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Changing patterns in paediatric surgical care

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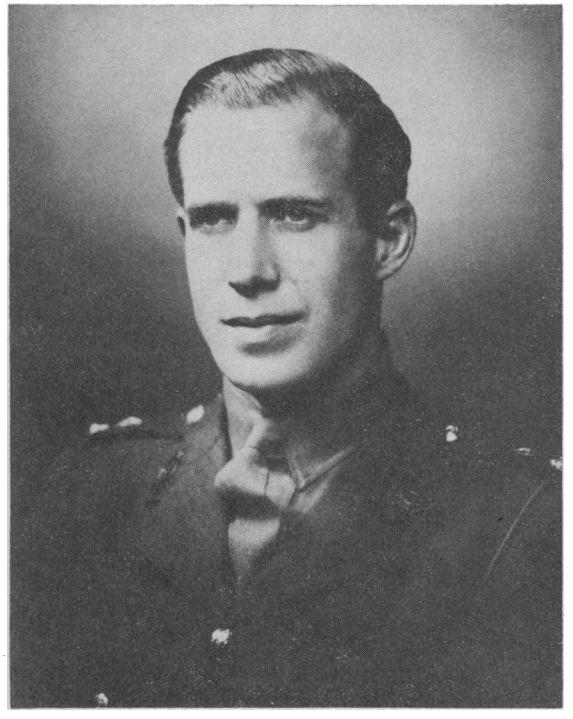

FIG. 1 *Lt-Col Alex Simpson Smith, 1940.*

Alex Simpson Smith was born in Huddersfield in 1900, the only boy in a family of four children. Both of his parents were deeply religious and this had an effect on his later life, which was dedicated to truth and devoted service to others.

Unfortunately, at the early age of 3 years he was burnt following an attempt to boil a kettle for a doll's tea party. In 1903 the treatment of burns was unsophisticated, with regular changing of dressings, which was very painful as anaesthetics were not being given and early skin grafting was not established. Sepsis was an inevitable sequel. Alex Simpson Smith's life lay in jeopardy and at one stage amputation of his arm was considered; his father refused consent, preferring that his son should die rather than suffer such a mutilation. Fortunately Alex survived, but with a crippled right hand and scarring of the body.

This long illness at an early, vulnerable age must have had a marked effect upon him. He was determined to overcome his handicap and to excel in manual skills. This was shown by his athletic success at school and university and in his later surgical career. At school he was head boy, captain of shooting, and in the cricket and football 1st XIs. At university he learnt to play rugger, gained a place in the Guy's Hospital 1st XV, and played several times for Surrey.

In 1919 Simpson Smith went to Cambridge with an exhibition in mathematics but intent on studying medicine. He passed his Tripos with 3rd class honours and went on to Guy's Hospital, qualifying in 1925. In 1930 his took his MChir and headed the list of candidates in this examination. His surgical training culminated in his appointment in May 1934 as Honorary Surgeon to the Hospital for Sick Children, Great Ormond Street, and in November 1934 as Assistant Surgeon to the West London Hospital. Thus by 1939 he was established as a consulting surgeon with every sign of becoming a leading figure in British surgery[1].

A few weeks before the outbreak of the Second World War he had married the younger daughter of Captain T B Davis, the owner of the famous racing schooner *Westward*[2].

During the Munich crisis in 1938 Alex had volunteered for service in the RAMC, so in 1939 he was immediately commissioned and posted to the 2nd London General Hospital at Shenley as a surgical specialist. In January 1941 he was posted to a base hospital in North Africa and by January 1942 was on active service in the 62nd General Hospital at Tobruk as officer in charge of the surgical division. He remained at this hospital until after the fall of Tobruk following the retreat of the 8th Army. During his time there a special study had been made of the treatment of burns and it was felt that this invaluable information should be transmitted to Cairo. Lt-Col Simpson Smith, together with two other officers and a sergeant of the Long Range Desert Group, undertook this hazardous venture. With a lorry and extra supplies of petrol they vanished into a July night never to be seen again.

Thus we had lost a man in his prime who at the early age of 42 years had already made a considerable impression on British surgery.

The theme of my lecture today is changing patterns in paediatric surgical care. As with sailing in the Solent, we no longer see such

From the 30th Alex Simpson Smith Memorial Lecture, West London Hospital, 19th October 1977.

beautiful yachts thundering to windward but large numbers of smaller yachts racing as keenly as ever. There can be no doubt that the burn which Simpson Smith sustained at 3 years of age had a very marked effect on his life and left him with a handicap. His courage and energy and support from his family allowed him to forget this unpleasant experience and overcome his disability. Unfortunately a handicap does not always have such an effect and one has seen mental illness and marital disharmony developing in the parents of children with severe physical handicaps such as spina bifida, with equally disastrous effects upon their children. It has been well demonstrated that an admission to hospital at any age is an unpleasant experience but particularly so for the young child, and the effects may be temporary or permanent. Thus we should endeavour by every means at our disposal to minimise these effects. This can be carried out by trying to make their inpatient stay, *if necessary,* as pleasant as possible and to ensure that its length is as short as possible. As examples of how this may be achieved I will discuss our experiences with paediatric outpatient surgery in Southampton; the early discharge of patients; some advances in surgical treatment and changes in attitudes regarding the management of the newborn with spina bifida, duodenal obstruction, and exomphalos; and finally a few comments on life in a hospital ward for a child.

PAEDIATRIC OUTPATIENT SURGERY

The credit for pioneering day-case surgery for children in recent times must go to Mr Rex Lawrie of Guy's Hospital and the Evelina Children's Hospital[3]. However, there is nothing new about outpatient surgery for children as Nicoll[4] in 1909 published his observations on the treatment of 8988 patients over a 10-year period at the Glasgow Royal Hospital for Sick Children. His patients included 406 with hare lip, 18 with pyloric stenosis, 36 with spina bifida, and 220 with inguinal and umbilical hernia. I suspect that one of the reasons for the industry of this surgeon was his appointment as an outpatient surgeon without admitting rights! Nicoll laid down criteria for treating patients on an outpatient basis which are as valid today as then—namely:

'1) A much larger share of the operative work in a children's hospital should be handled on an outpatient basis, for the treatment of a large number of inpatients is a waste of the resources of a children's hospital or wards.

'2) Patients treated should be largely infants and young children because such children can easily be carried home in their mother's arms and rest there more quietly than anywhere else.

'3) Separation of the child from the mother is harmful.

'4) Preoperative skin preparation is unnecessary.

'5) Experience in herniotomies and abdominal section in young children treated as outpatients is reconciling me to view that we keep similar cases in adults too long in bed.'

A worrying aspect of outpatient surgery is the problem of the management of postoperative complications because of difficulties in communication which may exist between the hospital, the general practitioner, the patient, and the district nurse. This problem has been overcome by establishing a paediatric home nursing service, and our success has been largely due to the devoted care and attention to detail of our nurses in the management of the child in his home environment. The nurses are children's trained, visit our wards daily, and attend one of the regular ward rounds once a week, thus keeping abreast of any changes in surgical management. They also have the right to readmit a patient at any time should they become anxious about any aspect of home care.

Our day unit originally contained 5 beds, later increased to 6; eventually this will be increased to 8 beds in the final phase of the teaching hospital development. The unit is open for 5 days a week between 8 a.m. and 6 p.m. It is staffed by a sister and 2 staff nurses, with supporting staff all of whom are part-time. There are 10 lists allocated each week—that is, our day surgery has now become half-day surgery. Since the unit opened in April 1969 we have admitted over 10 000 patients, with a steady increase in the number of surgical patients treated each year from some 700 in 1970 to over 1000 in 1976.

Operative procedures

Three common surgical procedures may be considered.

CIRCUMCISION

This operation is suitable for day care irrespective of the age of the patient. Initially, because of postoperative pain, the operation was confined to children under 5 years of age. This policy has been changed recently, with the result that an increased number of patients have been treated in the past 2 years. It has been possible to treat the older children by using more potent analgesics to be given at home and also by the use of caudal anaesthesia, which is carried out after induction of general anaesthesia.

INGUINAL HERNIA

This common condition of infancy and childhood requires operative correction irrespective of the age of the patient. In childhood there is a peak incidence in the first 3 months of life which is associated with a high incidence of incarceration, especially in the premature infant. We have now treated over 1000 infants and children with an inguinal hernia on a day basis with satisfactory results and less disturbance to the family. The number of such patients treated each year has risen from an average of about 100 in 1969–72 to about 150 in 1973–76.

ORCHIDOPEXY

The indications for orchidopexy remain unaltered—that is, to improve spermatogenesis, to prevent malignant change in the retained testis, to prevent torsion and trauma to the testis, and to treat the associated inguinal hernia. To this list may be added any psychological or cosmetic benefit which is obtained.

The debatable question still concerns the timing of the operation. Recent evidence[5] suggests that the changes in the gonad become more marked and permanent after 2 years of age. In 1966 the average age at operation was 10.2 years. In recent years we have tried to ensure that this operation is performed before the child starts school at 5 years of age, but by 1976 the average age had only been reduced to 6.7 years (Table I); thus we are falling short of our aim.

The operation is suitable for day care although this has been a gradual development since 1969, the number treated having risen from 2 in 1969 to 20 in 1970 and 72 in 1976. Patients requiring inpatient care are those who are undergoing bilateral orchidopexy or a second-stage operation or those whose family circumstances make day care unsuitable.

Advantages and disadvantages of day-case surgery

Firstly, there is less emotional stress to the child as the separation from the mother and family unit is minimal, while the costs of travelling to the hospital for repeated visits are avoided. The parents may be anxious about the care of their child postoperatively, but much of this can be avoided by careful explanation to the parents by all members of staff and by the regular visiting of the nurses of the paediatric home nursing team.

Secondly, there is an enormous financial saving in the overall cost of providing surgery on a day basis. Contributing to this are a reduction in the waiting-list time, the use of part-time nurses to staff the unit, integration of the hospital with the services in the community, a possible decrease in the wound infection rate, and encouragement of the early discharge of patients following an inpatient operation.

The financial saving has been calculated on the assumption that patients for circumcision, inguinal herniotomy, and orchidopexy would in the past have been admitted for 2 nights in hospital. This is a shorter admission than the average length of hospital stay for these procedures in England and Wales in 1973 (Table II). The saving on a day

TABLE I *Orchidopexy; age at operation in 1966 and 1976*

Age at operation (years)	1966 (50 patients)	1976 (132 patients)
0–2	nil	9 (7%)
2–5	2 (4%)	33 (25%)
>5	48 (96%)	90 (68%)
	(Mean age 10.2 years)	(Mean age 6.7 years)

TABLE II *Mean length of hospital stay for 3 paediatric operations, England and Wales, 1973 (DHSS statistics)*

Operation	Mean length of stay (days)	
	Age 0–4 years	Age 5–14 years
Circumcision	1.76	2.28
Inguinal herniotomy	3.88	4.39
Orchidopexy	4.03	5.96

TABLE III *Ratio of day patients to inpatients for general paediatric surgical operations, Southampton 1970–76*

	1970		1973		1976	
Day patients	648	1:2	866	1:1.5	1009	1:1
Inpatients	1412		1320		1187	
Total	2060		2186		2196	

basis would be £70 000 annually and more than £700 000 over a 10-year period. Apart from the advantages of outpatient surgery to the child, such financial savings must be worth while.

In the nine years since outpatient surgery for infants and children was established in Southampton the ratio of day to inpatients has fallen from 1 : 2 in 1970 to 1 : 1 in 1976 (Table III).

One disadvantage of day-patient care in paediatric practice is that there is an increased pressure of work on the staff in the inpatient areas. The Department of Health and Social Security maintains that such an inpatient area should have the same nursing ratios as a normal paediatric ward in a district or teaching hospital. A research team is required to investigate the different levels of staffing required under different conditions, thus allowing some latitude in nursing establishment.

EARLY DISCHARGE OF PATIENTS

Acute appendicitis

Is it necessary for the child undergoing uncomplicated appendicectomy to spend 5 days in hospital? During the past 8 years we have been attempting to minimise the length of stay in hospital of children admitted with acute appendicitis. Our policy has been to discharge the patient 48–72 h after appendicectomy and then for the further nursing care to be carried out in the home by the paediatric home nursing team. Patients have had to be readmitted with wound infection or when a pelvic abscess has developed, but if this possibility has been explained to the parents it causes the minimum of inconvenience and in any case it is uncommon following appendicectomy for the non-perforated appendix. The average length of inpatient stay has been reduced to 4.55 days, which contrasts with the national average of 8.75 days (DHSS, 1973) and has resulted in a saving to the Health Service of £26 000 per annum.

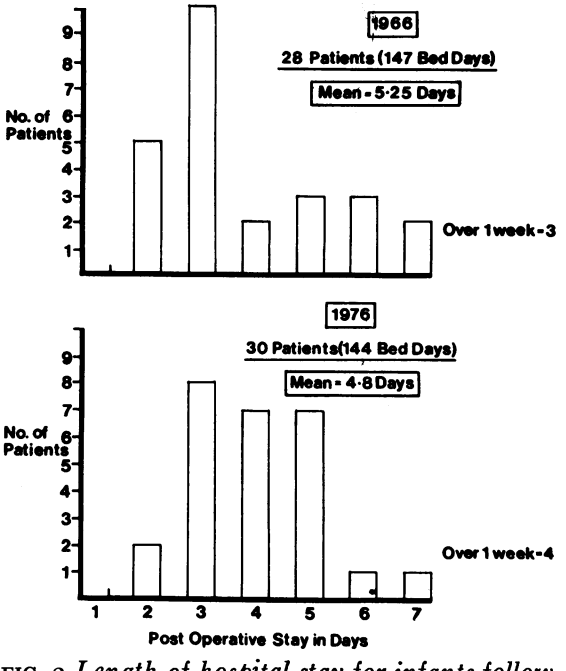

FIG. 2 *Length of hospital stay for infants following a Ramstedt's pyloromyotomy in 1966 and 1976.*

Congenital hypertrophic pyloric stenosis

The early discharge of patients following laparotomy for a Ramstedt's pyloromyotomy has been possible now for a number of years and in 1976 the average length of stay was 4.8 days compared with 5.25 days in 1966 (Fig. 2). This represents a financial saving of £600 per annum. This demonstrates an important point which is that in order to make worthwhile financial savings a change in policy must be made for common conditions. This would allow a better distribution of funds for the more complicated treatments which are now part of everyday surgical practice; it would also allow us to continue with the standards of care which we all expect and attempt to provide.

NEONATAL SURGERY

General observations

There has been a dramatic fall in the birth rate, from 17.8 per 1000 in 1966 to 11.9 per 1000 in 1976, and a fall in total births from over 750 000 in 1966 to just over 500 000 in 1976 (Fig. 3). This fall in the birth rate is reflected in a decrease in the number of neonatal surgical admissions. There has also been a change in the types and distribution of neonatal surgical admissions, infants with central nervous system defects being replaced to some extent by newborns with other neonatal surgical conditions. These changes in neonatal surgery can be demonstrated by considering the treatment of spina bifida, duodenal atresia, and exomphalos.

Ethical considerations

The saga of the surgical treatment of spina bifida is well known. With non-selective treatment and early closure of the back lesion the mortality was 18% in the first month of life (Fig. 4). This included surgical control of the associated hydrocephalus and careful monitoring of the changes in the urinary tract, with control of infection and relief of obstruction. At the same time active measures were taken to correct the orthopaedic deformities, and the families received counselling and moral support. Paediatric surgeons then found themselves faced with a dilemma, as the results obtained were unsatisfactory in many respects. The degree of mobility achieved was disappointing and many children relied more and more on the wheelchair as they grew older; double incontinence was a severe handicap despite urinary diversion and improvements in the design of appliances.

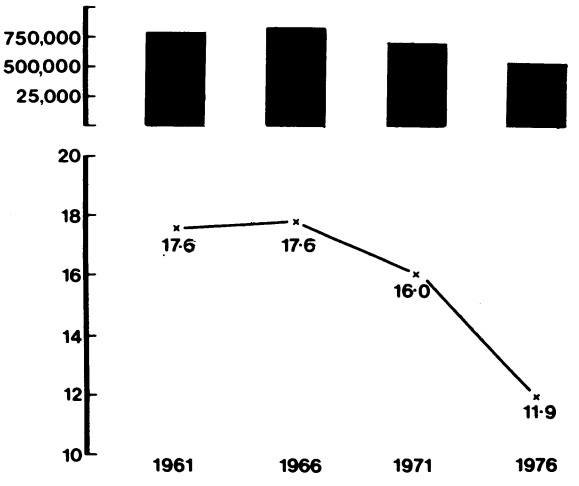

FIG. 3 *Total births and birth rate per 1000 in England and Wales at 5-year intervals between 1961 and 1976.*

These factors, added to which might be brain damage either from meningitis or failure to control the hydrocephalus, led one to reconsider the quality of life rather than survival. These facts, together with the changes in the law brought about by the Abortion Act in 1968, resulted in many surgeons changing their policy to a selective one. The criteria of selection, which include kyphosis, type, level, and size of the back lesion, the severity of the hydrocephalus, associated malformations, and personal or social factors, were then used to

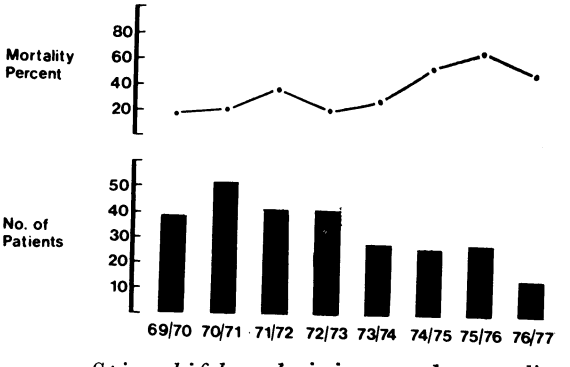

FIG. 4 *Spina bifida admissions and mortality April 1969–March 1977 inclusive.*

divide patients into two groups, those selected for intensive treatment and those from whom treatment was withheld. In adopting this policy one must be sure that one includes in the latter group only those severely handicapped infants who will almost certainly die in the first few weeks of life. Genetic advice is given about the risks of producing a malformed infant in any subsequent pregnancy, and amniocentesis during the 16th week of pregnancy is advisable to estimate the level of α-fetoprotein in the amniotic fluid. If this is elevated therapeutic abortion is offered. In the future estimations of α-fetoprotein in the serum of all pregnant women will become routine practice, with a resultant fall in the overall incidence of central nervous system defects.

Ethical considerations have to be taken into account also when treating duodenal obstruction in the newborn, as there is a high incidence of associated congenital defects (Table IV). Down's syndrome (trisomy 21) is one of the commonest and since 1970 our practice has been to withhold surgical treatment from such patients (Table V). One new advance has helped the surgeon: an emergency chromosomal analysis is now possible on actively dividing blood cells removed from the bone marrow, and within 3 hours confirmatory laboratory evidence is available to support the clinical diagnosis.

TABLE IV *Incidence of associated anomalies in a series of 40 patients with either duodenal atresia or stenosis*

Trisomy 21		14
Gastrointestinal tract		17
Malrotation	6	
Oesophageal atresia and tracheo-oesophageal fistula	6	
Anorectal	1	
Jejunoileal atresia	2	
Meckel's diverticulum	2	
Meconium peritonitis	1	
Ectopic pancreas	1	
Bands	1	
Cardiovascular system		4
Vertebral		6

TABLE V *Mortality of duodenal atresia associated with trisomy 21, 1961–69 and 1970-76*

	No of patients	Alive	Dead
1961–69	8	4	4
1970–76	6	1	5
Total	14	5	9

Omphalocele

CLASSIFICATION OF DEFECTS

The defects at the umbilicus can be classified according to their size and position into three main groups: exomphalos minor (hernia into the cord), exomphalos major, and gastroschisis. There are patients with defects which extend beyond these limits or who have associated defects, which has led to a proposed new classification shown in Table VI.

INCIDENCE OF GASTROSCHISIS

From a review of 236 reported cases of omphalocele and 278 reported cases of gastroschisis from the recent literature it appears that gastroschisis occurs twice as often as exomphalos and is increasing in frequency despite the fall in the birth rate. This is in keeping with our findings of 16 cases of gastroschisis out of 38 patients with omphalocele treated since our unit opened in 1969, although the increase in incidence of gastroschisis is not so marked. In a series of 100 infants treated at Great Ormond Street between 1938 and 1961 there were only 6 patients with antenatal rupture of the sac, none of whom survived, which contrasts with our 13 survivors out of 16 patients.

TABLE VI *Proposed classification of omphalocele and gastroschisis*

OMPHALOCELE
- *Non-syndrome omphalocele*
  - Type 1 (defect diameter <2.5 cm)
  - Type 2 (defect diameter 2.5–5.0 cm)
  - Type 3 (defect diameter >5.0 cm)
- *Syndrome omphalocele*
  - Lower middle syndrome (with bladder extrophy and vesicointestinal fissure)
  - Upper midline syndrome (with sternal, diaphragmatic, pericardial, and cardiac defects)
  - Beckwith–Wiedemann syndrome (with macroglossia and gigantism)

GASTROSCHISIS
- *Type* 1
  - Subtype A (<1/3 intestine altered in appearance)
  - Subtype B (1/3-2/3 intestine altered)
  - Subtype C (>2/3 intestine altered)
- *Type* 2 (defect length 2.5–5.0 cm)
  - Subtypes as above
- *Type* 3 (defect length >5.0 cm)
  - Subtypes as above

BIRTH WEIGHT AND ASSOCIATED MALFORMATIONS

The average birth weight of infants with gastroschisis was 2.266±0.26 (SD) kg, which contrasts markedly with the birth weight of infants with exomphalos minor (3.095 ± 0.92 kg) and exomphalos major (3.065 ± 0.54 kg). This low birth weight in the group of infants with gastroschisis, all of whom had universal mesentery, and the low incidence of other congenital anomalies which are usually related to the gastrointestinal tract, jejunal atresia (1/16) and ileal duplication (1/16), suggests that these defects are probably acquired during pregnancy and may be included as an integral part of the gastroschisis condition.

In exomphalos minor and major the incidence of associated anomalies is high (Table VII). Such defects include chromosomal defects, congenital heart disease, and non-specific syndromes such as the Beckwith–Wiedemann syndrome, vesicointestinal fissure, and ectopia cordis. These major defects result in a high mortality (Table VIII). Thus these two differences between gastroschisis and exomphalos suggest that they are separate conditions with different clinical challenges and response to surgical treatment.

TABLE VII *Congenital anomalies found in association with exomphalos minor and exomphalos major*

Exomphalos minor (12 patients)	
Universal mesentery	9
Trisomy 18	1
Situs inversus	1
Congenital heart disease	1
Beckwith–Wiedemann syndrome	1
Exomphalos major (10 patients)	
Transposition of the great vessels: single ventricle	1
Cleft palate	1
Universal mesentery	10
Annular pancreas	1
Multiple congenital defects (severe)	3

TABLE VIII *Mortality in exomphalos and gastroschisis*

Type	No	Dead	Mortality (%)
Exomphalos minor	12	1	8
Exomphalos major	10	4	40
Gastroschisis	16	3	19
Overall mortality	38	8	21

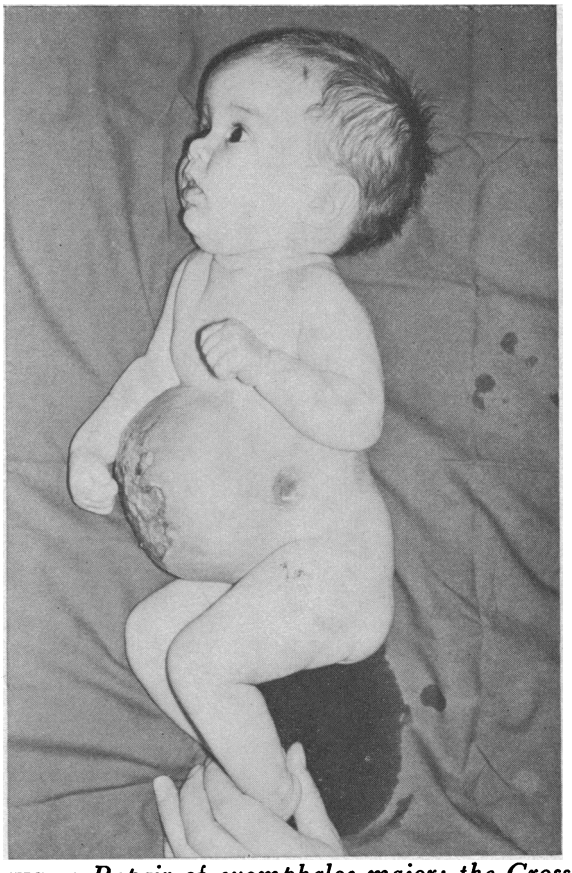

FIG. 5 *Repair of exomphalos major: the Gross method.*

SURGICAL TREATMENT AND RESULTS

Exomphalos minor Primary repair of the defect is the treatment of choice, with excellent results. The only death in our series occurred in an infant with a chromosomal abnormality (trisomy 15/18).

Exomphalos major The high incidence of associated defects may lead one to withhold treatment, as occurred in 2 of our cases. In uncomplicated exomphalos major the problems are related to the size of the sac, which is large and contains liver and small and large bowel, and the small size of the true abdominal cavity. Primary repair in such patients led to a cardiorespiratory death as there was interference with respiration due to splinting the diaphragm and a reduction of venous return to the heart. These problems were partially solved by the Gross method of repair (Fig. 5) and by the Grob method, both of which allowed epithelisation of the sac, thus allowing one to proceed to a

secondary repair at a later date. The latter method of repair fell into disrepute owing to the dangers of mercury poisoning. The treatment of choice is now to cover the defect with a Silastic sheet and then to reduce the contents into the abdomen over a period of 2-3 weeks, thus achieving full repair at an early age.

Gastroschisis has been a challenge to the neonatal surgeon. In the past the mortality was high, ranging from 50 to 100%[8]. The improvements in results reported in recent years are due to careful management of the prolonged ileus which follows closure of the defect either with or without the use of Silastic sheet. Thus improvements in respirator care in the newborn, the use of prostheses, and intravenous nutrition have resulted in an improved prognosis for those infants who previously died. This is very rewarding because of the low incidence of other congenital anomalies.

MORTALITY IN NEONATAL SURGICAL PROCEDURES

The initial reduction in the mortality of neonatal surgical operations was achieved by concentrating the material into specialised units. In Liverpool, for example, the mortality in 1949 for a neonatal surgical operation was 72%. This high mortality was due to failure and delay in diagnosis and failure to concentrate such cases in one hospital or ward area. In 1953 the Liverpool Regional Neonatal Surgical Unit was opened and within 5 years the neonatal surgical mortality was reduced to 24%[9]. Since then there has been only a gradual improvement in total neonatal surgical mortality, but in our experience of 376 patients admitted over a 5-year period between 1st April 1969 and 31st March 1974 (excluding spina bifida patients) the mortality was 17.5%. This fall has been due to improvements in intensive care relating to the respiratory tract, intravenous nutrition, and technical improvements such as the use of Silastic as previously described.

LIFE WITHIN THE HOSPITAL

Visiting and residence for mothers

The publication of the Platt Report[10] has led to many improvements in hospital care for the infant and child. The recommendation for unrestricted visiting and residence for mothers in hospital accommodation has meant that the trauma of a hospital admission has been reduced. However, there are few grounds for complacency, as a review by the National Association for the Welfare of Children in Hospital in 1975 of over 800 wards showed that on the day of a surgical operation only 76% of mothers were allowed to visit before and only 69% after the operation. Visiting on other days was less than 10 h a day on over half of the wards. In summary, only 20% of wards allowed 24-h unrestricted visiting, a further 33% allowed daytime visiting, but the remainder only allowed visiting after lunch.

Play in hospital

Children from time immemorial have relied upon play to develop their personalities, but the provision of equipment and the organisation of play in hospitals has often been deficient. Watching a child at play can be delightful and is sometimes frightening, but it is all-absorbing and tends to minimise the effect of a hospital admission upon the child.

Hospitals should take the advice of the Charak Samhita[11], written in 600 BC, which made the following recommendations about the equipment of a child patient's room: 'A variety of toys to please the child which should be coloured, light, musical, and beautiful and not sharp-pointed'.

The use of 'play leaders' in children's wards is a recent advance but is still largely dependent upon the use of voluntary help or financial aid from such organisations as the Save the Children Fund. There can be no doubt that the provision of such equipment and services in a surgical ward creates a happy atmosphere with benefit to the overall health of the child.

CONCLUSION

The increased use of day facilities for children undergoing surgery and the provision of a paediatric home nursing team has resulted in a change in overall care of surgical children in hospital in Southampton. The ratio of day patients to inpatients has fallen from 1 : 2 in 1970 to 1 : 1 in 1976 and the early discharge of inpatients has resulted in a fall in the average inpatient stay of 6.6 days in 1970 to 5.7 days in 1976.

I am sure that Alex Simpson Smith, who experienced a traumatic hospital admission at the age of 3 years and who always had the interests of children at heart, would have appreciated and actively encouraged these changes in hospital practice if he had been alive and with us today.

I am indebted to the Department of Teaching Media, University of Southampton, for their help in the preparation of the illustrations.

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