Case reports

Discussion

A syndrome of Klippel-Feil anomaly, deafness, abducens paralysis, and retraction of the bulbi has been described by Wildervanck\(^1\) and Wildervanck \textit{et al.}\(^2\). Although the syndrome was thought to be responsible for at least 1\% of deafness among girls,\(^3\) there have been only a few reports of this syndrome in recent years. Moreover, to our knowledge, there are no reports of the association of bilateral subluxation of the lens and unilateral facial paralysis in association with this syndrome. It is possible that the facial paralysis resulted from birth trauma although there was no evidence for this in the history. It is even more difficult to understand lens subluxation in this patient, since we have excluded most metabolic diseases associated with subluxation of the lens, including homocystinuria, sulphite oxidase deficiency, and hyperlysininaemia.

To our knowledge there are no other published reports of developmental syndromes with the clinical features found in our patient. Therefore, either the findings of lens subluxation and facial paralysis are just a coincidence, or they represent previously undescribed associated defects in this rare syndrome. Other reports of this syndrome include other infrequently seen signs, such as pseudopapilloedema\(^4\) and occipital meningocoele,\(^5\) but not subluxation of the lens and facial paralysis. The syndrome is genetically limited to females which suggests X linked dominant transmission with lethality in the hemizygous male. Other authors think that multifactorial inheritance is more likely.\(^6\) Further reports are necessary to establish the incidence of subluxation of the lens and facial paralysis in this syndrome.

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References


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\(\alpha\beta\)-thalassaemia in Sicily: report of a case of double heterozygosity for \(A_\gamma\delta\beta\)-thalassaemia and \(A_\gamma G_\gamma\delta\beta\)-thalassaemia

\textbf{SUMMARY} A case of double heterozygosity for \(A_\gamma\delta\beta\)-thalassaemia and \(A_\gamma G_\gamma\delta\beta\)-thalassaemia was found during a screening programme in Sicily. The proband, a 4-year-old girl, showed a clinical picture of thalassaemia intermedia. Hb F (85.12\% by the Singer method) was \(G_\gamma A_\gamma\)-type. The parents and the brother were \(\delta\beta\)-thalassaemia carriers. Structural analysis of Hb F showed both \(G_\gamma\) and \(A_\gamma\) chains in the father, but only \(A_\gamma\) chains in the mother.

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δβ-thalassaemia can be divided into GγAγ δβ-thalassaemia and Gγ δβ-thalassaemia depending on the structural analysis of Hb F.1 The severity of δβ-thalassaemia is correlated with the extent of the deletion of the non-α globin gene complex and consequently with the different degrees of γ locus activation. Amin et al2 suggested that the Gγ form of δβ-thalassaemia can be more severe clinically than GγAγ δβ-thalassaemia. Recently Cao et al3 observed Aγ δβ-thalassaemia where no gene deletion appeared to be responsible for the molecular defect. We present the clinical and haematological data of a family with δβ-thalassaemia recently identified in Sicily. The proband is a double heterozygote for Aγ and GγAγ δβ-thalassaemia.

Case report

The family pedigree is shown in fig 1. The proband, a 4-year-old girl, came to us because of pallor. She had mild scleral icterus and her face showed slight signs of Cooley's disease. Her spleen was palpable 2 cm below the costal margin. Her growth was moderately retarded when compared with girls of the same age. Haematological data are shown in the table. The girl had moderate anaemia but had never required blood transfusions. Electrophoretic analysis of Hb F showed only Hb F (85-12% by the Singer method), and gel acrylamide electrophoresis indicated that both Gγ and Aγ chains were present with a ratio of 51:49 (fig 2). The distribution of Hb F was unevenly pancellular. Globin chain synthesis in the bone marrow was more unbalanced than in the peripheral blood.

Both the parents and the brother were found to be δβ-thalassaemia carriers with normal Hb A2 and increased Hb F levels (table). The Hb F structural analysis showed the presence of Gγ and Aγ chains in the father, but only Aγ chains in the mother (fig 2). The distribution of Hb F was heterocellular in both the parents after acid elution, while it was

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**TABLE Haematological data in the family.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Age (yr)</th>
<th>Hb (g/dl)</th>
<th>RBC (x 1012/l)</th>
<th>MCH (pg)</th>
<th>MCV (fl)</th>
<th>Morphological alterations</th>
<th>Hb F (%)</th>
<th>Hb A2 (%)</th>
<th>Globin chain synthesis Non-α/α ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>41</td>
<td>13</td>
<td>4.8</td>
<td>27</td>
<td>83</td>
<td>± ± ±</td>
<td>17.48</td>
<td>2.45</td>
<td>0.83 0.65</td>
</tr>
<tr>
<td>I-2</td>
<td>38</td>
<td>12</td>
<td>4.3</td>
<td>27.9</td>
<td>86</td>
<td>± ± ±</td>
<td>8.00</td>
<td>2.72</td>
<td>0.71 0.70</td>
</tr>
<tr>
<td>II-1</td>
<td>10</td>
<td>12</td>
<td>4.2</td>
<td>28.6</td>
<td>80</td>
<td>± ± ±</td>
<td>17.75</td>
<td>2.42</td>
<td>0.83 0.67</td>
</tr>
<tr>
<td>II-2</td>
<td>4</td>
<td>9.5</td>
<td>3.5</td>
<td>27.2</td>
<td>60</td>
<td>+ + +</td>
<td>87.12</td>
<td></td>
<td>0.39 0.30</td>
</tr>
</tbody>
</table>

H = hypochromia
A = anisocytosis
P = poikilocytosis
T = target cell
PB = peripheral blood
BM = bone marrow

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**FIG 2 Globin polyacrylamide electrophoresis in the mother (a), the proband (b), and the father (c).**
irregularly pancellular in the mother and hetero-
cellular in the father after immunofluorescence
(fig 3). Globin chain synthesis showed an un-
balanced non-α/α ratio in both peripheral blood and
bone marrow of the heterozygous members of the family.

Discussion

The study of this family indicates that the proband is
a double heterozygote for \(\alpha\gamma\) and \(G\gamma\alpha\gamma\) \(\delta\beta\)-thalassaemia. In this patient the clinical picture is more
severe than in the three sisters with homozygous
\(G\gamma\alpha\gamma\) \(\delta\beta\)-thalassaemia previously identified in Sicily.\(^4\)-\(^6\) This is probably the result of the extent of
the molecular defect which also involves one \(G\gamma\)
genome in our patient. The \(Hb\ F\) level was lower and the
non-α/α ratio in peripheral blood was more un-
balanced in the mother than in the father and
brother. The distribution of \(Hb\ F\) in the blood cells
was heterocellular in the father, a \(G\gamma\alpha\gamma\) \(\delta\beta\)-thalas-
saemia carrier, while it was irregularly pancellular
in the mother, an \(\alpha\gamma\) \(\delta\beta\)-thalassaemia carrier. This
finding is similar to that found by Matthews \textit{et al}\(^7\)
in heterozygotes for \(G\gamma\) \(\delta\beta\)-thalassaemia.

\(\alpha\gamma\) \(\delta\beta\)-thalassaemia, which is the least common
form of \(\delta\beta\)-thalassaemia, could be the result of either
an unequal crossing over in the non-α globin gene
complex or of an interstitial deletion.

Gene mapping studies could define the molecular
basis of this case of double heterozygosity for \(\alpha\gamma\)
and \(G\gamma\alpha\gamma\) \(\delta\beta\)-thalassaemia, which is the first to be
reported so far.

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Note added in proof

Another two cases of \(\alpha\gamma\) \(\delta\beta\)-thalassaemia with low
levels of \(Hb\ F\) were recently reported by Cao \textit{et al}
analysis in these patients excluded the presence of
large gene deletion or gross rearrangement within
the non-α globin cluster (Ottolenghi \textit{et al}. \textit{Proc Natl
Acad Sci USA}, in press).