Here there is the expected type of inequality in rates when we pass from urban to rural conditions; this is not explained by an excess of females at risk in the more vulnerable 10 to 14 age-group—for example, see detailed table for Bungay (Table III).

TABLE III

Age-group (Years)	5-9	10-14	Total	Both Sexes 5-14
No. of girls at risk ..	126	159	285	780
Attack rates (%) ..	15.1	34.0	25.6	20.1
No. of girls with hepatitis ..	19	54	73	157
Expected numbers, for equal attack rates on boys and girls ..	57.4			
No. of boys at risk ..	142	353	495	
Attack rates (%) ..	12.7	18.7	17.0	
No. of boys with hepatitis ..	18	66	84	
Expected numbers for equal attack rates ..	99.6			

For the age-group 5-14 years $\chi^2=7.88$ for $D=1$, whence $P<0.01$, which is significant.

Summary and Conclusions

Under certain conditions, which are enumerated, an infection with the bowel-to-mouth type of spread should show a high attack rate in females. A school epidemic of infective hepatitis provides an example.

Bowel-to-mouth transmission of this disease has been proved experimentally in volunteers; this epidemic appears to be a demonstration in the field of the same fact.

The infection was not spread by injections of poliomyelitis vaccine given at a time when the extent of the epidemic was not realized.

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"County Hall, London, has acquired five letters from Mrs. Humphry Ward, written to 'Dr. Barlow,' afterwards Sir Thomas Barlow, physician to Queen Victoria. They have been given by Miss Helen Barlow, his daughter. They are written in a clear hand, and, naturally, well phrased, and they belong to the 1898-9 season when Mrs. Ward was organizing the Tavistock Settlement, which now bears her name. She wrote to Dr. Barlow about the invalid children's school she wanted to found. She asked him to suggest a doctor for the committee, and later invited him to see the school and take tea with her. Finally she thanked him for a 'generous gift'—presumably money. The letters have a social significance, for this school for cripples became, as Mrs. Ward prophesied, 'the beginning of a general scheme for invalid children's education.'" (*The Guardian*, September 29, 1960.)

LONG-TERM FOLLOW-UP OF HYDROCEPHALIC INFANTS TREATED BY OPERATION

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Before the introduction of plastic substances which human tissues would tolerate without reaction, surgeons strove mightily, but largely in vain, to lead unabsorbed cerebrospinal fluid from the spinal canals of hydrocephalic infants to sites where it would be absorbed. Quincke (1891), Parkin (1893), and Cushing (1905) were the principal pioneers, and the German surgeon Heile from 1910 to 1927 the most persistent (Heile, 1925). For twenty years thereafter few such operations seem to have been performed, but with the addition of "polythene" tubing to surgical equipment, surgeons began again to anastomose the ventricles or the spinal theca to the ureter, mastoid cavity, peritoneal or pleural cavity, vertebral marrow, jugular vein, and many other likely and unlikely sites.

It is not the purpose of this paper to advocate any particular method, although the cases described were all treated by theco-peritoneal anastomosis. Each method has its champions, and the results overall are claimed to show from 30 to 80% of "cures" varying widely according to the definitions of hydrocephalus and the criteria for operation. Laurence (1958) followed up 182 untreated hydrocephalic infants and showed that half of the survivors were educable and potentially useful members of society. This by implication raised the question of the advisability of treating hydrocephalus surgically.

As the long-term investigation of cases operated on is limited by the small number of years in which the operation has been technically practicable, it will not be possible for a long time to assess the intelligence and social usefulness of a large surviving series. It is, however, over seven years since the first infants were operated on in this centre, and the five survivors of the eight children treated during the first year are now at school. The investigation of these children's present status by psychologist, psychiatrist, and neurological surgeon is the subject of this paper. Although the number is small, the series seems fairly representative of the larger one presenting in the following years, and the findings, although tentative, may be important.

Material and Results

Eight infants with communicating hydrocephalus were operated on during 1952, of whom three died. One developed a staphylococcal meningitis six weeks after operation. One died a year after operation, and at post-mortem examination was found to have large chronic subdural haematomata, which had probably developed in the immediate post-operative period as the result of a too sudden lowering of the intracranial pressure. One

was under treatment for gastroenteritis when the hydrocephalus was observed. After operation he died from a recurrence of this disorder.

The following are the clinical histories and present state of the five survivors.

Case 1

This baby was first seen in the premature ward of the Belfast Maternity Hospital. She was 1 week old and had been born four weeks prematurely, but without complications. Her head was expanding rapidly and measured 41 cm. in

FIG. 1.—Case 1. Air study showing ventricular size, and thickness of surviving brain.

circumference. Ventriculography showed a communicating hydrocephalus with a surviving pallium 2 cm. thick (Fig. 1). The ventricular fluid was xanthochromic and the protein was 100 mg./100 ml. Operation was delayed for one week to give opportunity for spontaneous arrest or the reduction of the protein level in the cerebrospinal fluid. At the end of this time the skull circumference was 44 cm. and the protein 50 mg./100 ml. Theco-peritoneal anastomosis was performed. The fontanelles became depressed, and skull expansion ceased. At 6 months the child did not appear to see, and had constant spontaneous nystagmus. At 1 year she was standing with support and could see, but had developed an alternating squint as well as the nystagmus. The optic disks were pale. She walked and cut her teeth at the usual times and was talking well by the age of 3.

She was easily trained, but started to wet the bed again when a baby sister was born; she was then 3½. She continued to be jealous of her younger sister until she went to school, but her aggressive tendencies then came under control, and, if anything, she became shy and self-effacing. This prevented her complaining enough when she could not see the blackboard, and, as a result, she lagged behind the other pupils in arithmetic. When this was put right she improved, and is now an average pupil, holding her own in the middle of the class. Her I.Q. is 100 (Stanford-Binet). She is happy at school and makes friends easily. She tends to follow rather than lead, but likes to mother and look after smaller children. Her alternating squint is still under treatment, and the nystagmus persists. She is 7½ years old.

Case 2

This baby was born in April, 1952, by caesarean section. There had been no disproportion in a previous pregnancy, so it is likely that he was hydrocephalic at birth. The skull expanded slowly, and he was 8 months old before it was

appreciated that his head was too large. He had no other symptoms. On admission the skull circumference was 52 cm. and the fontanelles were tense. Ventriculography revealed a communicating hydrocephalus with only 0.5 cm. surviving-brain thickness (Fig. 3). His lower limbs were spastic but he was otherwise normal on examination. He was operated on in spite of the thin pallium. For the first four days drainage was satisfactory and then tension built up again. The theco-peritoneal tube was inspected and found to be blocked at the abdominal end. It was replaced, and for the next three months functioned intermittently, being apparently blocked for about half the time. Thereafter drainage was satisfactory, but the skull meanwhile had expanded to 56 cm.

At 18 months he was standing with support. Other milestones were passed at the normal time. At 2 years he had a good vocabulary but his gait was spastic. At 3 years he was supplied with splints to correct his genu valgum and equinovarus. At four years his spasticity was less and his intelligence appeared to be normal. Rote learning was always above the average judged by nursery standards. He is the second child of three, and at present the most independent. He has, of course, received more attention than the other two, and, probably as a result, tends to insist on having his own way. He has already decided on a career in medicine, probably seeing the doctor as the all-powerful individual to whom even parents defer. He is friendly, and wants to join in everything, but the limitations set by the residual spasticity of his legs prevent his participation in some games. He does not seem to resent this at the present time. His teachers regard his school performance as average and his I.Q. is 104.

FIG. 2.—Case 2. Air study showing ventricular size, and thickness of surviving brain.

Case 3

This baby was admitted to hospital in June, 1952, at the age of 10 months. Her birth had been uncomplicated after induction at 38 weeks because of Rh incompatibility. At 5 months the parents thought the head was abnormally large, but she was not referred for examination then. At 10 months the head was still growing too quickly and she was vomiting frequently. She was then trying to hold up her head but not sitting up. She played with toys, but was thought to be a little retarded.

On examination the skull diameter was 49.5 cm. and the anterior fontanelle was widely open and tense. There were constant rotatory nystagmoid movements of the eyes but no other neurological abnormalities. Ventriculography showed symmetrical dilatation of the ventricles and no obstruction to ventricular outflow. The surviving pallium measured 1 cm. Theco-peritoneal anastomosis with polythene tubing was done. Post-operative progress was normal and the fontanelle began to close. She did not walk efficiently until she was 2 years 3 months old, and showed a tendency to genu

recurvatum, for which she was given corrective splints. At about this time there was an episode of vomiting and fretfulness for which she was readmitted. Intracranial pressure was 275 mm. Symptoms and pressure settled in three days, and she had no further trouble. During her third year she was often fretful. Walking was unsteady at times and she had a tendency towards genu valgum.

In July, 1954, the family went to Canada and the child began to attend school at the age of 4. During that year she had two generalized epileptic attacks and is still on anticonvulsant drugs. Her early school reports were encouraging, and she was said to be "82% normal." It is not known if this refers to I.Q. or is a general assessment, but she has remained in the class appropriate to her age. She works and plays happily, but apparently has aggressive outbursts. A letter from the mother says there are no domestic troubles, and referring to the child's earlier walking difficulties, that "—— can now run, skip, hop, and do the hula hoop." Her I.Q. is not known.

Case 4

This baby was born in May, 1952. His birth was normal but skull growth was probably excessive from the start. He was admitted to hospital at the age of 4 months, obviously hydrocephalic but not showing any neurological abnormalities. Skull circumference was 48 cm. Ventriculography showed a communicating hydrocephalus. Brain thickness was 0.5 to 0.75 cm. A theco-peritoneal anastomosis was done. The sutures began to close. His early milestones were passed normally, but he did not walk until he was just over 2. His behaviour and vocabulary were appropriate to his age. At 3 years 2 months he became lethargic and vomited frequently. After two weeks a left sixth-nerve paresis was noted.

On admission he had, in addition, bilateral papilloedema and a coarse nystagmus in all directions. The fontanelles were closed. Skull circumference was 54 cm. At operation it was found that the abdominal end of the tube had been pulled by growth out of the peritoneal cavity and was lying in a cystic collection of fluid. An outer tube was threaded over this, and led into the abdomen to allow for further growth in telescope fashion. One month later the intracranial hypertension recurred, and re-exploration showed that the outer tube had been pulled into the peritoneal cavity, and the inner tube had fractured over a rib, 5 cm. above its abdominal end. A second tube was threaded over the still functioning spinal end, and this system continued to function for the next two and a half years. He still had a partial sixth-nerve paresis. He went to school at 4½. This was rather early, but he wished to be with the neighbour's children. He had an attack of headache and vomiting lasting one day just before his fifth birthday, but on admission to hospital settled down completely.

In January, 1959, when he was 6 years 8 months old, he had another attack of vomiting and drowsiness, and this time developed papilloedema. A Spitz-Holter valve was used to anastomose the dilated ventricular system to the superior vena cava. He was last seen in May, 1960, then aged 8 years, and remained healthy and active. He was left-handed, and had more difficulty than his schoolfellows in learning to write, having a strong tendency to reversals. In reading and other subjects his performance was average, and his teachers were satisfied. He has one brother, two years younger, with whom he gets on well. He tends to be the more aggressive of the two, but not pathologically so. His I.Q. is 108.

Case 5

This baby was admitted to hospital in September, 1952, at the age of 11 months. He was born eight weeks prematurely and his head had always been thought to be a little large. Five weeks before admission he began to vomit frequently and his head grew rapidly. The skull circumference was 53 cm. and the fontanelles were wide and tense. Ventriculography showed a communicating hydrocephalus. The pallium measured 1 cm. anteriorly and 0.5 cm. posteriorly. After admission he had several attacks

of opisthotonos and extensor rigidity. The operation of theco-peritoneal anastomosis was urgently carried out. After operation extensor rigidity of the lower limbs continued for three days and he then progressed normally. The skull circumference decreased by 1 cm. and the fontanelles closed. At 16 months he was trying to stand. Just before he was 2, his parents emigrated to New Zealand. He was not seen again until he was 5.

The history was then given that six months after arrival in New Zealand he developed a severe gastroenteritis, attributed by his parents to eating bad fruit. The following day he could not move his legs, showed complete loss of sensation below the umbilicus, and was incontinent of urine and faeces. Presumably he had some form of myelitis. According to his father the condition continued unchanged for two years—he was then 4. Bladder and bowel control then returned, followed by restoration of sensation and the development of spasticity and some movement in the legs. He returned to Ireland in 1956. There was no evidence that he had ever developed pressure sores, his sphincters were competent, and he had a spastic paraparesis. The beginning of his schooling was delayed because of his difficulty in walking and his parents' natural unwillingness to send him to a residential institution for cripples. He began home tuition at the age of 5½ and went to school when he was 6.

This child has had a great deal of care from very devoted parents, but he is not spoilt. He has an elder brother eight years older, and they get on well together. He tends to ignore his disability and does not like to be treated differently from "normal" children. He is happy at school, where his reports indicate his attainments to be slightly above average and his personality pleasing. His I.Q. is 110.

Clinical Summary

This group, small though it is, presents an interesting cross-section of treated hydrocephalic infants of the "infantile" or idiopathic type (idiopathic because it is still undetermined whether the cause is overproduction or under-absorption of C.S.F.). It may be that these are all cases of tentorial or cisternal obstruction (Laurence, 1959), but the evidence of air pictures taken in 1952 is not conclusive enough to be dogmatic on this point. They presented at ages varying from 1 week to 11 months. They all had grossly expanded brains, but only the two children with spastic legs and nystagmus respectively had any neurologically detectable lesion. One child had to be operated on twice in the first month, and one required a second drainage-tube when he outgrew his first. The latter also fractured his second tube over a rib margin. One developed a permanent nystagmus, two alternating squints, and one a sixth-nerve palsy. One developed epilepsy. The well-known complications of subdural haemorrhage and meningitis were represented in the non-surviving members of the group. One developed what must be a very rare type of localized spinal meningitis or myelitis from a bowel infection—the infection presumably travelling along the polythene tube.

In spite of their many adventures, all the survivors have reached school age with I.Q.s just over 100—this figure is regarded as purely coincidental in a small series—showing no obvious personality disorders and apparently happily integrated into their families. The prognosis for adult life is still uncertain, but a fairly hopeful one seems to be justified.

Discussion

Information on the long-term follow-up of operations for hydrocephalus is scanty. Scarff (1959) has followed up two series of cases treated personally by endoscopic cauterization of the choroid plexus, a method which no

longer enjoys great popularity. Five of the first series of 20 are alive, 17 to 19 years after operation, two of whom are of subnormal intelligence. Thirteen of the second series of 19 are alive 9 to 11 years after operation. Five are severe mental defectives, three are moderately retarded, and five are of normal intellect. Jackson and Snodgrass (1955) followed 62 patients operated on in a four-year period. Only four had drainage-tubes for more than three years, and, of these, only one had infantile hydrocephalus. About 40% of these patients were benefited for over two years, and the authors think that the longer the patients are followed the worse will be the results. This is not in agreement with the experience in this centre, where most of the failures have occurred in the early post-operative months. Of those surviving over two years, only one has had to be operated on again, and that successfully.

It seems likely that only a small percentage of these infants continue to require drainage for ever, because a tube allowing only 2 in. (5 cm.) for growth at either end at the time of its insertion is outgrown some time in the child's third year. What is required of the operation is to supply a safety-valve which will function efficiently for two years. At some time during this period balance between fluid production and absorption will probably be achieved. This is a speculative working hypothesis for use until the pathology of communicating hydrocephalus is understood. The common diagnosis may be cisternal obstruction as mentioned above.

This paper helps only in a negative way in the choosing of patients for operation. It has been suggested that if less than 2 cm. of pallium remains, as judged by ventriculography, operation is not worth while (Scarff, 1952). Only one of the infants described here had a brain thickness of more than 1 cm., and in two it was about 0.5 cm. We have not had cause to regret operating on these children. If there is any criterion for selection it is not pallial thickness. If there is no clinical evidence of gross cerebral damage, and there seldom is, selection should probably be by distillation of the combined experience of the attending paediatricians and neurological surgeons. There is at present no single clinical or laboratory criterion of operability. Babies who "don't look as if they would do well" probably should not be operated on, but these are in a small minority. Most infants with communicating hydrocephalus look well unless they have been vomiting over a long period. Babies with associated myelocoeles or aqueduct stenosis or who have developed obstructive hydrocephalus after meningitis or neonatal haemorrhage, are a different matter, and the operability in each case must be decided on its merits.

At the beginning of this paper it was said that Laurence's (1958) figures for untreated hydrocephalics of mixed aetiology raised the whole question of the surgical treatment of this disorder. If his figures are broken down, it is found that, out of 182, 46% survived, 30% had I.Q.s of over 50 and were presumed educable, and only 6.5% had I.Q.s over 100. In so far as the present small series gives any guide to surgical treatment, it would suggest that the cisternal obstruction or communicating group should almost always be treated surgically and that the outcome is likely to be favourable if the early complications of operation are avoided.

Summary

A follow-up study has been made of five children surviving out of eight operated on for communicating

hydrocephalus in 1952. Their physical, emotional, and intellectual status was reviewed and found to lie within the normal range.

The aim of operation for communicating hydrocephalus is discussed. If the early complications of operation are avoided and the infant is protected against high intracranial pressure for about two to three years the prognosis for normal survival appears to be good. There is still no definite criterion of operability. Thickness of surviving brain is not a reliable prognostic guide to the intellectual or emotional status of the survivors.

We are grateful to Professor F. M. B. Allen and other paediatricians in Belfast who referred these patients and helped in their care; to Dr. W. H. T. Shepherd, who did the ventricular studies; and to Mr. R. G. Woods, who took the photographs.

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SEMINAL ANALYSIS IN 22 HOMOSEXUALS

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The concept of male homosexuality as a form of constitutional deviation has given rise to a variety of somatic, anthropometric, and genetical studies directed to the discovery of physical correlates of the deviation. Particular attention has been paid to body build, hormone balance, and the structure of cell nuclei, but little work has been done on primary gonadal function in this connexion. Raboch and Nedoma (1958) reported that of 194 homosexuals examined at the Sexological Institute, Prague, only nine had hypoplastic testes (measuring less than 3.4 cm. in the long axis). We have been unable to trace any reference to seminological studies in homosexuals. It is well known that homosexuals who marry often prove themselves fertile, but they may be unrepresentative of homosexuals as a whole: for example, a much higher proportion of the married group may be bisexual.

To test the hypothesis that homosexuality is correlated with testicular inadequacy, seminal analysis was carried out in 22 homosexual men of whom 20 were single and none had more than a very small conscious heterosexual component in his make-up.

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