Brief Report

Congenital Dermatoglyphic Malformations and Psychosis: A Twin Study

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Objective: In a previous twin study, congenital dermatoglyphic abnormalities, such as ridge dissociations and abnormalities of palmar flexion creases, were more prevalent in twins with psychotic and related disorders than in comparison twins. This study was an attempt to replicate that finding in an independent study group.

Method: Ridge dissociations and abnormal palmar flexion creases were assessed in monozygotic pairs concordant (19 pairs) and discordant (31 pairs) for psychosis and related disorders.

Results: The presence of either ridge dissociations or abnormal palmar flexion creases was higher in the combined group of affected concordant and discordant twins (37.7%), than in the nonaffected discordant twins (20.0%; odds ratio=2.4). In the discordant pairs, the presence of either abnormality was strongly associated with psychotic disorder (odds ratio=3.0).

Conclusions: Factors affecting early fetal development may increase the risk for psychotic disorder. Differential exposure to such early risk factors may contribute to twin discordance for psychotic disorder.

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The presence of abnormalities in the patterned traceries of fine ridges on fingers and palms (dermatoglyphics) may constitute indelible evidence of a prenatal insult in the 4th or 5th month of pregnancy (1–3). In two studies (4, 5) the frequencies of congenital dermatoglyphic abnormalities were examined in pairs of twins discordant and con-

cordant for schizophrenia. In the United States, some of us (4) found that in pairs of monozygotic twins discordant for schizophrenia or delusional disorder, the affected co-twin had higher scores for certain dysmorphological hand anomalies. In a different sample in the United Kingdom, others of us (5) found that the frequencies of two dermatoglyphic measures, abnormal palmar flexion creases and ridge dissociation, were more frequent in monozygotic affected twins than in normal comparison twins. In addition, the frequency of these abnormalities appeared higher in the concordant affected twins than in the discordant affected twins. We wished to replicate the findings of the U.K. study by using the subjects in the U.S. study (4).

Method

The monozygotic pairs concordant and discordant for psychosis and related disorders were drawn from the National Institute of Mental Health twin study (6). The members of the participating pairs had given written informed consent after having received a complete description of the study. The current report is based on the most recent diagnostic data. Of two sets of triplets, the last-born individual was excluded. For two reasons, the study group was a priori not confined to any particular diagnostic category. First, dermatoglyphic abnormalities occur more frequently than normal not only in schizophrenia and delusional disorder, but also in bipolar disorder and schizotypy (7, 8). Second, there is good evidence that the diagnostic categories of affective and nonaffective psychoses share to a large degree the liabilities arising from prenatal and developmental risk factors, which argues against division along arbitrary diagnostic lines (9, 10). Included were 31 pairs discordant for DSM-III-R schizophrenia or schizoaffective disorder (20 pairs), bipolar disorder (eight pairs), or other psychosis (three pairs) and 19 pairs concordant for any of the psychosis categories (11 pairs with schizophrenia or schizoaffective disorder in both twins, three pairs with schizophrenia in one twin and schizotypal disorder in the other, and five pairs with psychosis in one twin and affective or schizotypal/schizoid disorder in the other).

Ridge dissociation refers to short broken segments of lines that cover the patterns of dermatoglyphic areas in a disorganized way (for image, see reference 7). Examples of abnormal palmar flexion creases are the Simian line, the Sydney line, clear broken proximal and distal palmar creases, and very rudimentary creases. The measure of ridge count dissociation was available for all pairs; abnormalities of palmar flexion creases could be read in 25 discordant and 17 concordant pairs. The reading of handprints was performed by one of us (A.R.), who remained entirely blind to pair status, concordance, and diagnostic status throughout the study.

We calculated the association between dermatoglyphic abnormalities and psychosis in the matched data set of twin pairs. Effect size was expressed as the odds ratio from the conditional logistic regression procedure for matched data (11); the 95% confidence interval (CI) of each odds ratio is also presented. As we explicitly sought to replicate the direction of a previously reported effect, one-sided p values are presented. Because of the small number of subjects, exact McNemar significance probabilities are also presented.

Results

The risk of an abnormal palmar flexion crease was 36.0% in the discordant affected twins (N=9), 32.4% in the concordant affected twins (N=11), and 16.0% in the discordant nonaffected twins (N=4). The risk of ridge count dissociation was 9.7% in the discordant affected twins (N=3), 10.5% in the concordant affected twins (N=4), and 6.5% in the discordant nonaffected twins (N=2). The risk of either ridge dissociation or abnormal palmar flexion creases was higher in the combined group of affected concordant and affected discordant twins (37.7%, 23 of 61) than in the group of discordant nonaffected twins (20.0%, five of 25; odds ratio=2.4, 95% CI=0.8–7.1; χ^2=2.53, df=1, one-sided p=0.06, one-sided exact p=0.09). Of the 31 discordant pairs, nine were discordant for abnormal palmar flexion creases. In seven of these nine pairs, the abnormality occurred in the affected twin (odds ratio=3.5, 95% CI=0.7–16.8, χ^2=2.78, df=1, one-sided p=0.05, one-sided exact p=0.09). Similarly, of the three pairs discordant for ridge count dissociation, the abnormality occurred in the affected co-twin in two pairs (odds ratio=2.0, 95% CI=0.2–22.0, χ^2=0.33, df=1, one-sided p=0.28, one-sided exact p=0.50). For the discordant pairs the odds ratio associated with the presence of either abnormal palmar flexion creases or ridge count dissociation in the affected twin was 3.0 (95% CI=0.8–11.1, χ^2=3.00, df=1, one-sided p=0.04, one-sided exact p=0.07). Of the nine concordant pairs in which at least one twin had either ridge count dissociation or abnormal palmar flexion creases, only three pairs were also concordant for the dermatoglyphic abnormality.

Discussion

Because of the small number of subjects, the results of this investigation are statistically imprecise. However, even using the exact p values, we can be more than 90% confident that the main findings were not due to chance. Although this may be slightly lower than the conventional 95% limit, we nevertheless feel the findings remain suggestive of an association.

The four main findings were that 1) dermatoglyphic abnormalities were more frequent in subjects with psychosis and related diagnoses than in nonaffected subjects, 2) dermatoglyphic abnormalities were more frequent in the affected co-twins of the discordant twin pairs, 3) dermatoglyphic abnormalities were equally frequent in concordant affected and discordant affected subjects, and 4) the frequency of concordance for dermatoglyphic measures was low in twins concordant for psychosis. The first result replicates the findings of our previous case-control study in a group of U.K. twins (5). The second result confirms the first, but the underlying comparison of the well and affected members of discordant pairs is arguably superior methodologically, as discordant pairs are matched for a host of possible confounding factors. The third and fourth results fail to agree with those in our previous study, where it was found that the frequency of the two dermatoglyphic abnormalities was higher in concordant than in discordant affected twins. It has been suggested (12) that monozygotic twins concordant for schizophrenia are concordant because they more often share the same chorion than do discordant monozygotic pairs, making

them jointly more susceptible to prenatal environmental insults. However, the rate of concordance for dermatoglyphic abnormality among the concordant pairs was very low relative to the rate of discordance, which is not what would have been expected if monochorionicity made it more likely for the members of a pair to share the same environmental insult.

As in the U.S. study (4), the fact that the genetically identical twins were discordant for the dermatoglyphic markers used strongly suggests a nongenetic mechanism or a mechanism involving an interaction of genotype and environment, whereby an environmental insult influences the expression of genetic liability. The validity of ridge dissociation and abnormal palmar flexion creases as consequences of some environmental exposure is suggested by their association with 1) congenital syndromes that share such clinical features as low birth weight, growth retardation, and mental retardation, 2) fetal alcohol syndrome, 3) congenital hypotonia, 4) delayed development in children, and 5) intrauterine exposure to viruses and other teratogenic agents (2). In addition, several independent studies (7, 8, 13) have shown an excess of ridge dissociation and abnormal palmar flexion creases in psychosis and related disorders. The findings therefore lend further credence to the suggestion that nongenetic factors affecting development in the 4th and 5th months of pregnancy increase the risk for adult psychosis and related outcomes.

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