unexpectedly the multinomial method referred markedly fewer than any other method since no assumptions underlie it and the referral rule obtained depends solely on the particular set of data. When this referral rule was applied to the independent data, however, it gave the worst result in that only seven of the 48 hypothyroid patients were referred. The remaining seven methods performed similarly to each other, identifying between 24 (50%) and 34 (71%) of the hypothyroid patients and incorrectly referring between 53 (25%) and 87 (41%) of the 215 euthyroid patients. The simplest method, that of counting the number of symptoms present, gave results which were comparable with those of the more complex techniques.

Discussion

The development of statistical techniques for classifying individuals on the basis of symptoms, signs, and laboratory tests has potential value in diagnosis, treatment, and screening. There are few diseases for which the prognostic significance of different combinations of symptoms, signs, and measurements has been quantified. Many techniques have been proposed and used in particular clinical problems, but few comparisons of their performance have been made. Crucial to such comparisons is the application of diagnostic or referral rules derived in one set of data to a second independent set of data.

The result of our study was surprising. The simple method of counting the total number of symptoms present was, in this situation, as effective in determining a referral rule as more complicated methods. The simplicity of the rule, which refers patients with four or more symptoms, and its lack of dependence on complex calculations and computers make it the method of choice.

This may be disquieting to both clinician and statistician. For the clinician the thought that the presence of any four of these nine symptoms indicate the need for referral may conflict with his clinical impression that some combinations of symptoms of hypothyroidism are diagnostically more important than others. For the statistician there may be disappointment that sophisticated methods do not produce a better result. It would be interesting to see whether simply derived diagnostic rules are usually as effective as those determined by complex techniques.

We thank Professor J. M. Bishop, department of medicine, Queen Elizabeth Hospital, Birmingham, who allowed us to use the thyroid follow-up data; Mrs. M. M. Thompson, thyroid follow-up secretary, who was responsible for the collection of much of the data; and Mrs. H. Bungay for her help with the analyses.

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Clinical Topics

Microcephaly Following Baby Battering and Shaking

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British Medical Journal, 1975, 2, 262-264

Summary

Three cases of microcephaly following the rough handling of babies are described. If detailed social and psychiatric information had not been available, these three children would have become part of the large proportion of individuals in subnormality hospitals who have unsatisfactory and incomplete diagnoses.

Introduction

Most textbooks in subnormality do not consider child abuse as a direct cause of subnormality of intelligence, but one case of microcephaly following bilateral subdural haematomas is pictured and described by Holmes *et al.*¹ Many publications on

battered babies nevertheless suggest that a high proportion of battered children are left with permanent brain damage, and a proportion of these children are rendered mentally retarded.²⁻⁴ The extent of very severe abuse of children in north-east Wiltshire is at least one new case referred per year per thousand children under 4 years old. Twelve out of 38 children studied suffered skull fracture. Sixteen out of 38 suffered intracranial haemorrhage or other brain injury, usually in the first year of life.⁵

Three cases are here described from subnormality hospitals in N.E. Wiltshire in which the brain had been damaged by the shaking, swinging, hitting, or throwing of a baby. Mental retardation ensued. The rate of growth of the head circumference suddenly decelerated, or almost ceased, after the abuse. Previously normal children became microcephalic and severely mentally retarded.

Case Reports

CASE 1

A girl healthy at birth (2 weeks postmature, normal delivery, birth weight 8 lb 2 oz (3685 g), placenta healthy) developed normally until

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she was 3 months old. Head circumference at birth was 33 cm and at 3 months 41 cm (both within normal limits). The battering (at 3 months) was inflicted by the mother, and consisted in shaking, throwing, and possibly swinging against an object. Few or no surface injuries were recorded, and there was a long delay before the baby was taken to the casualty department. She had been refusing feeds, and had suffered a run of fits, but the parents were reluctant to stay and give details.

There were large bilateral subhyaloid haemorrhages. Damage to the optic nerves and retinas later resulted in bilateral optic atrophy. X-ray films showed a fracture on the left side of the occipital bone, and possibly also in the left parietal bone. Subdural tapping yielded 20 ml of blood-stained fluid mainly from the left angle of the anterior fontanelle, but repeated taps were necessary. The child remained irritable and unable to suck. The reflexes and tone were increased, especially in the upper limbs, and twitching of the right arm was noted.

Over the next three months the child put on weight but her head grew only half a centimetre in circumference. Nine months after the battering, at 1 year old, the head circumference was 42 cm. Hearing seemed impaired. The child was uninterested and showed signs of mental retardation, but her backwardness may have been partly the result of some degree of optic atrophy in both eyes.

At the age of 7 the head circumference was 43 cm. The child was in a state of profound mental retardation, with limited vision and hearing, bilateral spasticity, and helplessness.

CASE 2

A boy healthy at birth (2 weeks postmature, normal delivery, birth weight 6 lb 2 oz (2780 g), placenta healthy) developed normally until he was nearly 3½ months old. Meaningful smiles were noted at 9 weeks and cooing at 3 months. Head circumference at birth was 34 cm and at 3½ months 40 cm (both within normal limits). The battering (at 3½ months) was inflicted by the mother, and consisted in fist blows and shaking. There was slight bruising on one arm and the cheek, scratches on the chest, and evidence of old rib fractures. Retinal haemorrhages were apparent on the left. The right pupil was contracted, the left fixed and dilated, and tone was increased on the right side of the body. Lumbar puncture gave bloodstained fluid, and blood was also obtained from the subdural and intraventricular taps. There was no skull fracture.

After a spell of deep unconsciousness the baby developed right- and then left-sided convulsions. Subsequently there was a residual right homonymous hemianopia and impaired hearing in the right ear. At 4½ months the head circumference was 41 cm, at 6 months 42 cm, and at one year only 43 cm. By 3 years old the head circumference was 45 cm. At 5½ years old the head circumference was only 46 cm, and the boy looked like any other microcephalic child in the ward of a subnormality hospital.

The full pattern of developmental quotients (Ruth Griffiths scales) is shown in the table. The intellectual loss became more pronounced as the child grew older. The face and body continued to grow normally; the brain and cranial growth lagged. Residual right homonymous hemianopia and partial right deafness persisted up to and beyond the age of 3, but by the age of 5½ these features, together with minimal right hemiparesis, were insignificant in comparison with the intellectual deficits and certain behavioural features. The general development quotient at 5½ years was 26% (Ruth Griffiths scale). The child continued to show a marked tendency to rock and scream, with distractibility, irritability, and restlessness.

Developmental Quotients in Case 2 (Ruth Griffiths Scales)

Age	4 m	5½m	8½m	1yr 6½m	2yr 1½m	2yr 8m	3yr 2½m	5yr 4m
Time after battering	3 wk	2½m	5½m	1yr 3½m	1yr 10½m	2yr 5m	2yr 11m	5yr 1m
General quotient	68%	88%	85%	51%	42%	50%	42%	26%
A: Locomotor	91%	87%	85%	66%	67%	75%	57%	36%
B: Personal/social	64%	87%	90%	47%	39%	45%	43%	26%
C: Hearing and speech	84%	97%	72%	41%	35%	43%	33%	17%
D: Eye and hand	0%	81%	90%	53%	36%	50%	45%	26%
E: Performance	77%	87%	85%	43%	32%	36%	34%	25%

CASE 3

A boy healthy at birth (3 weeks premature, normal delivery, birth weight 7 lb 13 oz (3543 g)) developed normally until 7 months old. The head circumference was not measured at birth, but detailed specialist examinations were carried out on the baby between birth and 2 months old on account of the mother's anxieties, importunacy, and social problems. When the baby was aged 2 months the specialist's report ended, "Healthy baby . . . no need for (further) review". At 7 months the baby was battered by the father. There were multiple bruising, fundal haemorrhages (both eyes), fractures in both parietal bones, and old and recent fractures in two ribs and the right tibia. Brain operation disclosed contusion of the left cerebral hemisphere, 10-15 ml hygroma, and subdural collection of blood with some solid clot. A small clot was also found in the right hemisphere. Five days later another operation (right craniotomy) was performed to suck out liquefied brain.

Subsequent investigations and observations indicated another collection of blood between the falx and the medial aspect of the cerebral hemisphere. Subsequent progress was poor, with whimpering, fretfulness, disconjugate gaze, sluggish pupillary reactions (especially on the left), up-going plantar reflexes, and flexed upper limbs. The head circumference measurements at the time of the battering and over the next 1½ months showed little variation which could be attributed to the operative interventions or raised intracranial pressure. The figures, between 43 and 45 cm, were within the range of normality for a child of 7-8½ months old.

Over the next few months the child remained in hospital. Bilateral spasticity persisted. Vision was seriously impaired but hearing was satisfactory. Swallowing was difficult but nutrition was easily maintained and body growth progressed. At 10½ months the Ruth Griffiths assessment gave a D.Q. of 12%. At 4½ years old the child remains in hospital, profoundly mentally retarded, with a head circumference of 45 cm. If allowance is made for the bilateral spasticity, his body and face continue to grow fairly normally, but his skull has hardly grown at all.

Additional Child Abuse

The three children reported on above had five full brothers and sisters (and further half and step brothers and sisters), most of whom had a variety of substitute parents. As babies, toddlers, or very young children, four of the full sibs had suffered hunger, thirst, ill-usage, and neglect. The fifth suffered scalds on buttocks and heels, injuries to the neck, damage to hearing, and haematomata and bruising on the head. Of the four neglected sibs one also was taken into care after neglect, mismanagement, and parental violence resulting in facial bruising. This child was hyperactive, unmanageable, and "backward" by the time foster-care was started. Another of the full sibs, also "backward" now, is attending the child guidance clinic.

Discussion

The Registrar General's Advisory Committee on Medical Nomenclature and Statistics does not include in its *Studies on Medical Population Subjects*⁶ a category of mental retardation attributable to baby battering. Microcephaly appears under the aetiological heading "(Mental Retardation) associated with diseases and conditions due to (unknown) pre-natal influence".

Doctors responsible for the care of abusive families must carry out frequent ophthalmoscopic examination. Where there is ferocious or frequent shaking of babies,^{2 7} or bruising to the heads and faces of young children, it is often a matter of chance which children are unfortunate enough to suffer the brain damage. A detailed survey on microcephaly in the Fountain Hospital, London,⁸ gives a clear analysis of the condition, and some of the case descriptions show uncomfortable similarities to those given above.

Professional reports on the three abusive families attenuated the information (compare Oliver *et al.*⁶). This tendency has the effect of (1) increasing the risk to sibs in abusive families, and (2) underestimating child abuse as one factor in causing certain types of microcephaly. In fact child abuse may be contributing

a notable proportion of cases to the hospital population of mentally subnormal patients.

I thank Dr. Lilian Jones for help, particularly in the records of serial measurements.

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Letter from . . . Denmark

Too Much, Not Too Little ?

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British Medical Journal, 1975, 2, 264-265

Judging from English medical journals it is a noteworthy problem that quite a number of your young doctors leave these isles to seek their fortune elsewhere. Working conditions, it appears are not sufficiently attractive within the National Health Service. In Denmark we are faced with the reverse problem, so to say—that is, young doctors do not leave the country in sufficient numbers. This odd statement needs some explanation.

By tradition admission to the three Danish universities with medical schools is free for everybody who has passed his or her finals from high school, and medicine has always attracted a fair share of undergraduates. During the 1960s the annual output of new doctors rose, but the decade also saw a corresponding expansion of hospital services, so ample numbers of suitable posts were available. Such were the absorbing powers of hospitals that there was even a certain overall shortage of staff. Peripheral hospitals in what were considered less attractive parts of the country were severely understaffed, and as might be expected, general practice also suffered.

From 1960 to 1970 the number of G.P.s remained unchanged, while both the population and its demand for medical care were growing. Those were the days when serious people all over the world did not give general practice much chance to survive, as it was expected that hospitals would continue to drain the pool of doctors.

Social Medicine More Popular

Nevertheless, the number of medical students has increased even more than expected, but parts of the whole picture have changed. Students and young doctors have developed a growing interest in the social aspects of medicine and consequently an interest to enter general practice. Furthermore, because of unsatisfactory state finances—to put it mildly—the Government has now applied the brakes to slow down the expansion of the hospital services.

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Primary health care is now receiving due attention from the authorities. Qualitative and quantitative furtherance of its activities is considered desirable and is encouraged. With more graduates than ever before and fewer jobs in hospitals than was calculated some years ago, we now have what looks like a surplus of young doctors, but this is partly spurious. Many might be absorbed by general practice, but there are reasons why the problems are not solved as easily as would seem possible.

Admittedly, Danish medical students have some clinical training, but no one would venture to call it sufficient. So when the student qualifies as a doctor, by international standards, his qualification is real enough, but in Denmark it does not entitle him to professional work without supervision. Thus he is entitled only to further training in clinical departments, irrespective of which branch of medicine he is aiming at.

If he wants to enter general practice he must have at least two years' training in the major specialties such as internal medicine, surgery, gynaecology and obstetrics, and psychiatry, spending a laid down number of months in each department. He might choose an assistantship in general practice to begin with, but then only as a temporary measure. Back to hospital he must go for further training; so for various reasons it is no happy solution (for the young doctor or the principal) if he does his clinical training the "wrong way round." But training posts are scarce, and it is feared that this state of affairs will continue for some considerable time, owing to shortage of central funds.

So we are in the most cumbersome situation of backward failure in the system resulting in the unemployment of young colleagues. General practice might offer a solution, but so far mainly in theory. This channel is blocked owing to the requirements of hospital training before registration as a G.P. Why not dispense with regulations and let general practice take doctors straight from university and train them appropriately then and there? Though it looks like a simple and sensible solution, it is perhaps too simple, creating new problems for the future that will be even more difficult to solve.

Improving the Image

In the 'sixties the image of general practice was not too flattering, and so from its own ranks rose the demand that something ought to be done. Working conditions and quality should be improved greatly, it was argued, and general practice ought to