex	Male	Male
Blood groups	Same as twin for seven groups	Same as twin for seven groups
Dermatoglyphics	Homolateral differences typical of dizygotic twins	
Reaction to phenylthiocarbamide (P.T.C.)	Bitter (Taster)	Bitter (Taster)
Ability to roll tongue into a tube	Yes	Yes
Hair on middle phalanx	Slight	Slight
Colour vision	Normal	Normal
Eye colour (W.H. Shakespeare chart)	Numbers 11, 18, or 30. Slightly more brown on inner margin of irides than in twin.	Numbers 18, 28, or 30
Hair colour	Brown, (Slightly darker than that of twin).	Brown
Shape of ears	Width, length and shape very similar	
Mentality	Apparently normal	Possible mild mental retardation indicated on hospital record; but not apparent to the writer
Physical appearance	Easily distinguished from twin	Easily distinguished from twin
Probability for monozygosity on basis of blood groups of parents	Seventy-two percent	
Type of zygosity favoured	Dizygous	

Clinical and Genetical Features

Set A (K.B. and W.B.)

The twins were born full term, and developed normally till the age of six years. At this time they started to have difficulty climbing stairs. A tendency to " toe-in " appeared when walking, their running slowed down, falls became frequent, and a characteristic waddling gait developed. By eight years weakness in the pelvic region had become pronounced and during their eleventh year they gradually became unable to walk. There is slight pseudohypertrophy in the deltoid and gastrocnemius muscles although there is good power in the latter. The feet are very flat and mildly fixed in plantar flexion. The clinical picture is almost identical for both brothers except that W.B. has more power than K.B. in the flexors of his hips and somewhat less in his extensors. The twins have been diagnosed as muscular dystrophy: opinions as to the type of dystrophy have included both the Duchenne and the limb-girdle type, with the majority opinion favouring the Duchenne type.

The sibship (Figure 1) consists of the twins and a sister two years older. The maternal family is of German origin; the paternal family has lived in the United States of America for several generations, and they have an English surname. There is no parental consanguinity. There is no hystory of muscular dystrophy or any other muscular or neuromuscular condition in the family. The twins therefore can be classified as a 'sporadic' case, and are possibly the result of a recent mutation although there are insufficent male relatives on the maternal side of the family to exclude a sex-linked recessive gene in earlier generations.

Set B (C.G. and R.G.)

The twins were born full term and appeared normal at birth. By the age of five years they walked very slowly, there was pseudohypertrophy of the gastrocnemius muscle, contractures at the knees, and weakness in the arms. At six years they walked only on the balls of their feet and climbed stairs one step at a time. The appearance of symptoms and progression were identical for both brothers except that C.G. was perhaps slightly less affected than R.G. There was no doubt as to the precise diagnosis. It was Duchenne muscular dystrophy.

The sibship (Figure 2) consists of a hydrocephalic boy who died at seven and one half years, next are the twins, followed by a healthy brother five years younger and a healthy sister eight years younger than the twins. The maternal family is of Polish origin while the paternal grandparents are Scottish and English, there being therefore no possibility of parental consanguinity. There is no history of muscular or neuromuscular disease in any other relative. It is possible the affected twins are the result of a mutation whose phenotypic aspects have appeared for the first time.

Set C (Ri. H. and Ro. H.)

The twins were born full term. Ri. H. contracted poliomyelitis at the age of one year with marked involvement of the left leg. Neither twin crept and when they started to walk their gaits were noted to be abnormal. The progression of the disease was similar till the age of five years. From this time on the progressive loss of muscle bulk became very apparent in Ro. H., but in Ri. H. the atrophy became obscured by progressive obesity. Both ceased to walk at 11 years. Pseudohypertrophy of the gastrocnemii and thigh muscles was present in the early stages of the disease. The parents of these twins have not permitted the thorough examination available in a Muscular Dystrophy Clinic but hospital records show a diagnosis of pseudohypertrophic muscular dystrophy (i.e. Duchenne) for Ro. H. and unspecified muscular dystrophy for Ri. H.

The sibship (Figure 3) consists of four children: a healthy brother four years older than the twins, and a sister eight years younger. The maternal grandparents are Dutch and Irish, the paternal family is of English origin, so there is no parental consanguinity. No history of any muscular disease is recorded in the family.

Summary

Three pairs of male twins concordant for muscular dystrophy are presented. Two of these pairs are shown to be monozygotic and affected with the Duchenne form of muscular dystrophy. The third pair is probably dizygotic. The clinical and genetical features of each pair of twins are discussed. Pedigrees with photographs of the twins are presented.

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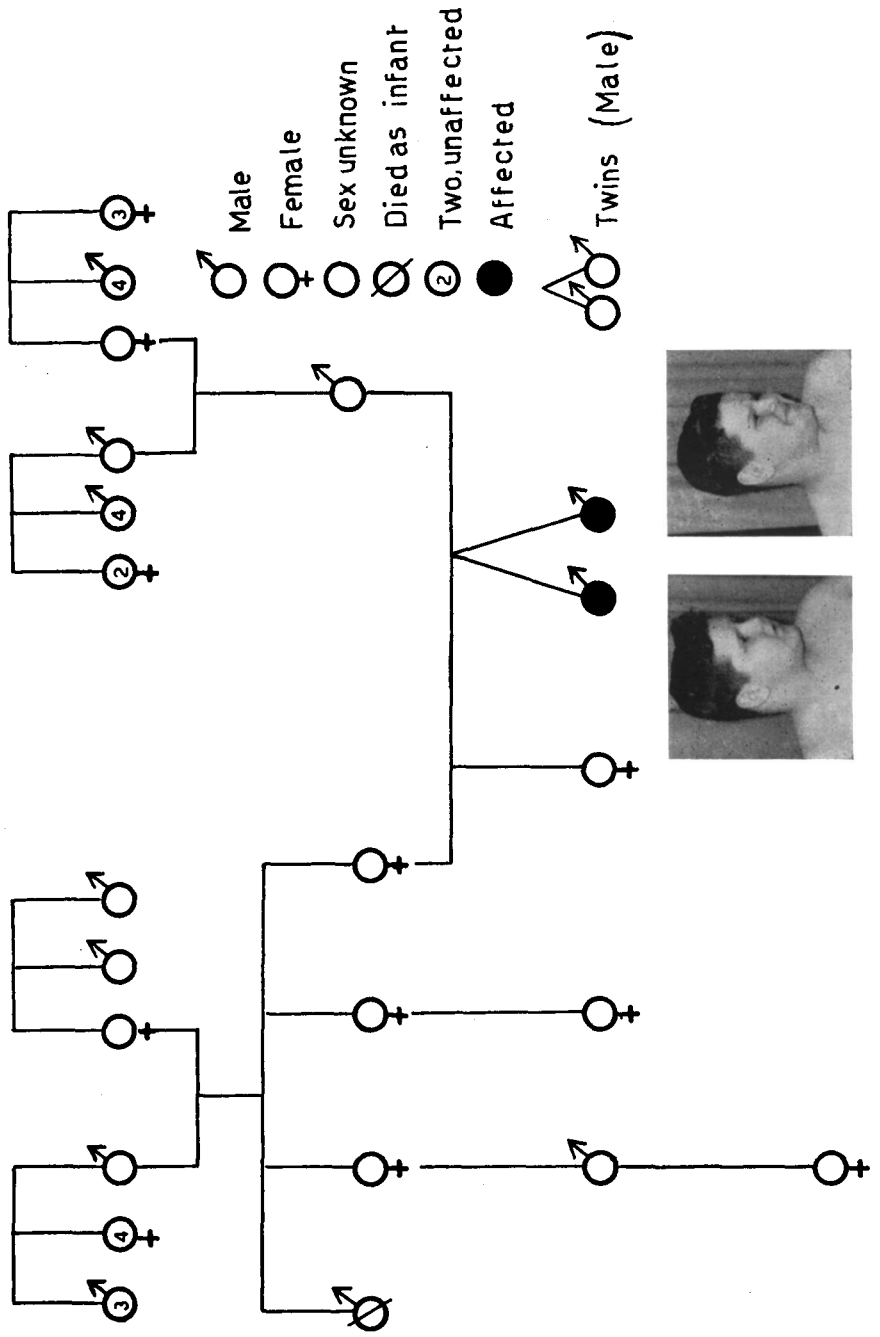

Fig. 1. Monozygotic twins (Set A) concordant for Duchenne muscular dystrophy

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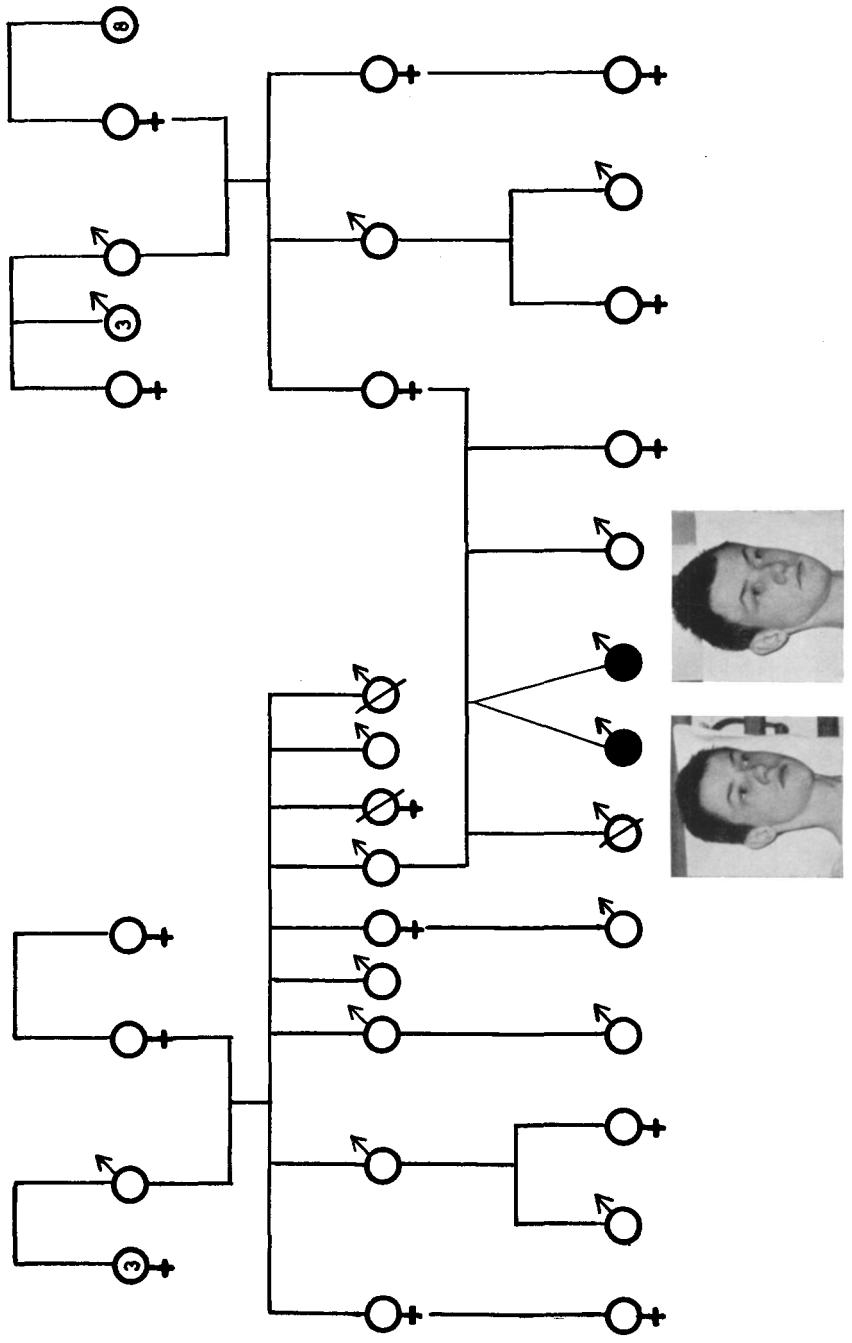

Fig. 2. Monozygotic twins (Set B) concordant for Duchenne muscular dystrophy

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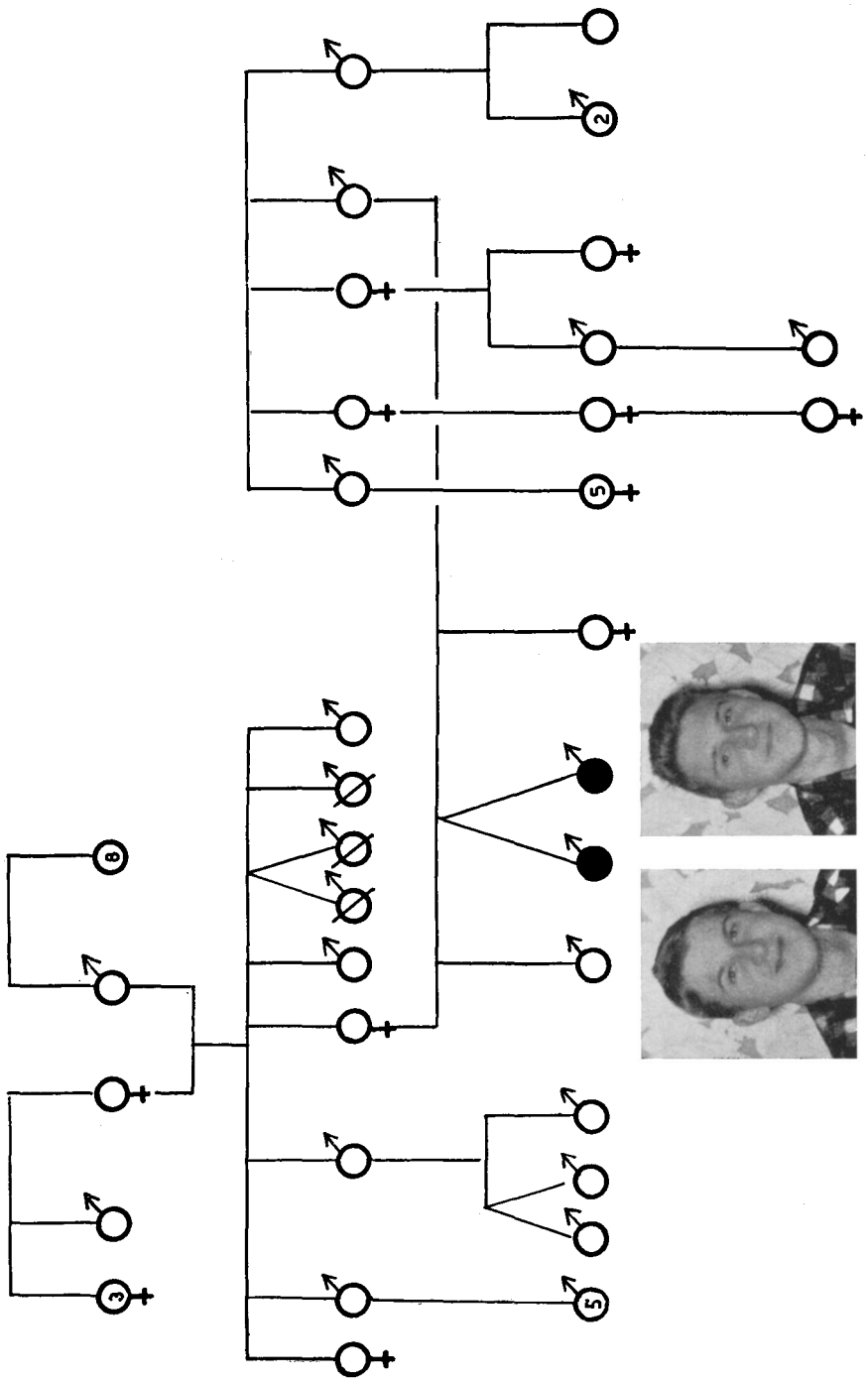

Fig. 3. Twins, probably dizygotic (Set C), concordant for Duchenne muscular dystrophy

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RIASSUNTO

Sono stati presentati tre paia di gemelli di sesso maschile con lo stesso tipo di distrofia muscolare. Due paia sono monozigoti ed affetti con una forma di distrofia muscolare Duchenne. Il terzo paio è probabilmente dizigoto. I caratteri clinici e genetici di ogni paio di gemelli sono discussi. Pedigrees con fotografie dei gemelli sono presentati.

ZUSAMMENFASSUNG

Drei fälle von männlichen Zwillingen, übereinstimmend an Muskelschwund erkrankt, sind hier aufgeführt. Zwei von den genannten Fällen werden als eineiige Zwillinge und mit der Duchenne Form von Muskeldystrophie gezeigt. Das dritte Zwillingspaar ist wahrscheinlich zweieiig. Die klinischen und genetischen Charakeristiken jedes Zwillingpaares sind besprochen, und Ahnentafeln und Photographien der Zwillinge sind aufgeführt.

RÉSUMÉ

Trois paires des jumeaux masculines concordant sont présentés. Deux paires de ces jumeaux sont démontrés comme MZ et tarés par la forme Duchenne. La troisième paire est probablement DZ. Les traits cliniques et génétiques de chaque paire des jumeaux sont discutés. Les arbres généologiques des jumeaux ainsi que des photographies sont présentés.